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STATE OF CALIFORNIA
BEFORE THE STATE WATER RESOURCES CONTROL BOARD

In the Matter of In the Matter of Waste Discharge Requirements Waste Discharge Requirements For Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC In the Upper Elk River Watershed, Humboldt County; Order No. R1-2016-0004	)	PETITION FOR REVIEW OF NORTH COAST REGIONAL WATER QUALITY CONTROL BOARD ACTION OF ADOPTING ORDER NO. R1-2016-0004; MOTION FOR STAY OF ENFORCEMENT; DECLARATION OF KRISTI WRIGLEY

In accordance with the provisions of California Water Code section 13320 and associated implementing regulations at Title 23, California Code of Regulations, section 2050, *et seq.*, the Environmental Protection Information Center and the North Group of the Redwood Chapter Sierra Club (collectively “Petitioners”), hereby petition the State Water Resources Control Board (“State Board”) to review the North Coast Regional Water Quality Control Board’s (“Regional Board”) November 30, 2016 action adopting Order No. R1-2016-004, “Watershed-Wide Waste Discharge Requirements for Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood, LLC, in the Upper Elk River Watershed (hereafter, “Adopted Order.”).

Additionally, Petitioners hereby request a stay of the effect of the Adopted Order until such time as a public hearing before the State Board can be held, in accordance with the provisions of Title 23, California Code of Regulations, § 2052 (c). *See also* Tit. 23, Cal. Code Reg. § 2050.6. The Motion to Stay the effect of the Adopted Order is included herein.

I. Identification of Petitioners

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II. Action or Failure to Act being Petitioned

Petitioner herby requests that the State Board review and overturn the Regional Board's November 30, 2016 action to adopt Order No. R1-2016-004 ("Adopted Order"), on the basis of the allegations specified herein. A true and correct copy of the Adopted Order is attached as Attachment No. 1.

A. Procedural History of the Adopted Order

The Adopted Order is a Watershed-Wide Waste Discharge Requirement ("WWDR") for Humboldt Redwood Company in the Upper Elk River watershed, and is set in the context of the well-documented extremely impaired water quality conditions in the watershed. Timber harvesting activities in the Upper Elk River watershed were greatly accelerated from 1986-1997 as a consequence of the MAXXAM Corporation's take-over of the family-owned Pacific Lumber Company, and this accelerated timber harvesting had a devastating impact on the quality and beneficial uses of water in the basin. The Regional Board placed Elk River on the 303(d) list of impaired waterbodies pursuant to the federal Clean Water Act in 1998 due to excessive sedimentation from timber harvesting activities. In 2002, the Regional Board entered into a Memorandum of Understanding with the U.S. Environmental Protection Agency to develop and adopt a Total Maximum Daily Load ("TMDL") for the Elk River watershed with the intent to arrest sediment pollution discharges from controllable non-point sources associated with ongoing contemporary timber harvesting activities in the watershed.

The Regional Board has held numerous meetings and workshops in the intervening years. Finally, 18 years later, the Regional Board produced a public Notice of Intent to Adopt a TMDL Action Plan and Basin Plan Amendment for the Upper Portions of the Elk River watershed on December 23, 2015. The Regional Board issued a concurrent Notice of Intent to Adopt a revised WWDR for Humboldt Redwood Company Timber operations in the Upper Elk River watershed that included an early version of the Adopted Order, on that same date.

The Upper Elk River TMDL Action Plan and Basin Plan Amendment ("TMDL Action Plan") were adopted by the Regional Board on May 5, 2016. A true and correct copy of the TMDL Action Plan is attached as Attachment No. 2. The TMDL Action Plan contemplates a three-part strategy for controlling sediment discharges and remediating impaired water quality conditions. These are: (1) revised WDRs for potential sources of discharges, including revised WDRs for the two industrial timberland owners in the upper watershed (Humboldt Redwood Co., LLC ("HRC") and Green Diamond Resource Company), a revised WDR for NTMP holders in the watershed, and enrollment of activities restoration activities conducted by the Bureau of Land Management in the Headwaters Forest Reserve under a WDR permitting framework; (2) The Elk River Recovery Assessment Program, and; (3) the Elk River Stewardship Group, a watershed stakeholder group.

Revised WDRs are the only portion of the TMDL Action Plan and Basin Plan Amendment that are fully enforceable by, or under the complete control of the Regional Board. Additionally, the other two components of the TMDL Action Plan, the Recovery Assessment and Stewardship Group, are as-yet not fully developed, or funded, are a long way from full implementation, and not within the direct control or discretion of the Regional Board.

B. Contents of Final Adopted Order

The Adopted Order is a substantially weakened version of the order that had been originally circulated to the public for review. The Regional Board issued a Notice of Intent to Adopt an earlier version of the order for its April 7, 2016 Board meeting, but no action was ultimately taken at that time. Again, the Regional Board then issued Notice of Intent to Adopt an earlier version of the order at its May 5, 2016 Board meeting, but took no action. Then, the

Regional Board issued its August 30, 2016 Notice of Intent to Adopt the Adopted Order at its November 30, 2016 meeting.

At its November 30, 2016 meeting, the Regional Board made three substantive changes to the order from the dais prior to ultimately deciding to promulgate the now-Adopted Order. The version of the order upon which Board Members took action was itself a changed version from that circulated to the public for comment as part of the August 30, 2016 Notice of Intent, which was the version to which the Regional Board provided formal written response to public comments. The three substantive changes made by the Regional Board to the now-Adopted Order from the dais without re-notice or opportunity for public comment were: (1) Changing from delineation of five "high-risk sub-watersheds," to the much less restrictive "high-risk areas," defined by Hookton soil formation; (2) Applying enhanced Riparian Management Zone (RMZ) protective measures only to the so-called "high-risk areas," as opposed to those applying to the entire HRC ownership in the watershed; and (3) Deleting enhanced wet-weather road use restrictions present in previous iterations of the order. All three of these changes will result in substantially less protection for the quality and beneficial uses of water in the Upper Elk River and will serve to allow greater amounts of controllable sediment pollution discharges from HRC timber operations than was contemplated either by the Draft Proposed Order upon which the Board acted, or by the Initial Study and Mitigated Negative Declaration that the Regional Board relied upon.

III. Date of Regional Board Action

The Regional Board passed the Adopted Order on November 30, 2016.

IV. Statement of Reasons the Action was Inappropriate or Improper

The Regional Board acted improperly and prejudicially abused its discretion in promulgating the Adopted Order, and in doing so violated the California Porter-Cologne Water Quality Control Act and its implementing regulations, including the North Coast Regional Water Quality Control Plan ("Basin Plan"). The Regional Board also violated the California Environmental Quality Act ("CEQA") and the California Administrative Procedures Act ("APA") in promulgating the Adopted Order.

The promulgation of the Adopted Order was improper and represents a prejudicial abuse of discretion by the Regional Board because the Adopted Order does not contain sufficient enforceable standards to ensure that timber operations carried out pursuant to the Adopted Order will attain the TMDL Action Plan load allocation for the Upper Elk River Watershed, as adopted by the Regional Board on May 6, 2016 and codified in the North Coast Regional Water Quality Control Plan. Furthermore, the Adopted Order is not supported by either the initial December 4, 2015 Initial Study, or the August 30, 2016 Revised Initial Study, intended to support the Mitigated Negative Declaration, because the Regional Board made substantial changes to the Adopted Order without an opportunity for public review and comment. True and correct copies of the December 4 and August 30, 2016 Initial Studies are attached as Attachment No. 3 and 4. Finally, the Regional Board violated procedural provisions for public notice, review and comment in promulgating the Adopted Order.

<u>V. How Petitioners are Aggrieved:</u>

Petitioners are aggrieved by the Regional Board's improper action to promulgate the Adopted Order because the consequence of the effect of the Adopted Order will be a lack of regulatory assurance of compliance with the TMDL load allocation codified in the North Coast Regional Water Quality Control Plan for the Upper Elk River watershed as a result of timber operations conducted pursuant to the Adopted Order. Furthermore, Petitioners are aggrieved due to the lack of ability to consider and provide meaningful comment and input on major substantive changes in the Adopted Order, as outlined above, *supra* section II.B, and in turn, have their comments considered and responded to prior to the Regional Board's final decision approving the Adopted Order.

Petitioner Environmental Protection Information Center ("EPIC") is a community-based, grassroots, membership organization with over 39 years of history of engagement in environmental advocacy and citizen's action to protect, enhance, and restore, the quality and beneficial uses of water in the North Coast of California, which it serves. EPIC represents over 2,000 paid members, and thousands more online supporters, including several residents of the Upper Elk River Watershed. EPIC has an extensive and well-documented history of advocacy efforts to protect, enhance, and restore the beneficial uses of water in the Upper Elk River Watershed. Additionally, EPIC staff and membership live in and/or regularly utilize portions of the Upper Elk River Watershed for recreational uses and aesthetic enjoyment of open space.

Petitioner North Group of the Redwood Chapter Sierra Club is a local chapter of the Sierra Club representing members in Humboldt, Del Norte, Trinity, and western Siskiyou counties. For over 50 years, the North Group has been dedicated to the protection and restoration of the North Coast. North Group members have worked to protect the Elk River through participating in the development of the North Coast Regional Water Quality Control Plan, the Upper Elk River Sediment TMDL Action Plan, and the Adopted. North Group members recreate and appreciate the Elk River and are harmed by the continued failure of the river to meet its beneficial uses.

The Adopted Order will result in the further degradation of already severely-impaired watershed conditions in the Upper Elk River Watershed that affect forests, watersheds, fish, and people alike, and will result in the non-attainment of Basin Plan-specified Water Quality Objectives as articulated in the TMDL Action Plan. The Adopted Order represents the only legally-binding and enforceable component of the TMDL Action Plan, and the only component over which the Regional Board maintains discretion and control. The Adopted Order does not contain sufficient regulatory constraints to ensure attainment of the TMDL Action Plan load allocation or other specified Water Quality Objectives for the Upper Elk River.

VI. Action Petitioners Request that the State Board Take

Petitioners hereby request that the State Board: (1) Stay the effect of the Adopted Order; (2) Schedule a hearing on the Petition for Review and the Motion for Stay; (3) Review the Adopted Order and the manner in which the Order was adopted, and; (4) Set-aside the adoption of the Adopted Order and remand the decision back to the Regional Board for reconsideration, and adequate opportunity for noticed public review and comment.

VII. Statement of Points and Authorities and Rendering of Causes of this Action

The Regional Board prejudicially abused its discretion by the action of promulgating the Adopted Order on the basis that: (1) the Regional Board's action is in violation of the Porter-

Cologne Water Quality Control Act, and its implementing regulations, including the North Coast Regional Water Quality Control Plan ("Basin Plan"); (2) the Regional Board's action violates the provisions of the California Environmental Quality Act and its implementing regulations, and; (3) The Regional Board's action and conduct in promulgating the Adopted Order is in violation of the California Administrative Procedures Act.

A. Violations of Porter-Cologne Water Quality Control Plan and Water Quality Control Plan for North Coast Region

The Adopted Order promulgated by the Regional Board is not consistent with the California Porter-Cologne Water Quality Control Act, or its primary regulatory implementing vehicle, the Basin Plan. The Adopted Order will exacerbate ongoing unreasonable and significant degradation of the quality and beneficial uses of water in the Upper Elk River watershed, and will likely exacerbate already well-recognized nuisance conditions as pertains to the level, frequency, and intensity of over-bank flooding in the residential portions of the Upper Elk River watershed.

The Basin Plan plainly establishes that the Regional Board must regulate "controllable" water quality factors to achieve water quality objectives:

> Controllable water quality factors shall conform to the water quality objectives contained herein. <u>When other factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives then controllable factors shall not cause further degradation of water quality.</u> Controllable water quality factors are those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled.

Basin Plan at 3-1 (emphasis added). Controllable water quality factors includes discharges of settleable materials, suspended materials, or discharges that are resultant from discretionary actions, such as sedimentation from wet weather road use, as these actions may be reasonably controlled to minimize discharges.

Additionally, the Basin Plan contains the Action Plan for Logging, Construction and Associated Activities, and contains the following Prohibitions:

> 1. The discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature

> into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.
>
> 2. The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities which could be deleterious to fish, wildlife, or other beneficial uses is prohibited.

Id. at p. 4-29.00.

The Upper Elk River Technical Analysis for Sediment ("Tetra Tech Report"), prepared as part of the TMDL development process, found that the Upper Elk River watershed is presently overwhelmed with sediment and has no further assimilative capacity for inputs of additional sediment discharges. ." Tetra Tech Report at 7.2, p. 74 ("Because of sediment aggradation, there is current no apparent loading capacity for additional sediment within the impacted reach . . . without apparent capacity for additional sediment, the impacted reach of the Upper Elk River watershed has a current conceptual and regulatory sediment loading capacity of zero.") A true and correct copy of the Tetra Tech Report is attached as Attachment No. 5.

According to the Tetra Tech (2015), "[t]he sediment supply in Elk River has overwhelmed the transport capacity of the river resulting in rapid channel and flood-plain aggradation." *Id.* at 5.1, p. 30. Further, the Tetra Tech Report suggests that current regulations and voluntary practices, such as conformance with HRC's Habitat Conservation Plan ("HCP") and Watershed-Specific Prescriptions developed through HCP-mandated Watershed Analysis, are insufficient to prevent sediment from continuing to degrade the Elk River. The Tetra Tech Report estimates that Elk River is still currently capturing a mass retention rate of 7,300 metric tons of sediment per-year, based on estimates from the year 2004-2011. *Id.* at 6.2.4.4, pp. 68-69. The excess amounts of sediment overwhelming the Upper Elk River watershed are precipitating increases in the frequency, magnitude, and intensity of over-bank flooding, creating nuisance, and endangering the lives, health, and safety of citizens living in the residential areas of the upper watershed. *Id.* at 5.2.2, pp. 38-39.

The scientific conclusions, and the call for more stringent land use regulations to prevent controllable sediment pollution, were heard by the Regional Board and incorporated into the TMDL Action Plan. The TMDL Action Plan recognized that both the loading capacity—defined by the plan as the “as the total sediment load (natural and management-related) that can be discharged into the Upper Elk River and its tributaries without impacting beneficial uses of water, causing an exceedance of water quality objectives, reducing the quality of high quality water, or creating nuisance conditions”—is “zero.” TMDL Action Plan at § IV. While the TMDL Action Plan further found that the loading allocation is not an effluent limitation or waste load allocation, the zero loading allocation still underscores the drastic extent of degradation and the necessity for stringent controls on controllable discharges.

The Adopted Order fails to adequately regulate controllable water quality pollution. Take, for example, sediment pollution from roads. The Tetra Tech Report found that “road surface erosion” was an anthropogenic factor contributing to sediment pollution in the Elk River. (Tetra Tech, 2015, at Figure 15, p. 61.). The amount of sediment loading depicted demonstrates that existing regulations and voluntary actions are insufficient to prevent road surface related sediment pollution. The Adopted Order repeatedly recognizes that sediment from wet weather road use is a controllable source of sediment:

> Conducting timber operations during wet weather increases the potential for sediment production and discharge from roads, landing, and skid trails. <u>Use of trucks and heavy equipment during saturated soil conditions can result in soil compaction, create ruts which affect road drainage, and increase production of fine sediment. Typically the most effective way to prevent impacts from operations during saturated soil conditions is to avoid operations during the period of the year when rain is likely to occur.</u> This allows for timely implementation of seasonal erosion control, and the completion and stabilization of construction and reconstruction of roads, landings, skid trails and watercourse crossings. In the North Coast, over 90% of average annual precipitation falls between October 1 and May 1.

Adopted Order at 59, p. 18 (emphasis added). While the Adopted Order states, “Wet weather road use shall be avoided or limited to well rocked, paved, or chip sealed surfaces,” the Adopted Order fails to prohibit wet weather road use. Indeed a prohibition on wet weather road use was present in previous iterations of the WWDR but, as recounted above, *supra* section II.B., these prohibitions were excised from the dais at the November 30, 2016 Regional Board meeting. By recognizing that wet weather road use was a controllable source of sediment and by removing prohibitions against its use, the Regional Board violated the Basin Plan. Basin Plan water quality objectives for sediment, turbidity, settleable and suspended materials in the Upper Elk River watershed will continue to be exceeded and impaired as a result of the Adopted Order.

B. CEQA Claims

The Regional Board's action on the Adopted Order violated the California Environmental Quality Act ("CEQA") by: (1) relying on an inadequate Mitigated Negative Declaration; (2) failing to adequately analyze and disclose all activities and factors that may result in significant adverse impacts on the environment; and (3) failing to conduct a supplemental analysis subject to public review and comment following substantive changes made to the Adopted Order. We address these three factors in turn.

1. Mitigated Negative Declaration is not the Proper CEQA Compliance Vehicle for the Project

A Mitigated Negative Declaration ("MND") is not the proper vehicle for analysis of potentially significant adverse environmental effects of the Adopted Order for the purpose of demonstrating CEQA compliance. California Public Resources Code section 21064.5 defines the criteria for an agency to rely upon an MND:

> [A] negative declaration prepared for a project when the initial study has identified potentially significant effects on the environment, but (1) revisions in the project plans or proposals made by, or agreed to by, the applicant *before* the proposed negative declaration and initial study are released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effect on the environment would occur, and (2) there is no substantial evidence in light of the whole record before the public agency that the project, as revised, may have a significant effect on the environment.

(Emphasis added). *See also* 14 CCR § 15369.5.

An MND is an inappropriate vehicle for this action. The December 4, 2015 Initial Study intended to support adoption of a MND, as originally provided to the public for notice and comment, was not predicated upon agreement with the Project applicant, HRC, on measures necessary to either avoid or mitigate to a level of insignificance certain potentially significant adverse impacts on the environment that were identified in the Draft Initial Study. The record and proceedings before the Regional Board in promulgating the Adopted Order clearly show substantial disagreement between Regional Board staff and HRC over the measures necessary to ensure that significant adverse impacts on the environment were either avoided or mitigated to a level of insignificance, which, by definition, should have disqualified the use of an MND as the CEQA compliance vehicle. Again, CEQA requires that all revisions and mitigations to a project proposal must be agreed upon and incorporated into the Initial Study and the proposed action prior to release of the MND and Initial Study for public review. This clearly is not what transpired here.

As outlined above, *supra* section II.B., there were extensive changes to the Adopted Order from what was circulated for public review and comment. For example, Humboldt Redwood Company's August 28, 2015, Report of Waste Discharge ("ROWD") for its Elk River ownership—which constitutes its application for coverage under a new Watershed-Wide Waste Discharge Requirement ("WWDR") for Upper Elk River—originally contemplated continuing timber harvesting activities in all sub-watersheds within its ownership. *See* HRC August 28, 2015 ROWD, at Figure 4.3, page 24; a true and correct copy of which is attached as Attachment No. 6. By contrast however, the first public draft of the WWDR, dated November 18, 2015, contemplated a "temporary prohibition" on timber harvesting in five (5) sub-watersheds identified in the Draft Order as "high-risk." *See* November 18, 2015 Draft Order, section I(A)(4); a true and correct copy of which is attached as Attachment No. 7. This dramatic difference between logging vs. a temporary prohibition illustrates the certain lack of agreement for purposes of the project mitigation.

The Regional Board was well aware of the disagreement with the Applicant over measures necessary to either avoid or mitigate to less-than-significant the identified potential impacts to water quality in the Upper Elk River watershed in a final and adopted WWDR permit. Rather than circulate an Initial Study and MND with the mitigation agreed to, the Regional Board erred in continuing to rely upon the draft Initial Study and MND which was not the basis of an agreement, and contrary to the clear language in the Public Resource Code and CEQA guidelines.

There are numerous other examples where the project applicant, HRC, and the project application, ROWD, were not consistent with the Draft Proposed Order at the time of the

December 2015 release of the Draft Initial Study and MND. This disagreement was not remedied in the revised Initial Study and MND released on August 30, 2016. The record and proceedings before the Regional Board in promulgating the final Adopted Order demonstrate a fundamental lack of agreement between the Regional Board and HRC about mitigations and prescriptions necessary to avoid or lessen to a point of insignificance potential adverse impacts on the environment and water quality in the Upper Elk River in conjunction with HRC timber operations in the watershed. While the Regional Board does retain a measure of discretion in adoption of WWDRs for purposes of the Porter-Cologne Water Quality Control Act, it does not have discretion to utilize a MND when it has failed to document that all mitigation is agreed.

2. Regional Board Failed to Adequately Disclose, or Analyze Potentially Significant Adverse Impacts of the Proposed Project in its Initial Study and Mitigated Negative Declaration

The Regional Board also erred and violated CEQA by failing to adequately disclose, analyze, and mitigate to less than significant the potentially significant adverse impacts on the environment and to water quality in the Upper Elk River watershed that would occur as a result of the Adopted Order.

The December 4, 2015 Draft Initial Study intending to support the MND circulated for public review in support of the proposed action does not provide specific analysis of the timber harvesting methods and prescriptions contemplated in HRC's August 28, 2016 ROWD. Section H of the Initial Study is entitled, "Specifics of Proposed Project and General Environmental Concerns." *See* December 4, 2015 Initial Study at § H, pp. 8-22. The Regional Board cites broad-brushed and highly generalized concerns about the potential adverse impacts of timber harvesting on water quality, and then articulates the mitigation measures contemplated in the Proposed Action, but provides no specific analysis of the actual impacts of the activities specifically-proposed either in the HRC ROWD or the Draft Order circulated to the public.

Section H, of the December 4, 2015 Draft Initial Study at Section H, page 8, acknowledges generalized water quality concerns in the Upper Elk River watershed to which timber operations could potentially contribute, thus resulting in a significant adverse impact on the environment and water quality. These are:

a. impaired domestic and agricultural water quality;

b. impaired spawning habitat; and

c. increased rate and depth of flooding due to channel in-filling by sediment.

However, the summary paragraph in the December 4, 2015 Initial Study for this sub-section simply concludes:

> The overall result of timber harvesting as described in HRC's management strategy is a "managed" forest, which is qualitatively different from an untouched old growth forest. However, the management strategy is designed to retain much of the wildlife and watershed functions of the forest and will maintain or improve those values over current conditions. While it is difficult to quantify, when the proposed rate of harvest and partial harvesting methods are considered together with the emphasis on landslide avoidance strategy, landslide hazard analysis, and land management prescriptions, the potential for watershed impacts from timber harvesting is considered to be fairly low. *That said, new discharges of sediment from harvesting and associated activities can be significant due to the existing impacted and degraded water quality of the watershed*."
> December 4, 2015 Initial Study at § H, p. 9 (emphasis added).

The December 4, 2015 Draft Initial Study does not specifically analyze how HRC's specific timber operations and activities might adversely impact the environment or water quality in the Upper Elk River or why the risk of potential watershed impacts from HRC timber operations is considered "low." What constitutes a "low" risk, or how this has been determined, and using what criteria is similarly not disclosed. The Regional Board has not provided a substantial evidentiary basis in the December 4, 2015 Initial Study, or the Final Initial Study and adopted MND that accompanies the Adopted Order, to allow it to determine, based on the evidence in the record that HRC's timber operations would have a "low" potential adverse impact on the environment or water quality in the Upper Elk River watershed. The Regional Board erred in not conducting a thorough analysis based on substantial evidence either in the 2015 Draft Initial Study which it used to determine a MND was an appropriate CEQA vehicle, or in the Final Initial Study and approved MND when it promulgated the Adopted Order. The CEQA documentation lacked substantial evidence to demonstrate that potentially significant adverse and cumulative impacts resulting from implementation of the Adopted Order had been avoided or mitigated to a point of less than significant.

The December 4, 2015 Initial Study does not even incorporate within it information from HRC's own permit application—the August 28, 2015 ROWD—to extrapolate how much additional sediment pollution the Proposed Action and Adopted Order might contribute over the life of the permit to waters of the state, thus exacerbating existing conditions of already impaired beneficial uses of water. The Regional Board also does not provide an analysis of anticipated changes in water quality objectives resulting from the permitting of any discharges of sediment pollution that might result from implementation of the Adopted Order. Instead, the Regional Board relies almost exclusively on summary, conclusory, and unsubstantiated statements and claims in its December 4, 2015 Initial Study, and Final Initial Study, to conclude that the Proposed Action and Adopted Order will result in a less than significant impact on the environment following contemplated mitigations, even though some of these were a point of contention and dispute between the Regional Board and the Applicant.

The Regional Board's December 4, 2015 Initial Study also fails to analyze the potentially significant adverse environmental and water quality impacts of promulgating the Adopted Order on hydrology and water quality in the Upper Elk River watershed. It fails to provide substantial evidence that further sediment inputs as authorized by the Adopted Order would be consistent with the TMDL Action Plan load allocation set at "zero." The December 4, 2015 Draft Initial Study Check List, at IX., p. 88, clearly stipulates that the Sediment Source Analysis recommended a "zero" load allocation in light of the severely impaired environmental and water quality conditions in the Upper Elk River watershed, many of which are directly attributable to the Proposed Activity, i.e., timber harvesting. Yet, the Regional Board permits continued discharges when it states, "For discharges associated with continued timber operations, combined measures required under the Order, as itemized below, are protective of water quality within the [Upper Elk River] watershed." December 4, Draft 2015 Initial Study, at, p. 57.

The Regional Board's Draft Initial Study refers to no evidence of any kind to support such a statement. Instead, it assumes no significant adverse environmental effects because of the manner in which HRC logs, using selection harvest rather than clearcutting, with a rate of harvest. However, these practices in isolation do not demonstrate no environmental effects. What matters here is the sediment discharges, which may—or may not—be lessened depending on the silvicultural method. However, there is no analysis that they will be eliminated, which is needed to be consistent with the "zero" loading capacity.

These errors were not remedied by the Final Initial Study and Adopted MND. For example, the same statement about HRC's use of selection as opposed to clearcutting as a basis for an MND also appears in the August 30, 2016 version of the Initial Study. *See* August 30, 2016 Initial Study, at section H, p. 10. The same statement is also included in the Final Adopted Initial Study and MND from November 30, 2016. *See* Final Adopted Initial Study and MND, November 30, 2016, section H, at p. 9.

3. Regional Board Failed to Re-Consider its Analysis and Findings and Failed to Recirculate the Adopted Order Following Substantive Changes

The Regional Board violated CEQA by not recirculating, before approval, the and its Final Initial Study and MND for noticed public review and comment following substantive changes made on November 30, 2016 to these environmental review documents as well as the Adopted Order. The changes made to both the Adopted Order and to the Final Adopted MND and Initial Study constitute significant new information that was not available to Petitioners or the public in advance of the decision.

On August 30, 2016 the Regional Board circulated a Notice of Public Comment Period and Notice of Intent to Adopt a Revised a Proposed Order and the Revised Initial Study and MND. The public comment period was closed on September 29, 2016, although the Regional Board solicited oral comments at the November 30, 2016 meeting. On November 30, 2016, the Regional Board conducted the hearing pursuant to the August 30, 2016 Notice of Intent to Adopt the Adopted Order, but did not reopen the public comment period which ended on September 29, 2016. Prior to the November 30, 2016 meeting, the Regional Board formally responded to written comments submitted by the September 29, 2016 deadline, however because the Regional

Board responded to comments before the November 30, 2016 meeting, the Regional Board provided no response to oral comments delivered at the meeting.

The August 30, 2016 Revised Order itself represented a weakened version of its previous iteration, dated June 16, 2016. Specifically, the August 30, 2016 version of the Draft Order made the substantial change eliminating protections of a "temporary prohibition" on HRC timber harvesting activities in five-identified "high-risk" sub-watersheds in the Upper Elk River for an initial five-year interim period, to instead allowing timber harvest activities under a "harvest limitation." *See* August 30, 2016 Draft Order, at. I.6, p. 3; I.28, p.8; I.29 & 30, p.9; I.57, at p. 18; I.59, at p. 19; I.84, at p. 29; I.88, at p. 30; I.89, at p. 31; IA.4, at p. 33; II, at p. 39.

At its November 30, 2016 meeting and hearing to consider approval of the now-Adopted Order, Regional Board staff provided Regional Board members with yet another and changed version of the August 30, 2016 Draft Order. The November 30, 2016 version of the Draft Order was not made available to the general public for review and comment prior to the meeting, and was not the version of the Draft Order upon which the public based its comments to the Regional Board or the version upon which the Regional Board provided its November 30, 2016 response to comments on the August 30, 2016 Draft version of the Order. Furthermore, the Draft Order was not the version considered by the Initial Studies or proposed MND.

The November 30, 2016 version of the Draft Order provided to Board Members on the day of the hearing contained significant substantive changes from the August 30, 2016 version upon which public comments were provided, and upon which the Regional Board based its written response to public comments. These changes are explained in detail above, *supra* section II.B., but in summary, the Regional Board may three major changes from the dais.

<u>First</u>, the Regional Board changed what it considered high-risk areas of concern from one based on sub-watershed areal extent to one based on soil type. This substantive change meant harvest limitations would apply only on a certain soil type, the Hookton soil group, rather to readily-identified five high risk sub-watersheds. The effect of this change is substantial because the geographical area within which the harvest "limitation" would apply was reduced, thereby allowing an increase in timber harvest activities that would previously have been limited.

Additionally, the change in criteria itself from a sub-watershed basis to a soil type basis represents significant new information that was not available to the public at the time of the comment period or close of public comment, and was not the criteria upon which the public provided comment or that the Regional Board provided its response to comments. This change alone has the potential to result in an additional significant adverse and cumulative impact upon the environment and the likelihood of attainment of water quality objectives in the Upper Elk River watershed. It appears that the changes provided to the Regional Board at the time of the November 30, 2016 meeting were made in response to HRC's submittal of an Amended Revised ROWD on October 4, 2016, the period between the close of public comment and the hearing date. Not only was the public deprived of the opportunity to comment on the changes provided to the Board, but it was also deprived of the opportunity to comment on the Amended and Revised ROWD.

Second, at the November 30, 2016 meeting, the Regional Board reduced protective requirements within Riparian Management Zones ("RMZ") from applying across HRC's entire Upper Elk River ownership to just to apply in the newly-delineated "high-risk areas." *See* Adopted Order, Specific Requirements at IB, p. 31. The effect of this change has the potential to result in significant adverse cumulative impact on the environment and to the likelihood of attainment of water quality objectives in the Upper Elk River watershed, as it removes important protections for stream corridors. These additional potential impacts were not analyzed or considered by the Regional Board in its December 4, 2015 Draft Initial Study and MND, or in the Revised August 30, 2016 version of the Draft Initial Study and MND. Furthermore, these changes were not contemplated or disclosed in the August 30, 2016 Notice of Intent and August 30, 2016 version of the Draft Order. The public was denied its opportunity to comment on this substantive change. Therefore, the Regional Board could not possibly have analyzed or considered the potentially significant adverse impacts on the environment of water quality in the Upper Elk River as a result of subsequent changes at the time of the analysis.

Third, the Regional Board removed wet weather restrictions on hauling and on yarding within high-risk areas, despite recognizing that such restrictions would prevent sediment pollution. Again, these changes were not previously contemplated or disclosed and the public was denied its right to comment on this substantive change.

The changes made in the period between the August 30, 2016 Notice of Intent and Draft Order and the November 30, 2016 hearing and version of the Draft Order, as well as changes made from the dais enshrined in the Adopted Order are substantive in nature and have the potential to result in additional significant adverse and cumulative impacts that have not been analyzed by the Regional Board, or made available for the public to provide meaningful feedback and comments and testimony. At a minimum, such changes require an Addendum under CEQA, or more appropriately, recirculation of environmental documentation for public review and inspection prior to final action. *See* PRC 29012.2.

C. California Administrative Procedure Act

Whether the Regional Board was acting in a rulemaking or adjudicative capacity, the Regional Board failed to provide the necessary guarantees for public participation and review under its own Meeting Regulations in Title 23, California Code of Regulations, sections 647 *et seq*., and under the Government Code and California Administrative Procedure Act. The Regional Board erred by making substantive changes to the Adopted Order from the dais without providing an opportunity for public comments on these substantive changes. The Regional Board also inappropriately made changes in the record of proceeding after the close of the public hearing and the public comment period.

1. Changes to the Adopted Order Made from the Dais Require Public Comment

The Regional Board made substantive changes at three stages of the proceedings that require additional notification and circulation for public comment as it reached the decision to promulgate the Adopted Order. **First**, the Regional Board erred by relying upon and considering a version of the Draft Order provided by staff only at the time of the November 30, 2016 hearing, rather than the August 30, 2016 version, which had been noticed to the public as part of the Regional Board's Notice of Intent to Adopt. **Second**, the Regional Board erred by making changes from the dais during the hearing that were substantive in nature. These changes were much more than clarification or grammatical changes. Before acting, the Regional Board was obligated to provide an opportunity for the public to review and comment upon those changes. **Third**, as identified above in the CEQA discussion, the Regional Board erred by making substantive changes to the Final Adopted Initial Study and MND for the Adopted Order following the hearing at which it promulgated the Adopted Order for purposes of achieving consistency and harmony in both. These changes are identified above, *supra* sections II.B. and VII.B.3. This constitutes a post-hoc rationalization, and is clearly unlawful under the APA.

The APA requires that the state agency "shall consider all relevant matter presented to it" before taking action, and "shall not add any material to the record of proceedings after the close of the public hearing or public comment period." Gov't Code section 11346.8(a),(d). Additionally, the agency may not make changes, without providing a 15-day public notice and comment period, unless they are "nonsubstantial or solely grammatical in nature," or "sufficiently related to the original text that the public was adequately placed on notice that the change could result from the originally worded proposed regulatory action." *Id*.

At a minimum, the Regional Board needed to issue a supplemental Notice of Intent, and recirculate the final Proposed Order and the final Proposed Initial Study and MND for the public comment before finalizing the action it took on November 30, 2016. Its failure to do so has aggrieved Petitioners by denying us the right to review and provide meaningful comments on the changes, and for the Regional Board to respond, in writing, to our concerns and comments regarding the changes made.

VIII. Statement that the Petition has been sent to the Regional Board and the Discharger(s)

True and correct copies have been sent to both the Regional Board, and Discharger Humboldt Redwood Company via First Class Mail at the following addresses:

Humboldt Redwood Company, LLC
125 Main Street
P.O. Box 712
Scotia, CA 95565

North Coast Regional Water Quality Control Board
Attn: Executive Office Matt St. John

5550 Skylane Blvd., Suite A
Santa Rosa, CA 95403-1072
Matt.St.John@waterboards.ca.gov
Nathan.Jacobsen@waterboards.ca.gov

IX. Statement that the Issues Raised in the Petition were Presented to the Regional Board Before the Regional Board Acted or Failed to Act or an Explanation of Why the Petitioners could not Raise Those Objections Before the Regional Board

All issues pertaining to alleged violations of the Porter-Cologne Water Quality Control Act and its Implementing Regulations were raised before the Regional Board prior to the action to promulgate the Adopted Order. Not all issues pertaining to CEQA compliance or Administrative Procedures allegations were raised before the Regional Board prior to the action because these issues have arisen in light of the action taken by the Regional Board and the manner in which it acted in promulgated the Adopted Order on November 30, 2016, and therefore, Petitioner was afforded no opportunity to raise said issues in advance of the filing of this Petition.

Dated December 23, 2016

Respectfully submitted,

/s/ Tom Wheeler
Tom Wheeler
Attorney for Petitioner

X. Motion for Temporary Stay

Pursuant to Cal. Water Code § 13321, Petitioners request a temporary stay of effect of the Adopted Order (Order No. R1-2016-0004). Petitioners will be substantially harmed if a stay is not granted. Logging is imminent and is reasonably certain to result in controllable sediment pollution above limits prescribed by the Basin Plan. This pollution, in turn, will directly harm Petitioners and will continue the degradation of the Elk River. By contrast, a stay will not affect the long-term interests of Humboldt Redwood Co. and will only minimally harm the company in the short-term, as its planned harvesting within the Elk River watershed in the immediate future is minimal. Lastly, Petitioners raised numerous questions or law and fact and are likely to succeed on the merits.

A. Petitioners will be Substantially Harmed if a Stay is not Granted

This petition and request for stay centers on the North Coast Regional Water Quality Control Board's ("Regional Board") duty and authority to protect water quality pursuant to the Porter-Cologne Water Quality Control Act, Cal. Water Code § 13000 *et seq*. Prime among the Regional Board's directives is to develop regulations sufficient to achieve water quality objectives, including the development of water discharge requirements. Failure to achieve water quality objectives is not an esoteric or intellectual problem; it affects the daily lives of members of Petitioners' organizations.

The Elk River watershed is located within the temperate coastal rainforests of Humboldt County, California, and is one of the primary tributaries to the Humboldt Bay, the second largest estuary in California. Historic and ongoing land management, including logging operations, have drastically altered the Elk River. The Elk River watershed is identified on the Clean Water Act Section 303(d) List of Impaired Waterbodies as impaired for sediment, meaning that sediment pollution inhibits the realization desired of beneficial uses, such as recreation, domestic water supply, habitat for endangered species, including the coho salmon.

Sediment pollution is so severe that the Regional Board has recognized that the Elk River has a loading capacity—defined by the board as the "total sediment load (natural and management-related) that can be discharged into the Upper Elk River and its tributaries without impacting beneficial uses of water, causing an exceedance of water quality objectives, reducing the quality of high quality water, or creating nuisance conditions"—of zero. In other words, any additional controllable sediment pollution within Elk River will negatively impact water quality in the Elk River. In turn, individuals, such as Petitioner members, who are harmed by poor water quality will continue to be harm.

Sedimentation in the Elk River, much of which is attributable to historic and ongoing logging in the watershed, has "infilled" much of the Elk River channel, raising the natural water level of the river. This infilling has resulted in an increase in flooding events. These flooding events have caused property damage to Petitioner members in the Elk River. Flooding also put area residents in danger as flood waters often close bridges and roads in the area, including the North Fork Bridge, Elk River Road, Berta Road, and the Berta Road Covered Bridge, preventing egress and ingress for local residents, emergency responders, elder caregivers and visitors. See Declaration of Kristi Wrigley, *infra* section XI, at ¶¶ 8, 9.

Sediment impacts local water supply for watershed residents. Because of virtually non-existent water tables, owing to the clay-rich soil of the watershed, residents are forced to obtain their water supply from the surface water of the Elk River. However, pumping from the Elk River is often prohibitive due to high suspended sediment and/or algae blooms. As a result, landowners must truck in and store potable water for their personal use. See Declaration of Kristi Wrigley, *infra* section XI, at ¶ 10.

Sediment pollution also impacts local and regional fisheries through habitat modification. For example, salmonids, such as the Elk River's coho salmon, require clean, cool water for survival. Fine sediment smothers salmon redds, gravel nests made by female salmon on gravel bottoms of rivers and streams, preventing the emergence of salmon fry from the redd. Salmon also prefer deep pools that form around large pieces of wood in the waterbody. Sedimentation infills large pools, causing a loss of pool volume and the destruction of important salmon habitat. Suspended sediment, fine sediment which is suspended in the water column as opposed to settling at the bottom, causes turbidity. High turbidity, in turn, is correlated with stunted juvenile growth, likely due to impacted feeding ability. Harm to salmonids harms Petitioners as members of Petitioner organizations appreciate these fish and their declines and delayed recoveries harm the aesthetic and recreational interests of Petitioner members.

This ongoing sediment pollution also adversely affects recreational values. As the backyard for Elk River residents, the river is an important recreational spot for swimming, boating, and other aesthetic enjoyment. Contact recreational uses, such as swimming and wading, are impaired by the changes in the river caused by sediment pollution—deep pools are filled and the river bottom, once sand and gravel, has been covered by a "substantial layer" of muck. Non-contact recreation uses, like boating, are impacted by the noxious odors arising from shallow, stagnant water. *See* Declaration of Kristi Wrigley, *infra* section XI at ¶ 11.

Against this background, the Regional Board's Adopted Order and actions at the November 30 meeting are puzzling because instead of doing everything possible to reduce controllable sediment pollution and, in turn, the harm to Petitioner members, other Elk River residents, and others impacted by the poor water quality of the Elk River, the Regional Board systemically weakened the WWDR, as outlined above, *supra* section II.B. and VIII.B.3.

Humboldt Redwood Company has expressed that it would like to begin logging under the new WWDR as soon as possible. The Regional Board has further indicated that it would begin enrolling approved timber harvest plans as soon as soon as the WWDR is accepted by the State Water Resources Board. Without a stay, this logging may commence and discharge additional controllable sediment pollution—pollution that is prohibited by the Basin Plan—that will continue to affect the lives of Elk River residents.

B. A Temporary Stay Will Not Cause Harm to Other Parties

Only two entities may be harmed by a stay: Humboldt Redwood Co. and the Regional Board. Neither would be substantially harmed in the time of a temporary stay, especially in comparison to the real and immediate harm likely to be suffered by Petitioners.

Turning first to potential harm to Humboldt Redwood Co., any potential harm is limited in both temporal and geographic scope. A stay until a final decision by the State Board would be limited in temporal scope. Petitioners are not asking for a permanent injunction against logging, but rather a stay of action until the Regional Board drafts a new WWDR that complies with the

Basin Plan and other laws. The geographic scope of harm is also limited. The ownership in Elk River is a small portion of Humboldt Redwood Company's overall ownership, accounting for around 10 percent of their ownership. Much of this area is not subject to immediate harvest, either because of harvest limitations pursuant to the company's Habitat Conservation Plan, or because potential timber units are not ripe for harvest.

The Regional Board is not likely to suffer any substantial harm. Petitioners' prayer for relief would require the Regional Board to go back to the drawing board and complete regulations that comply with California law. To the extent that this harms the Regional Board by causing additional staff hours and money, the Regional Board invited this harm by promulgating regulations in a manner prohibited by California law and by ultimately adopting illegal regulations.

In sum, the likely harm caused by a stay is minimal, especially in light of the continued, long-term harm likely to be suffered by Petitioners.

C. The Regional Board's Action and the Adopted Order Violate Numerous Laws

As articulated above, *supra* section VII, the Regional Board's action and Adopted Order violate numerous laws, including the Porter-Cologne Water Quality Control Act, the California Environmental Quality Act, and the Administrative Procedure Act.

D. Conclusion

For the foregoing reasons, the State Board should issue a stay of the Adopted Order until resolution of the petition for review given the balance of harms and the likelihood of success on the merits.

Dated December 23, 2016

Respectfully submitted,

/s/ Tom Wheeler
Tom Wheeler
Attorney for Petitioner

XI. Declaration of Kristi Wrigley in Support of Motion for Temporary Stay

I, Kristi Wrigley, declare:

1. My name is Kristi Wrigley. I make this declaration based on my own personal knowledge. I am over eighteen (18) years of age and competent to attest to the matters declared herein if necessary.
2. I am a current member in good standing of the Environmental Protection Information Center ("EPIC"). I joined EPIC because I support the organization's attention to the relationship of logging to water quality and flooding in upper Elk River. I believe that EPIC should participate in this case because they have a long term understanding of the issues in Elk River and can best represent the residents like myself and those similarly situated in upper Elk River. EPIC has closely watched the timber activities in Elk River for many years, and knows intimately the short and long term cumulative effects that logging has caused and is causing here in upper Elk River.
3. In this declaration, I refer to the "Elk River watershed." I understand a "watershed" is defined as an area of land that drains all the streams and rainfall to a common outlet. The mainstem Elk River is fed by the North Fork Elk River and the South Fork Elk River, as well as other smaller tributaries. In turn, each of these forks are fed by numerous tributaries, some named and some unnamed. All of these waters compose the Elk River watershed.
4. My life is intimately attached to the Elk River watershed as I grew up in the watershed, own two properties within the watershed, and currently live within the watershed.
5. I was born in 1946, and raised at "Apple Farm," my family home and apple orchard located at 2550 Wrigley Road, Eureka, CA, 95503, on the North Fork Elk River. I lived here until 1968. I moved away for 10 years, but ultimately came back to Eureka in 1978 to help my parents at Apple Farm. I assumed ownership of Apple Farm in 1995 following my father's death.
6. In 1995, I purchased my uncle's property at the confluence of the North and South Forks of Elk River, 7968 Elk River Road, Eureka, CA, 95503. I purchased this property with

the intention of residing at it. This property has been in the family for many years, starting with the construction of the family home by my uncle in 1950. I call this property the “Red House” because of its barn-red paint.

7. The Adopted Order is especially important to me because of the harmful impacts that the logging has had on water quality, which has affected my enjoyment of my property, my orchard business, and my health and safety. I routinely document the negative effects in the hopes that someone will pay attention. Through my documentation, I have noted my observation that conditions in the Elk River continue to deteriorate.

8. I was forced to move from the Red House to Apple Farm because of routine flooding. Figure one shows the aftermath of flooding that occurred on January 17, 2016 at the Red House. The darker color is sediment deposited by the flood. The lighter color is my wood floor after cleaning. This sort of property damage has become too routine to risk living at this property.

Figure 1: Evidence of flooding on January 17, 2016. The dark is sediment left by the flood. The lighter color is a section of flooring after I cleaned off the sediment. Photo by Kristi Wrigley.

9. In the last 8 years, I have seen increased sediment deposition from logging in the South Fork Elk River and the upper main stem of Elk River. The smaller tributaries of Railroad, Clapp, and other unnamed gulches have become extremely sediment impaired as evidenced by the huge sediment deposits in the lower reaches where they drain into the lower main stem Elk River. Tom's Gulch, which drains land owned and operated by Humboldt Redwood Company, is also depositing significant amounts of sediment into the South Fork Elk River. These have all contributed to the further deposition in the

lower watershed where my Red House is located and cause increasing flood frequency and height in my house.

10. High turbidity and sediment infilling has also affected my domestic water supply at both Apple Farm and the Red House. I remember the North Fork Elk River, which runs near Apple Farm, as having a gravel bottom and the river was full of riffles and pools in my childhood through the mid 1980’s. My parents used the cool and clear surface water of the Elk River for our domestic water all their lives. Today, because the North Fork is so full of suspended sediment in winter and algae growth in summer, I am unable to pump surface water from the river and must often rely on water deliveries for my domestic water even though I have a complex water system which is supposed to purify the water. The water is often so polluted the system does not work.
11. My interest and ability to use the Elk River for recreation is also diminished due to the sediment and algae. The once clear pools are filled with slimy muck, an unpleasant experience.
12. Figure 2, taken on September 23, 2014, shows the North Fork Elk River near my domestic water intake for the Apple Farm.

Figure 2: Picture of North Fork Elk River near my domestic water intake, taken by Kristi Wrigley on September 23, 2014.

13. The Apple Farm is the first downstream land below Humboldt Redwood Company on the North Fork of Elk River. While the Apple Farm had supported my family while I was growing up, since flooding has increased, I am unable to have a productive and economically viable apple crop on my farm. Flood waters destroy my fences allowing deer and bear to enter and destroy my trees and apple crop. The flood waters and ensuing clay sediment deposits smother the apple tree roots from above and the increased water table in the ground drown the roots from below causing trees my father and I planted from the 1970's to the early 1990s to be stressed and ultimately die. Figure 3 shows my apple orchard under flood waters, despite being over 200 feet from the banks of the North Fork Elk River. I took these photos on January 17, 2016.


Figure 3: My apple orchard routinely floods, preventing a productive and economically viable apple crop. This picture was taken by Kristi Wrigley on January 17, 2016. This part of my apple orchard is over 200 feet from the North Fork Elk River.

14. Routine nuisance flooding over the years now often puts myself and others at risk. Because sediment has filled in much of the river channel, flood waters quickly rise after rain. Very quickly, many roads in the areas, including roads I frequently use such as Elk River Road, Wrigley Road, and the North Fork Bridge become impassable. Figure 4 shows the North Form Bridge, which connects Wrigley Road and Elk River Road, on January 17, 2016. This bridge routinely closes due to flooding.

Figure 4: North Fork Bridge on Elk River Road at intersection with Wrigley Road. Note, only the guardrails of the bridge are visible. Photo taken by Kristi Wrigley on January 17, 2016.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed this 20th day of December, 2016 at Eureka, California.

/s/ Kristi Wrigley

Kristi Wrigley

LIST OF ATTACHMENTS

Attachment No. 1: ORDER NO. R1-2016-0004, Waste Discharge Requirements For Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC In the Upper Elk River Watershed, Humboldt County

Attachment No. 2: TMDL Action Plan and Basin Plan Amendment

Attachment No. 3: December 4, 2015 Initial Study Supporting the Preparation of a Mitigated Negative Declaration Waste Discharge Requirements for Timber Harvesting and Related Land Management Activities Conducted by Humboldt Redwood Company, LLC. In Upper Elk River, Humboldt County, California

Attachment No. 4: November 30, 2016 Initial Study Supporting the Preparation of a Mitigated Negative Declaration Waste Discharge Requirements for Timber Harvesting and Related Land Management Activities Conducted by Humboldt Redwood Company, LLC. In Upper Elk River, Humboldt County, California

Attachment No. 5: Tetra Tech, Inc., "Upper Elk River: Technical Analysis for Sediment

Attachment No. 1: ORDER NO. R1-2016-0004, Waste Discharge Requirements For Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC In the Upper Elk River Watershed, Humboldt County

California Regional Water Quality Control Board
North Coast Region

ORDER NO. R1-2016-0004

Waste Discharge Requirements

For

Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC In the

Upper Elk River Watershed

Humboldt County

The California Regional Water Quality Control Board, North Coast Region, (hereinafter Regional Water Board) finds that:

OVERVIEW

1. The Elk River, one of the primary tributaries of Humboldt Bay and an important salmon spawning and rearing habitat, was identified in 1998 as impaired due to excessive sedimentation/siltation and was subsequently placed on the federal Clean Water Act section 303(d) list. The Upper Elk River (UER) Watershed has been utilized primarily for timber harvesting since the 1850s. Water quality impacts resulting from this history of timber management activities include:

    a. Sedimentation and threat of sedimentation;
    b. Impaired domestic and agricultural water quality;
    c. Impaired spawning habitat; and
    d. Increased frequency and depth of flooding due to sediment.

2. The 44.2 square mile Upper Elk River (Attachment A) watershed is predominantly timberland. Humboldt Redwood Company (HRC) is the largest landowner, with 79 percent ownership. This comprises 11% of HRC's total ownership of 209,300 acres in the North Coast region. Discharges from most of HRC's ownership are permitted under the General Waste Discharge Requirements for Discharges Related to Timber Harvest Activities on Non-Federal Lands in the North Coast Region (General WDRs), Order No. R1-2004-0030, or Categorical Waiver of WDRs, Order No. R1-2014-0011. Cumulative impacts in Elk River, Freshwater Creek, Bear Creek, Jordan Creek, and Stitz Creek Watersheds, require watershed-specific permitting. In 2006, the Regional Water Board adopted WDRs for Pacific Lumber Company (PALCO) in Elk River (R1-2006-0039) and Freshwater Creek (R1-2006-0041), which were subsequently transferred to HRC in 2008. In 2011, the Regional Water Board adopted R1-2011-0100, Bear Creek WDRs, and in 2014 adopted R1-2014-0036, Jordan Creek WDRs for HRC. No harvesting activities are currently taking place in Stitz Creek.

3. On September 22, 2015, pursuant to Water Code section 13260(a), HRC submitted a report of waste discharges (ROWD) for its timber harvesting and related management activities. HRC's ROWD was subsequently amended on March 11, 2016 and October 4, 2016. The ROWD includes HRC's proposed long term strategy, including measures designed to prevent or minimize water quality impacts from activities associated with its forest management, including:
   - Timber harvesting;
   - Road use, construction, reconstruction, decommissioning, repair, and maintenance;
   - Measures to prevent or minimize controllable sediment discharge from roads skid trails, landslides, and other sources related to timberland management;
   - Retention of riparian vegetation to preserve and/or restore shade, supply large wood, filter sediment from upslope sources, help maintain and restore channel form and in-stream habitat, and moderate peak flows;
   - Treatment of controllable sediment discharge sources;
   - In-stream and riparian zone habitat restoration by enhancement of in-stream large wood for habitat restoration;
   - Implementation and Effectiveness Monitoring; and
   - Watershed trend monitoring.

   While the ROWD has been deemed complete, it is not considered fully adequate to meet all water quality requirements associated with Elk River. As such, this Order establishes specific requirements based largely on the ROWD, with additional measures as warranted to meet applicable water quality requirements.

4. Water quality impacts from logging and associated activities can include increased sediment production and elevated water temperature. These impacts result from a complex interaction between inherent watershed characteristics, such as geology and geomorphology, external natural processes, such as climate and timing of stochastic events (i.e. large storms, earthquakes, fires), type of management practices, and extent and rate of watershed area disturbed. Increased sediment production is the result of greater incidence of landsliding, surface and gully erosion, and increases in channel erosion due to higher runoff rates. Much of the increased sediment production is associated with roads, skid trails, and landings, with the highest potential for sediment discharge occurring at road watercourse crossings.

5. On May 12, 2016, the Regional Water Board adopted an amendment to the *Basin Plan* to include the *Action Plan for Upper Elk River Sediment Total Maximum Daily Load* (TMDL Action Plan).[1] The TMDL Action Plan draws from the *Upper Elk River:*

[1]The TMDL Action Plan was adopted by the Regional Water Board to achieve sediment related water quality standards, including the protection of beneficial uses of water in the UER watershed, and prevention of nuisance conditions. It will become part of the Regional Water Board's Basin Plan following State Water Resources Control Board, Office of Administrative Law, and USEPA approval.

Technical Analysis for Sediment (Technical Report) (Tetra Tech, October 2015), included as Attachment B of this Order, which is a comprehensive assessment of sediment conditions in the Upper Elk River Watershed. The Technical Report is a synthesis of all Regional Water Board documents, reports from stakeholders in Upper Elk River, and an additional analysis conducted by Tetra Tech, and provides the technical basis for the TMDL Action Plan. This Order is informed by the Technical Report and overwhelming evidence pointing to the lack of any assimilative capacity in the impacted reach.[2]

6. The purpose of this Order is to provide a water quality regulatory structure for HRC to prevent and/or address discharges of waste and other controllable water quality factors associated with timber harvest activities in the UER watershed. The Order provides for implementation of rigorous best management practices (BMP) prepared in collaboration with HRC, according to the sediment loading risk of subwatersheds (See Attachment A, Elk River Location Map). It provides a minimum 5 year interim program where HRC will limit timber harvest activities in high risk areas to allow time for stewardship efforts (see Findings 70 and 71) to move forward and improve conditions in the impacted reach. High risk areas are defined as those areas identified in HRC's ROWD amendment request dated October 4, 2016 submitted to the Regional Water Board with associated map titled Sensitive Bedrock Sub-Basin and Elk River Geologic Map (see Finding 60).

UPPER ELK RIVER WATERSHED

7. The Elk River has a long and strained history, and despite numerous efforts to improve conditions, and recent and promising changes in management strategies, the watershed remains severely impaired, specifically the existing beneficial uses in the downstream reach.

8. In its sediment source analysis, the Regional Water Board evaluated the natural and anthropogenic factors that influence the production and transport of sediment in the Elk River Watershed. The results of the analyses are described in the Technical Report.

9. Over time, sediment transported from the upper tributaries has been deposited in low gradient downstream reaches and has resulted in ongoing aggradation, encroachment of riparian vegetation onto relatively recent fine sediment deposits, and an increased incidence of overbank flooding which has impacted the residential community for the past 20 years. It is estimated that approximately 640,000 cubic yards of sediment have accumulated within the past two decades in the low gradient stream reaches of the UER. In addition to elevated sediment loads, hydromodification from channel

[2] The term "impacted reach" applies to the North Fork Elk River below Browns Gulch, the South Fork Elk River below Tom Gulch, and the mainstem of Elk River from the confluence of the North and South Forks downstream to Bertas Road.

stabilization, removal of large woody material, dredging, and channel constrictions in lower portions of the watershed, such as bridges and roads, have diminished the ability of the river to assimilate increased sediment loads.

10. High sediment production during the period between 1988-1997 is due to several factors, including an approximate four-fold increase in logging under prior ownership of the primary landowner, PALCO. Additional factors include poorly regulated logging practices, a series of winters with above average precipitation and a series of large storm events, and potentially the effects of a magnitude 7.2 earthquake off Cape Mendocino in 1992.

11. In 1997, the Regional Water Board and other state agencies began to receive reports from downstream residents of increased turbidity, channel filling, and flood frequency. In December 1997, California Department of Forestry and Fire Protection (CAL FIRE), California Department of Fish and Wildlife (DFW, then California Department of Fish and Game), California Geological Survey (CGS) and the Regional Water Board determined, based on field observations and aerial photograph data, that the Elk River Watershed was one of five watersheds owned by PALCO that were significantly cumulatively impacted by sediment discharges following the large storm events in late 1996 and early 1997. The other watersheds included Bear, Stitz and Jordan Creeks, which are tributary to the Eel River in the same vicinity, and Freshwater Creek, the adjacent watershed directly north of Elk River, which is also tributary to Humboldt Bay. Following this determination, a series of regulatory and non-regulatory actions designed to increased land use controls to reduce sediment discharges from timber harvesting activities were implemented.

12. This most recent period of increased disturbance, which peaked from the mid-1980s to 1998 and has gradually diminished through the present, is most closely associated with the degradation of conditions in the impacted reach.

REGULATORY ACTIONS IN THE UPPER ELK RIVER

13. CAL FIRE is the state agency responsible for overseeing timber harvesting activities through implementation of the Forest Practice Rules (FPR). (Cal. Code Regs., tit. 14, §§895 *et seq.*[3]) Under the Forest Practices Act, non-federal landowners proposing to harvest timber are required to have an approved timber harvest plan (THP) prior to commencing timber harvesting. The Regional Water Board, DFW, CGS, and other agencies are responsible agencies charged with the multidisciplinary review of THPs to ensure compliance with applicable state laws.

14. The FPRs include rules for protection of the beneficial uses of water, including rules for enhanced protection in watersheds with listed anadromous salmonids. The FPRs

[3] Citations to the Forest Practice Rules contained in title 14 of the California Code of Regulations will be indicated by "FPR" followed by the relevant section number.

provide measures designed to prevent sediment discharge; (See FPR §§ 914, 934 [harvesting practices and erosion control]; §§ 923, 943 [prescriptions for construction, reconstruction, use, maintenance, and decommissioning of roads and landings]; §§ 916.4, 936.4 [requiring evaluation of sites that could adversely impact beneficial uses of water and treatment of such sites when feasible].) FPR section 916.9 requires that every timber operation shall be planned and conducted to comply with the terms of a total maximum daily load (TMDL). The FPRs also provide measures to limit reductions in riparian shade to moderate water temperature. Public Resource Code section 4581.71 specifies that a timber harvesting plan may not be approved if the appropriate regional water quality control board finds, based on substantial evidence, that the timber operations proposed in the plan will result in a discharge into a watercourse that has been classified as impaired due to sediment under Clean Water Act section 303(d). Full and proper implementation of the FPRs related to sediment discharge from timberlands can contribute greatly towards achieving water quality standards. (See e.g. RB1-2013-0005 [FPRs are generally adequate to implement Basin Plan water quality standards if implemented correctly].) Accordingly, this Order relies in part upon the water quality protection provided by the FPRs. Additional protection measures are necessary to protect the beneficial uses of water for site-specific conditions, prevent nuisance, and to comply with a TMDL load allocation.

15. HRC ownership in the Elk River watershed is covered by a multi-species state and federal Habitat Conservation Plan (HCP) approved in 1999. The HCP implements state and federal Incidental Take Permits (ITP) issued for aquatic species including Chinook salmon, Coho salmon, steelhead trout, southern torrent salamander, tailed-frog, red-legged frog, foothill yellow-legged frog, and the northwestern pond turtle in conformance with the state and federal Endangered Species Acts. The HCP includes a Watershed Analysis (WA) component for focused inventory and investigation of conditions and processes related to mass wasting, surface erosion, riparian function, stream channel, and aquatic habitat. The most recent WA iteration for the Elk River is the Elk River/Salmon Creek Watershed Analysis (ERSC WA) Revisited, prepared by HRC in June 2014. The ERSC WA establishes forest management prescriptions pertaining to slope stability, and riparian forest protection are established in consultation with multiple state and federal resource agencies. While the HCP and WA impose prescriptions and other requirements helpful for water quality protection needs and therefore can be relied upon in this Order, they cannot ensure full compliance with federal and state water quality laws, including protection of all the designated beneficial uses of water listed in Finding 23 below.

16. Starting in 1997, the Regional Water Board issued a series of Cleanup and Abatement Orders (CAOs) that required the inventory, prioritization, treatment, and monitoring of existing sediment sources associated with land management activities, prevention of new sediment sources, and monitoring of in-stream sediment-related indices.

Treatment of existing controllable sediment discharge sources (CSDS)[4] have been conducted under CAO Nos. R1-2004-0028 (for the South Fork and Mainstem Elk River) and R1-2006-0055 (for the North Fork Elk River). By 2011, 80% of the top 100 sites with the greatest potential for environmental impact were treated. In 2012, HRC submitted a new master treatment schedule to inventory and schedule implementation of treatment to control sediment discharge of the remaining CSDS in the watershed, which is included as Attachment C of this Order.

17. In September of 1998, the Regional Water Board issued Cleanup and Abatement Order No. 98-100, requiring cleanup and abatement of THP-related discharges by restoring damaged domestic and agricultural water supplies in the North Fork Elk River. HRC currently provides drinking water service to twelve residences, while seeking final resolution and termination of the CAO.

18. In addition, HRC currently operates under Order No. R1-2006-0039, Elk River Watershed-specific Waste Discharge Requirements (WWDR) issued by the Regional Water Board in 2006. Among other requirements, the WWDR includes receiving water limitations on peak flow increases and sediment discharge from harvest-related landslides. Rate of harvest (ROH) limitations were established based on two scientific models.

19. All Regional Water Board Orders that pertain to HRC's current activities were originally issued to PALCO and amended by Order No. R1-2008-0100 to reflect HRC's ownership of the former PALCO holdings.

20. The WWDR (Order No. R1-2006-0039) is not tailored to the management practices of HRC, and does not comprehensively address HRC's obligations for cleanups and TMDL implementation. An updated WDR would provide a more comprehensive permit that reflects current watershed conditions, changes in management practices, and new technical analyses of watershed sediment conditions. The remaining requirements for erosion control from the 2004 and 2006 CAOs are incorporated into this Order for a more efficient management of related monitoring and reporting.

TMDLs AND REVISED WASTE DISCHARGE REQUIREMENTS

21. In spite of all of the efforts to control sediment discharge, beneficial uses in the downstream impacted reaches remain impaired, the stream channel continues to aggrade, and flooding frequency has increased. It appears that the river's capacity to transport sediment out of the aggraded reach is limited by hydrologic and geomorphic constraints and sediment continues to work its way down through the fluvial system. In addition, even with implementation of current management practices and restrictions, ongoing timber harvesting and associated activities will

[4] Sites that discharge or have the potential to discharge sediment to waters of the state in violation of water quality standards, that are caused or affected by human activity, and that may feasibly and reasonably respond to prevention and minimization management measures.

result in increased sediment discharge, further exacerbating the already impaired condition.

22. The Water Quality Control Plan for the North Coast Region (Basin Plan), last adopted in 2011, is the Regional Water Board's master water quality control planning document. It identifies beneficial uses and water quality objectives for waters of the state, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives.

23. The beneficial uses for the Upper Elk River and its tributaries include:

Municipal – Domestic Water Supply (MUN)	Non-Contact Water Recreation (REC-2)
Agricultural Supply (AGR)	Commercial or Sport Fishing (COMM)
Industrial Service Supply (IND)	Cold Freshwater Habitat (COLD)
Industrial Process Supply (PRO)	Wildlife Habitat (WILD)
Groundwater Recharge (GWR)	Rare, Threatened, or Endangered Species (RARE)
Freshwater Replenishment (FRSH)	Migration of Aquatic Organisms (MIGR)
Navigation (NAV)	Spawning, Reproduction, and/or Early Development (SPWN)
Hydropower Generation (POW)	Aquaculture (AQUA)
Water Contact Recreation (REC-1)	

24. At least five of the identified beneficial uses are considered as impaired, including MUN, AGR, COLD, and to a lesser extent both REC-1 and REC-2. The primary beneficial uses of concern for this Order are domestic and agricultural water supplies and the cold freshwater habitat. Existing public and private infrastructure (e.g. roads, bridges, septic systems, and houses) are impacted by increased flooding, creating risks to public safety and nuisance conditions.

25. TMDLs must be established at levels necessary to attain and maintain water quality standards. A TMDL is the sum of individual waste load allocations (WLA) for point sources and load allocations (LA) for nonpoint sources and natural background. (40 CFR 130.2 (i).) Loading capacity is the greatest amount of loading that a waterbody can receive without violating water quality standards. (40 CFR 130.2(f).) A LA is the portion of receiving water's loading capacity that is attributed either to nonpoint source pollution or to natural background sources. Wherever possible, natural and nonpoint source loads should be distinguished. (40 C.F.R. § 130.2(g).)

26. The capacity of the UER for sediment is limited by the ongoing aggradation in the impacted reach resulting in nuisance conditions and compromised beneficial uses. Under the Regional Water Board adopted TMDL, the loading capacity of the impacted

reach for additional sediment is defined as zero until its capacity can be expanded through sediment remediation and channel restoration, nuisance conditions are abated, and beneficial uses are supported. In the UER watershed, all the land use-related sediment delivered to the stream channel is attributed to nonpoint source pollution and natural background. Due to the lack of assimilative capacity in the impacted reach, the Regional Water Board determined that the nonpoint source load allocation be defined as zero.

27. Unlike a WLA that must be translated into a National Pollution Discharge Elimination System (NPDES) permit as an effluent limit, the Board has more discretion in how it chooses to implement the LA[5]. A LA is not independently enforceable and must be applied in the statutory context of the implementation mechanism, such as waste discharge requirements issued under Water Code section 13263. When water quality is already degraded, it may take time to achieve water quality objectives and immediate compliance may not be possible, even with complete cessation of a discharging activity. (See generally Nonpoint Source Policy at 13.) WDRs must include requirements designed to show measurable progress toward improving water quality over the short term and achieving water quality objectives in a meaningful timeframe. Pursuant to Water Code section 13263, the Regional Water Board shall prescribe requirements as to the nature of any proposed or existing discharge with relation to the receiving water conditions. Requirements shall implement any relevant Basin Plan requirements and take into consideration beneficial uses of water, relevant water quality objectives, and other relevant factors. WDRs can prohibit the discharge of waste or certain types of waste, either under specific conditions or in specified areas. (Wat. Code, § 13243.) All requirements shall be reviewed periodically.

28. The ROWD, as amended in a request dated October 4, 2016, identifies high risk areas with respect to water quality. Sediment production from these high risk areas, which are also located directly above and adjacent to the impacted reach of the South Fork Elk River, is among the highest observed throughout the UER. The relative risk rating informs specific protection measures applicable to these high risk areas, including limited timber harvest activities. (See Order Section I.A.4.)

29. The findings below describe reasonable waste discharge requirements for HRC timber management and associated activities in the UER watershed. In this case, a significant portion of in-channel sources are likely to be mobilized and transported to the impacted reach over time. In-channel sources include headward migration of low order channels, streamside landslides and unstable streambanks resulting from ground disturbances from past and on-going timber harvesting activities. Stringent

[5] Even for waste load allocations, dischargers may be granted additional time to come into compliance with TMDL requirements (see e.g. State Water Board Order WQ-2015-0075 [allowing a watershed-based planning and implementation approach as an alternative compliance pathway with TMDLs and receiving water limitations when issuing Phase I MS4 permits, subject to if rigor, accountability, and transparency requirements are met]).

controls are necessary to prevent exacerbation of these sources from continuing timber harvesting activities. The sediment source analysis estimated that approximately 56% of the sediment loading in the UER is from in-channel sources. This increases the need to further constrain any additional sediment inputs that are controllable in order to make progress toward attainment of the load allocation and protection of beneficial uses. Therefore, this Order includes stringent waste discharge requirements designed to minimize new sediment production and to control and remediate existing sediment inputs to the extent feasible. Monitoring will be required to determine whether implementation is leading to measurable improvements. In addition, limiting timber harvesting activities that are likely to generate additional sediment in high risk areas is appropriate, and the Watershed Stewardship Program (see Finding 70) will take active measures to improve downstream beneficial uses.

30. Findings below provide a discussion of HRC's management plan addressing water quality controls, with additional requirements as deemed necessary by the Regional Water Board in order to implement the Porter-Cologne Water Quality Control Act and water quality regulations contained in the Basin Plan. The additional requirements are based on information contained in the evidentiary record that supports this Order, including the Technical Report and additional evidence that informed the Regional Water Board's decision to adopt the TMDL Action Plan. The Order incorporates and includes the following components:
    - Measures to Prevent Sediment Discharge;
        - Forest Management;
        - Riparian Zones Protection;
        - Roads Management;
        - Landslide Prevention;
        - Wet Weather Restrictions; and
        - Limiting Timber Harvesting Activities in High Risk Areas
    - Inventory and Treatment of Existing Controllable Sediment Sources;
    - Watershed Restoration Efforts; and
    - Monitoring and Reporting Program.

SPECIFIC REQUIREMENTS AND RATIONALE

Measures to Prevent Sediment Discharge

31. Specific requirements to prevent new sediment discharge fall into several categories discussed below, including forest management (including harvest rate), riparian protection, roads management, landslide prevention, and wet weather prescriptions. Management measures in separate categories often overlap, and also provide benefits relevant to other categories. For example, riparian protections and proper road management can help reduce landslides. The categories are provided as a way to organize the discussion but should not be viewed in isolation.

    Also, practices implemented to prevent and minimize elevated sediment discharges may also help control elevated water temperatures. While the UER is not listed as impaired for temperature, removal of trees providing shade to watercourses and decreased channel depth due to in-filling of pools with sediment can result in elevated water temperature. Due to the proximity of the UER to the ocean and the moderating effects of the marine influences and stringent BMPs for control of sediment that include significant tree retention the will provide shade along all watercourses, elevated water temperatures are not anticipated to result from HRC's management activities.

Forest Management/Harvest Rate

32. Tree removal can result in reduced interception, evaporation, and evapotranspiration of rainfall by forest canopy and can therefore potentially increase the peak flows and landslides. Tree roots enhance the strength of shallow soils, increasing the soil's ability to resist failure. When trees are harvested, their roots gradually decay, reducing the reinforcement they provide and increasing the potential for shallow landslides. Harvesting trees can potentially increase peak flows and decrease root strength, which can contribute to landslides and increase erosion throughout a watershed. These impacts can be reduced or prevented by limiting canopy removal through silvicultural prescriptions and/or harvest rates limits.

33. The rate of harvest in a watershed is an important management variable. Various studies cite specific thresholds for the rate of harvest, above which, cumulative impacts become more likely to occur and have linked specific processes to watershed impacts, such as increased peak flows from road and canopy removal (Lisle et al. 2000, Lewis et al. 2001), landslide related sediment discharge (Reid, 1998), road density (Cedarholm et al. 1981, Gucinski et al. 2001, Trombulak et al, 2000), or equivalent clearcut area[6] (USDA Forest Service, 1974).

34. HRC has implemented a significantly different silvicultural management strategy from PALCO that predominantly utilizes partial harvesting methods such as uneven-aged single-tree and small group selection (ROWD section 4.1). Partial harvesting results in post-harvest conditions that are less susceptible to mass wasting and increased erosional processes as compared to clearcut harvesting. HRC does not utilize the clearcut harvest method and does not harvest old growth[7].

35. Section 4.0 of the ROWD describes HRC's Forest Management Plan, including projected timber harvesting over a twenty year period between 2015 and 2034 based

[6] Equivalent clearcut area (ECA) is a widely used methodology developed by the USFS to account for the relative impacts of different types of silvicultural treatment. It assigns a weighting factor of one to clearcutting and a value less than one for partial harvesting silvicultural treatments. The weighting factor for a silvicultural treatment is multiplied by total area treated under each silviculture to arrive at a normalized disturbance calculation. Therefore, 100 acres of selection harvest, which is typically assigned a ECA factor of 0.5, would be counted as 50 equivalent clearcut acres.

[7] Variable Retention may be used in some instances as an alternative silviculture to address certain stand conditions, such as high levels of whitewood or hardwood species, animal damage, or general poor form and vigor due to past logging history. Other silvicultural methods that may be applied infrequently include Rehabilitation of Understocked Areas, Seed Tree Removal, and Sanitation Salvage.

on multiple management factors such as growth and inventory, forest canopy, protection of critical terrestrial and aquatic habitat, and watershed analysis constraints. HRC's projected harvest can be described as: 1) average annual harvest acreage (and equivalent clearcut acres) and average overlapping crown canopy for each five year period throughout the UER (ROWD Figure 4-2), as well as 2) for individual subwatersheds (ROWD Figures 4-3 and 4-4). HRC projected harvest scenario shows increases in standing timber inventory and yield over 20 years.

36. Watershed-wide average annual harvest rates proposed in the ROWD for each five year period vary between 466 and 605 acres (223 to 303 equivalent clearcut acres). These rates are lower than required under the 2006 WWDRs, which allowed annual harvest rates of 1.9% in the North Fork and 1.8% and upwards in the South Fork. Based on the transition to uneven-aged management under HRC's ownership, the proposed average annual harvest rate for each five-year period from through the year 2034 throughout the entire UER watershed is less than 1.5% equivalent clearcut acres, the harvest rate above which Klein et.al. (2012) found elevated chronic turbidity levels.

37. Figures 4-3 and 4-4 of the ROWD show projected harvest acreage and overlapping overstory canopy by subwatershed in each five year period over a 20 year time period. Modeled canopy changes for each five year increment over the 20 year period generally show a balance between reductions in canopy due to harvesting and increases from regrowth. For the majority of individual subbasins, canopy changes tend to be positive (increased canopy) for the first three five year periods, with some decreases. Decreases in canopy occur more frequently during the period between 2030 and 2034.

38. The Technical Report recommends a numeric target for limiting increases in peak flows from timber harvesting in individual Class II and III catchment to less than 10% in ten years. Implementation of this numeric target can generally be met by limiting canopy reduction by allowing predominantly unevenaged silviculture, harvest rate limits, and limiting timber harvesting in high risk areas. Using the regression equation developed from the North Fork Caspar Creek (Lisle et al. 2000; Lewis et al. 2001; Cafferata and Reid, 2012), Regional Water Board staff have calculated changes in peak flows from canopy removal based on HRC's projected harvest rates for each subwatershed. Even without taking into account canopy regrowth following harvesting, modeled peak flow increases from HRC's proposed harvesting in individual subwatersheds are below 10%.

39. HRC's projected harvest rates from Table 4.3 of the ROWD (Attachment D) are generally reasonable. Average annual harvest rates in subwatersheds fall near or below 2% equivalent clearcut acres averaged over any 10 year period in most subwatersheds. Harvest rates above this threshold would cause concern for cumulative impacts on water quality that have been observed from intensive logging practices in the past. Each timber harvest plan (THP) is evaluated individually for

impacts to water quality and that review may reveal the need for additional constraints. Where an individual, or multiple, THP(s) would exceed this threshold of concern in any subwatershed, the Regional Water Board Executive Officer may decline to enroll the THP(s), or portions of the THP, or may require additional mitigations or monitoring as a condition of enrollment. (See also Section I.A.3 and Section VI.)

Riparian Zone Protection

40. Properly functioning riparian areas in UER can promote complexity in stream channels, both in the steep upper watershed as well as in the depositional reach. A riparian zone helps maintain healthy stream ecosystems and supports beneficial uses by:

    i. Stabilizing banks through provision of root cohesion on banks and floodplains;
    ii. Filtering sediment from upslope sources;
    iii. Filtering nutrients from upslope sources;
    iv. Supplying large wood to the channel, which maintains channel form and improves in-stream habitat complexity;
    v. Helping to maintain channel form, in-stream habitat, and an appropriate sediment regime through the restriction of sediment inputs or metering of sediment through the system;
    vi. Moderating downstream flood peaks through temporary upstream storage and infiltration of flood water;
    vii. Helping maintain cool water temperatures through provision of shade and creation of a cool and humid microclimate over the stream; and
    viii. Providing both plant and animal food resources for the aquatic ecosystem in the form of, for example, leaves, branches, and terrestrial insects.

41. Alteration of physical processes in riparian zones have led to reduced forest stand complexity, including reduction in the number of trees available within riparian areas for recruitment to streams, increased surface erosion and landsliding, and destabilization of stream channels. Subsurface erosion of soil pipes is prevalent in the UER, particularly in swales above small headwater channels. Preferential flow through soil pipes results in internal erosion of the pipe, which may produce gullies by tunnel collapse. Considerations of the interactions between sediment processes, water temperature, and riparian trees are essential for evaluating and avoiding management related impacts to streams. Management of riparian zone must be designed to preserve and restore the function of riparian vegetation and hillslope processes, including retention of adequate riparian zone trees and avoiding use of roads and heavy equipment on vulnerable hillslopes and swales.

42. HRC's timber operations in Riparian Management Zones (RMZs) are subject to the ERSC WA prescriptions that prevent or minimize sediment delivery to streams and maintain and restore riparian forests for the benefit of shade canopy and large woody

debris recruitment. These prescriptions are enforced through specific requirements for timber harvest and road construction, re-construction, and maintenance activities. ERSC WA prescriptions for RMZs include no harvesting within 150 feet of the lower eight miles of the North Fork Elk River and within 50 feet of all other Class I watercourses. No harvesting is permitted within 30 feet of Class II watercourses and 20 feet of Class III watercourses in high risk areas. Large tree, down wood, canopy retention requirements are mandated throughout the remainder of the RMZ. Entry into Class I and II riparian zones are permitted no more than once every 20 years. Hillslope prescriptions include further restrictions on harvesting on inner gorge slopes and headwall swales, road use and construction, and heavy equipment use. A "Hillslope Management Checklist" is used by registered professional foresters (RPFs) to identify areas that are vulnerable to mass wasting. Silvicultural treatments in RMZs are managed to develop or maintain late seral forest conditions, such as thinning from below or individual tree selection.

43. Section I.B. of this Order establishes additional protection measures for RMZs in high risk areas that incorporate ERSC WA prescriptions for riparian protection as minimum protection standards with additional requirements for RMZ widths and post-harvest tree retention on Class II and III watercourses to minimize peak flow increases, protect slope stability and promote and maintain robust riparian stands. Additional protection measures to be implemented include avoidance of tractor crossings and retention of trees in unchanneled swales to the extent feasible, and implementation of erosion control on all RMZ road segment, landings, and skid trails.

44. Section I.C of this Order establishes ERSC WA prescriptions for riparian protection as specified in section 6.3.3.7 of the HCP as minimum protection measures for RMZs throughout HRC's timberlands in the UER.

<u>Control of Sediment from Roads</u>

45. Sediment TMDLs adopted for watersheds throughout the North Coast Region have identified logging roads as one of the most significant sources of anthropogenic sediment discharge. Logging roads can alter hillslope hydrologic processes and increase sediment discharge from surface and gully erosion and landslides. Roads can contribute to landsliding by undermining and oversteepening slopes and placing fill material on steep slopes. Roads also intercept and concentrate shallow groundwater and surface runoff, which can cause gully erosion and saturate vulnerable slopes, increasing the potential for failure. Road crossings of watercourses are subject to the force of high stream flows and failure usually results in direct delivery of sediment to streams. Road crossings of watercourses are one of the most common controllable sediment sources. Management practices have become standard in timberlands throughout the North Coast to reduce the potential for road related sediment discharge. Inventory and treatment of existing roads is addressed under a separate heading below.

46. A programmatic approach to road construction, reconstruction, maintenance, decommissioning, and regular inspections is essential to controlling sediment discharge from roads. A widely used reference document for planning, designing, constructing, reconstructing, maintaining, and decommissioning roads on forestlands in the North Coast is the Handbook of Forest and Ranch Roads (Weaver and Hagans, 1994)[8]. The Handbook contains a comprehensive suite of measures for forestland roads that the Regional Water Board consider adequate and necessary to control sediment discharge from roads. Roads that have implemented all feasible site specific sediment control measures as described in the Handbook are referred to as "stormproofed."

    Stormproofed roads incorporate the design features as summarized below into construction of new roads or reconstruction of existing roads:

    - Hydrologically disconnecting road segments from watercourses and minimizing concentration of surface runoff by installing drainage structures at sufficient intervals to disperse runoff so as to avoid gully formation and minimize erosion of the road surface and inside ditches;
    - Identifying and treating potential road failures (mostly fill slope failures) that deliver sediments to streams;
    - Watercourse crossing shall be designed to minimize the potential for crossing failure and diversion of streams. Watercourse crossings shall be sized adequately to accommodate estimated 100-year flood flow, including wood and sediment;
    - Inspecting and maintaining roads annually; and
    - Wet weather road use shall be avoided or limited to well rocked, paved, or chip sealed surfaces.

47. Appendix B of the ROWD includes the description of sediment control measures for roads from HCP section 6.3.3, which largely rely on implementation of standards identified in Weaver and Hagans Handbook. By 2014, HRC stormproofed 206 miles of the approximately 260 mile active road system in the UER, and decommissioned 50 miles. Implementation of these road prescriptions are established as specific requirements in Section I.D. of this Order. Section I.D.3. of this Order requires that all of HRC's roads in the UER shall be upgraded to stormproof standards by October 15, 2018.

<u>Landslide Prevention</u>

48. Due to the weak geologic bedrock underlying much of the watershed, relatively high rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout

[8] Handbook for Forest, Ranch, and Rural Roads, A Guide for Planning, Design, Constructing, Reconstructing, Maintaining, and Closing Wildland Roads. The handbook was updated in 2014, funded in part by a State Water Board 319(h) nonpoint source grant.

much of the UER are naturally vulnerable to landsliding. Natural rates of landslide related sediment production vary based on the occurrence of landscape disturbance such as large storms, fires, earthquakes or other infrequent natural events. Timber harvesting and associated ground disturbance can result in increased rates of shallow landslides on vulnerable slopes due to decreases in root strength, increased soil moisture, altering of hillslope hydrologic process, and oversteepening or loading slopes by cut and fill road construction.

49. Tree roots can enhance the strength of shallow soils, increasing the soil's ability to resist failure. When trees are harvested, their roots gradually decay, reducing the reinforcement they provide and increasing the potential for shallow landslides. The loss of root strength gradually increases over a period of several years, with the critical period of maximum loss occurring approximately 5 to 15 years after harvesting. As new roots grow into the space previously occupied by the older root system, the support they provide gradually increases. Loss of root strength varies with species and intensity of harvest. Interception, evaporation, and evapotranspiration of rainfall by forest canopy can reduce the volume of precipitation that infiltrates and remains in soils. Harvesting trees can therefore increase peak flows, which can contribute to landsliding and increased erosion. Vulnerability to shallow landsliding processes varies throughout a hillslope, primarily as a function of soil depth, slope gradient, contributing drainage area, subsurface hydrology, and soil characteristics.

50. Construction of roads, skid trails, and landings can also increase landsliding. Excavations on vulnerable areas to construct roads and skid trails can undermine steep slopes. In addition, fill material placed on steep slopes on the outboard edge of roads can fail. Such failures can trigger larger failures on slopes below, often displacing large volumes of debris which can be transported considerable distances down slope.

51. The TMDL sediment source analysis found that landslide-related sediment production increased over two-fold above natural rates during the period between 1955 and 2001, with the highest rates (almost 5 times natural landslide rates) observed during the 1988 to 1997 time period. Open-slope landslides and road-related landslides were the dominant sediment sources during this period. Landslide-related sediment production has declined in the UER during subsequent time periods, notwithstanding large storm events that occurred in 2003 and 2006. Declines in landsliding rates are thought to be partially the result of the HCP mass wasting avoidance strategy, which limits or precludes operations on areas identified as high landslide hazard as well as the ERSC WA prescriptions for landslide prevention.

52. The 2006 WWDRs included a "zero landslide-related discharge" requirement for harvest acreage in excess of the landslide reduction model limits. In 2008, Regional Water Board staff in collaboration with PALCO staff and other interested parties developed a methodology for evaluating enrollment of harvest acreage in excess of

the limits based on the landslide reduction model and monitoring compliance with the zero landslide discharge requirement. Applications for this additional acreage, referred to as “Tier 2”, were evaluated in a watershed context, and were subject to a far more rigorous level of geologic review than standard THPs, including consideration of geomorphology, topography, engineering geologic characteristics, management history, and hydrology.

53. In 2008, Regional Water Board staff developed Monitoring and Reporting Program (MRP) R1-2008-0071 in collaboration with PALCO and other interested parties to establish a process to ensure compliance with Tier 2 zero discharge requirements. The MRP specifies clear guidelines for application, review, and enrollment of THPs under Tier 2. The MRP also requires that following harvest all Tier 2 units be inspected at a minimum two times per year to identify new landslides or enlargement of existing landslides. HRC submits annual Tier 2 monitoring reports to the Regional Water Board. To date, no sediment discharge from harvest related landslides in units enrolled under Tier 2 has been reported. The current inventory of landslides based on interpretation of aerial photographs from 2003, 2006, and 2010 is discussed in the Landslide Prevention section of this Order and provided as Appendix C of the ROWD. Section IV of this Order requires HRC to maintain and update the landslide inventory according to the specifications described in the Monitoring and Reporting Program (MRP).

54. In addition to periodic air photo analysis, monitoring and reporting requirements required in Section IV of this Order rely upon annual field and helicopter fly-over inspections of harvested areas and road systems to evaluate the effectiveness of required measures to prevent landslides.

55. HRC’s approach for evaluating landslide hazards includes ERSC WA prescriptions. As part of THP planning, a review of pertinent technical data are conducted to denote potential high risk slopes, including landslide inventories, regional geomorphic maps, stereoscopic aerial photographs, and a shallow landslide potential map developed using the SHALSTAB landslide model. Appendix D of the ROWD (HCP section 6.3.3.7, ERSC WA) includes the following prescriptions for hillslope management mass wasting strategy:
    - A hillslope management checklist is used to identify areas that are particularly vulnerable to mass wasting;
    - No harvesting or road construction or reconstruction on Class I inner gorges;
    - No harvesting or road construction or reconstruction on the following areas without characterization and development of measures to protect water quality prescribed by a California Professional Geologist (PG);
        - Class II or III inner gorges;
        - headwall swales;
        - other areas with very high mass wasting hazard (including slopes greater than 60%); and

- o earthworks (skid trails, landings, road prisms, or other earthen structures) exhibiting characteristics identified in the hillslope management checklist.

56. In addition to the hillslope management mass wasting strategy described above, a comprehensive approach to preventing increases in landslide related sediment discharge resulting from timber harvesting and associated activities includes characterization of landslide hazards, designing projects to minimize impacts to slope stability based on site specific hazards, and ongoing monitoring of landslide activity to better understand landslide patterns and modify management practices based on observed activity. The California Geological Survey Note 45 provides guidelines for Engineering Geologic Reports for Timber Harvesting Plans[9], which must be prepared by a PG who is familiar with watershed characteristics. Section I.E. of this Order establishes requirements for characterization of geologic hazards by a PG and development of site-specific mitigations. Characterization of landslide hazard should at a minimum consider the following information:
    - Existing hazard maps derived from slope stability models;
    - Available maps and reports;
    - Aerial photographs;
    - Field investigation and mapping; and
    - Applicable studies and technical models.

57. The Engineering Geologic report must include an evaluation of potential effects on slope stability, surface soil erosion, and landslide related sediment discharge from the proposed management activity, identify problem areas, and describe specific mitigation measures needed to minimize potential effects for identified areas of concern. The mitigations should be based on the potential hazard process (likelihood of landslide initiation or acceleration in sediment mobilization or water flow, and the potential risk to water quality or public safety). Where appropriate, mitigations shall include, but are not necessarily limited to, the following:
    - Limit canopy removal in areas with elevated landslide hazard;
    - Limit activities upslope of existing landslide and on vulnerable portions of deep seated landslides;
    - Avoid road or skid trail construction on steep or vulnerable slopes; and
    - Stabilize existing landslides where applicable by methods such as planting, drainage manipulation, buttressing, and other feasible engineering techniques.

58. This Order establishes enforceable provisions to prevent increases in sediment discharge from landslides associated with HRC's timber harvest activities. The provisions entail an overall strategy that includes HRC's hillslope management mass wasting strategy from the ERSC WA, as well as additional measures included in their

[9] California Department of Conservation, California Geological Survey Note 45, 2013.

ROWD and those deemed necessary by Regional Water Board to prevent management related landsliding. These are summarized below as follows:

- Harvest rates throughout HRC's ownership in the UER that must be less than those allowed under the limits set by the landslide reduction model under the current WWDRs;
- Use of partial harvesting methods that retain a significant component of post-harvest root strength;
- Limiting timber harvesting in high risk areas;
- Riparian protection zones, in high risk areas which include no harvesting within 50 feet of Class I watercourses, 30 feet of Class II watercourses, 20 feet of Class III watercourses and specific tree retention up to 150, 200, and 100 feet of Class I, II and III watercourses, respectively;
- Implementation of HRCs ERSC WA riparian management zone prescriptions;
- Review by PG of all proposed activities, including harvesting and construction or reconstruction of roads and watercourse crossings; and
- Implementation of HRCs ERSC WA hillslope management prescriptions.

Wet Weather Requirements

59. Conducting timber operations during wet weather increases the potential for sediment production and discharge from roads, landing, and skid trails. Use of trucks and heavy equipment during saturated soil conditions can result in soil compaction, create ruts which affect road drainage, and increase production of fine sediment. Typically the most effective way to prevent impacts from operations during saturated soil conditions is to avoid operations during the period of the year when rain is likely to occur. This allows for timely implementation of seasonal erosion control, and the completion and stabilization of construction and reconstruction of roads, landings, skid trails and watercourse crossings. In the North Coast, over 90% of average annual precipitation falls between October 1 and May 1.

    In order to minimize the impacts of conducting timber operations during wet weather, the following seasonal restriction shall apply:

    a. Road construction or reconstruction may not take place between September 15 and May 1 except in response to failure of a road segment or watercourse crossing resulting in ongoing or imminent sediment discharge.

    b. Between October 1 and May 1, timber falling and cable yarding are permitted. Ground-based yarding and site preparation are prohibited.

Limited Harvesting in High Risk Areas

60. Regional Water Board staff evaluated the relative risk of sediment production and discharge in each subwatershed in the UER based on probabilistic landslide hazard, bedrock geology, and observed sediment production from 2000-2011. This evaluation

was used to establish a ranking of relative risk to water quality of low, moderate, or high for each subwatershed. Similarly, section 5.4 of the ROWD identifies five subwatersheds predominantly underlain by the Hookton Formation, a geologically young sandstone/siltstone bedrock unit that is highly vulnerable to surface erosion and mass wasting. These areas closely correlate with Regional Water Board assessment, and include: Clapp, Tom, and Railroad Gulches, McCloud Creek, Mainstem Elk River, and the Lower South Fork Elk River. Sediment production from these subwatersheds, which are also located directly above and adjacent to the impacted reach of the South Fork Elk River, is among the highest observed throughout the UER. Further refinement of the relative risk ranking based on subwatershed sediment production, landslide hazard, and observations by field staff of areas dominated by the Hookton Formation, have resulted in identification of areas within portions of the six subwatersheds identified above that are appropriately considered as high water quality risk for the purposes of this Order. The relative risk rating informs specific protection measures applicable in high risk areas, including limiting timber harvest activities.

In order to make progress toward attaining beneficial uses by further reducing sediment discharge from timber harvesting and associated activities, prevent nuisance conditions, and to meet the Regional Water Board-adopted zero load allocation for the UER watershed, while fully recognizing that halting all timber harvest activity in the UER watershed is not necessarily feasible or helpful in promoting HRC's participation in cleanup and restoration efforts, for the five year period following adoption of this Order timber harvesting in the high risk areas is limited to units of THP 1-12-110 HUM, which was approved by CAL FIRE on April 26, 2013 prior to the completion of the Upper Elk River TMDL and supporting Technical Report[10]. Following this five-year period, as outlined below, the Board may modify the harvest limitations of this Order.

61. No later than five years from the date of adoption of this Order, Regional Water Board staff will provide an update to the Regional Water Board on the effectiveness of the harvest limitations in the high risk areas. In providing the update, the Regional Water Board staff shall consider monitoring data and other relevant information to assess whether water quality conditions in the impacted reach are improving and beneficial uses will be supported within a reasonable period of time. Staff will provide the update at a scheduled Board meeting, after providing notice and an opportunity for HRC and interested persons to comment. At the meeting, the Board will consider whether to reopen the Order, or continue the existing limited harvest provisions as outlined in I.A.4 of this Order. If the Board determines to reopen the Order to modify the limited harvest conditions based on staff recommendations, comments, and

[10] On May 20, 2015, Regional Water Board staff notified HRC that their requested enrollment of one harvest unit in THP 1-12-110 HUM would be postponed pending finalization of the Elk River TMDL and development of additional measures to address impaired conditions in revised WDRs. Enrollment of harvest units of THP 1-12-110 HUM is conditioned on implementing the applicable requirements of this Order

evidence received, it will provide further direction to staff on the conditions under which harvesting in the high risk areas may proceed. After a minimum 30-day public review and comment period, the Board will consider a modified Order in a public hearing that addresses the limited harvest provisions in high risk areas[11].

62. Support for beneficial uses may result, but is not limited to, projects that focus on:

    i. Flood flow routing improvement (e.g. replace earthen approaches to bridges with culverts and riparian plantation thinning) to reduce the current flooding frequency in the impacted reach;
    ii. Reduction of the volume of stored sediment (e.g. slowing, trapping, removing of accumulated sediment) in the impact reach to a level which reduces the current flooding frequency in the impacted reach;
    iii. Water supply reliability (e.g. implement alternative supplies)[12]; and
    iv. Infrastructure enhancement (e.g. roads, bridges, septic systems, houses) to alleviate impacts from flooding.

<u>Inventory and Treatment of Controllable Sediment Discharge Sources</u>

63. Timber harvesting and associated road construction and use have left disturbed areas throughout the landscape that have the potential to discharge sediment over extended periods of time. These legacy sites, which should be treated as CSDS, may include failing or failed watercourse crossings, road failures, road surfaces, landslides, unstable watercourse banks, soil stockpiles, skid trails, landings, exposed harvest units, or any other site discharging or threatening to discharge waste or earthen materials.

64. The identification, evaluation, and treatment of CSDS are important components of a strategy to prevent or minimize ongoing sediment discharge in order to support beneficial uses in the watershed, prevent nuisance conditions, and to also contribute towards achieving Regional Water Board adopted sediment load allocations for HRC's timberlands. This Order supersedes the two existing CAO Nos. R1-2004-0028 and R1-2006-0055. The CAOs required off-road surveys of large tracts of land known to have experienced significant ground based logging operations, in addition to inventories conducted during the development of individual THPs. As a result, over 12,300 acres have been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trails, were identified. As of 2014, corrective actions had been implemented at approximately half of these sites. The CAOs also addressed road-related CSDSs. The CAOs required inventories of road related CSDS. To date, it is estimated that over

[11] This Order specifically requires the Board to reconsider the limited harvest conditions of this Order within five years. It does not require modifications to the Order, and does not limit the Board's authority to reopen the Order before or after the required five year update if it determines changes are necessary.

[12] Note: A project that provides reliable, permanent water supplies to those residents whose water supplies have been impaired by excess sediment from timber operations may also be considered for final resolution and termination of the existing CAO No. 98-100.

330,000 cubic yards of road related sediment has been controlled. Twenty one road related CSDS from the master treatment schedule remain and are scheduled to be treated by the end of 2017. Sites in the Railroad Gulch control watershed will not be treated until after completion of the study in 2021. Attachment C of this Order includes a master treatment schedule that identifies the remaining potential sources to be treated. HRC will continue to treat these sites annually according to the prioritization described in the master treatment schedule in Attachment C, as well as concurrently with timber operations for those sites located in the vicinity of THPs. In order to demonstrate continued progress in treating remaining sites, monitoring and reporting requirements in Section IV of this Order require that HRC provide annual reports identifying sites to be treated each year. Submittal of monthly status reports will no longer be required. Order Section I.D.4. requires treatment of the remaining CSDSs identified in Attachment C by October 15, 2018.

65. New active or potential sediment sources are identified through implementation of an Annual Road Inspection Program (ARIP). This program requires that all accessible roads be inspected for maintenance needs at least once annually. CSDS identified by ARIP, storm-triggered inspections, and active THP inspections are typically scheduled and treated within one year of discovery during the drier months of the year (May-November) and will be included in annual reports pursuant to Section IV of this Order. Order Section I.D.5. requires that HRC track these new CSDS as they are identified and subsequently treated in accordance with the ARIP. Additional non-scheduled routine minor maintenance (i.e. shaping of road surface, cleaning of inboard ditches and culvert inlets, maintenance of energy dissipation/downspouts, and roadside brush maintenance) will also occur as needed in response to road inspection and results in directives by HRC management or Regional Water Board.

66. CSDS not previously identified are also addressed by preparation and submittal of Erosion Control Plans (ECPs) for individual THPs. ECPs must include an inventory of CSDS within the logging area of all THPs submitted by HRC. The inventory must include a description of each CSDS and corrective actions that can reasonably be expected to control sediment discharge from each source. Corrective action for each source must be implemented during the life of the THP.

67. In addition, HRC must conduct annual inspection requirements of the THP project area as outlined below, including appurtenant roads and harvest units where timber operations are or have been active. Inspections will be scheduled as follows:

- Prior to October 16th – to ensure erosion control measures are in place;
- Between October 16th and April 1st – Storm-triggered inspections following any storm that generates over 3 inches of rain falling in a 24 hour period; and
- After April 1st – Inspection of THP areas including all appurtenant roads to document any discharges resulting from the preceding winter period and to schedule any required road maintenance or other corrective action.

In-channel Sediment Sources

68. As described in Finding 5, the sediment source analysis estimates that in-channel sources such as low order channel incision, bank erosion, and streamside landslides, represent approximately 56% of the potential sediment load from UER. Due to limited access and the sensitive nature of riparian zones, controlling sediment discharge from these in-channel sources can be difficult. Section I.H. of this Order requires that HRC conduct a feasibility study to evaluate potential projects or methods to control, trap, or meter sediment from in-channel sources in the UER before it can be transported to the impacted reach.

69. The feasibility study should identify potential projects or methods to reduce transport of sediment from tributaries in the UER to the impacted reach that may include design and implementation of small scale pilot projects. If the pilot projects demonstrate the success of methods, HRC shall develop a plan to implement these methods on a wider scale throughout the UER.

In-stream Restoration and Watershed Stewardship

70. In-stream restoration and enhancement work consisting primarily of large wood placement to provide increased aquatic habitat complexity (e.g. pool development, sediment sorting, shelter and refuge) has been implemented since the 1990s. In addition to on-property conservation, restoration, and enhancement activities, HRC is also partnering with the Regional Water Board, NGOs, and other agencies to address chronic downstream health and safety concerns relative to water quality, domestic water supply, winter storm flooding, and associated threats to public and private infrastructure. HRC's participation includes voluntary financial and in-kind contributions to the Elk River Watershed Stewardship program. HRC has indicated a willingness to continue development and implementation of in-stream restoration projects in the UER as well as a long-term commitment to participation in Watershed Stewardship to address beneficial use impairments in the impacted reach. The Monitoring and Reporting Plan in Section IV of the Order requires that HRC provide an annual report to the Regional Water Board summarizing its participation in Watershed Stewardship and other restoration efforts.

71. The purpose of the Watershed Stewardship Program is to convene a participatory program that engages community members, residents, scientists, land managers, and regulatory agencies in developing a collaborative planning process that seeks to enhance conditions in the Elk River watershed. The Watershed Stewardship Program will include the entire Elk River Watershed, and will work to accomplish the following goals:
    - Promote shared understanding and seek agreements among diverse participants; and
    - Identify strategies and solutions to:
        - Improve the hydrologic, water quality, and habitat functions of Elk River;
        - Reduce nuisance flooding and improve transportation routes during high water conditions;

- Improve residential and agricultural water supplies; and
- Promote coordinated monitoring and adaptive management.

72. In addition to the work discussed in Finding 68, HRC may conduct various types of restoration projects intended to improve fish habitat and control sediment delivery from in-channel and near-stream sources. Restoration covered under the Order would include projects such as:
    - Large wood augmentation for the purposes of improving fish habitat and sediment routing. Methods could include falling riparian zone trees or placement of logs using heavy equipment;
    - Construction of off-channel sediment detention basins;
    - Streambank stabilization using large wood, excavation, planting, or other bioengineering methods;
    - Removal or reconstruction of watercourse crossings and near-stream road segments; and
    - Excavation of in-stream sediment deposits.

MONITORING AND REPORTING

73. Section IV of this Order contains monitoring and reporting requirements to achieve the following objectives:
    a. Provide regular reports on all timber harvesting and associated activities covered under this Order, including harvesting, road use and construction, and implementation of corrective action to control sediment discharge, in order to evaluate compliance with requirements of this Order;
    b. Provide for a five year summary report to evaluate the effectiveness of this Order in contributing towards control of sediment discharge and watershed recovery and providing an efficient mechanism to ensure water quality requirements are implemented for timber harvesting and associated activities in the UER;
    c. Determine the effectiveness of management measures designed to protect water quality and inform adaptive management decisions;
    d. Identify potential new sources of sediment discharge and implement corrective action in a timely manner;
    e. Track HRC's participation in Watershed Stewardship efforts working towards recovery of beneficial uses in Elk River;
    f. Track water quality trends; and,
    g. Help inform re-evaluation of the UER's assimilative capacity for sediment and sediment load allocations.
74. HRC conducts various types of monitoring, including water quality monitoring, and regular inspections of all roads; inspections for landslides, including annual and periodic aerial photographic flights; all treated sediment sources included in the master treatment schedule (Attachment C) for road and non-road CSDS; and all CSDS identified in ECPs for individual THPs following implementation of corrective action.

Inspections and Inspection Reports

75. HRC conducts inspections of: 1) all harvest areas during the period a THP is active and throughout the three year erosion control maintenance period following completion of operations, 2) all treated CSDS, and 3) all roads on their ownership in the UER.

Regular inspection by HRC of those areas and activities described above are essential in ensuring the management practices designed to control sediment have been adequately implemented and are functioning properly, to identify areas where management practices are not functioning as intended or where additional corrective action is needed to control sediment discharge, and to allow for timely implementation of additional corrective action when needed.

Inspection reports serve to document that inspections have been conducted as required and to provide Regional Water Board staff with a mechanism to evaluate effectiveness of management practices designed to control sediment discharge.

Water Quality Monitoring

76. Water Quality Monitoring conducted by HRC includes the following:
    a. Aquatic trends monitoring of Class I stream habitat at seven locations for channel substrate (pebble counts), pools, large wood, riparian canopy, water temperature, fish surveys, and channel cross sections; and
    b. Hydrology and suspended sediment trends monitoring at nine locations throughout UER for discharge, and suspended sediment concentration.

Collecting data on in-stream physical habitat characteristics and suspended sediment loads and discharge is essential for tracking watershed conditions and trends and the distribution and movement of sediment throughout the watershed. These monitoring data can also improve understanding of the spatial and temporal association between sediment loads and management activities such as timber harvesting, sediment control efforts, and restoration activities.

Annual Summary Report and Work Plan

77. By January 31 of each year, HRC must submit an annual summary report and work plan describing all activities covered under this Order conducted during the previous year and planned for the upcoming year. Annual reports will provide specific information on the following activities:
    a. The total harvest acreage by THP number, silviculture method, and subwatershed;
    b. Corrective action to treat CSDS from the master treatment schedule (Attachment C), ARIP activities, ECPs for individual THPs, and any additional sites identified during required inspections;
    c. Road construction, reconstruction, or decommissioning;
    d. All inspections and water quality monitoring;
    e. In-stream Restoration and Riparian Restoration activities; and
    f. Participation in Watershed Stewardship efforts.

HRC must certify in the annual work plan (and Regional Water Board staff verify during the CAL FIRE THP review and implementation process, including additional field inspections as warranted) that approved THPs comply with the requirements of the WDRs. Annual reports provide a mechanism for Regional Water Board to review and comment on activities planned for the coming year, track compliance with Order requirements and progress in sediment control and restoration, and efficiently focus staff resources and prioritize inspection efforts.

Five year Synthesis Report

78. By November 15, 2021, and every five years thereafter, HRC shall submit a report summarizing current watershed conditions and any trends observed over the previous five year period, including water quality, effectiveness of measures to control sediment discharge, landslide rates and distribution, watershed recovery efforts, including Watershed Stewardship. This will allow Regional Water Board, HRC, and other stakeholders to evaluate the effectiveness of the requirements of this Order and the Regional Water Board to modify them if warranted.

79. HRC conducts additional monitoring as described below to evaluate the effectiveness of management practices in controlling sediment discharge.

Best Management Practice Evaluation Program (BMPEP)

HRC forestry staff inspects all completed stream crossing related roadwork to ensure HCP stormproofing standards are correctly implemented and that each work site has been properly treated for erosion control in advance of the wet weather season. In coordination with ARIP and Storm-Triggered Inspections, these newly treated sites are specifically inspected for sediment prevention and minimization performance following the first winter. Accessible sites then continue to be monitored over time per the ARIP and storm triggered inspection requirements.

Railroad Gulch BMP Evaluation Study

HRC has designed and is implementing a paired watershed study in the Railroad Gulch subwatershed. The objective of the study is to collect and evaluate specific sediment production, storage, and delivery data to test the effectiveness of HCP prescriptions in limiting sediment production and delivery from potential sources (roads, landslides, bank erosion, upslope stream channel head-cutting, and harvest unit surface erosion) as it relates to its management practices. The study presents ten hypotheses that are intended to test whether THP-related HCP and ERSC WA harvest prescriptions are effective at minimizing the impact that land management has on the delivery rate of fine sediment to Railroad Gulch. The hypotheses include overall THP effectiveness relating to mass wasting, stream channel erosion, and road-related sediment delivery.

PROCEDURE

THP Enrollment and Administration

80. During the first five years following adoption of this Order, HRC must apply to the Regional Water Board Executive Officer for coverage of individual THPs as described below. After the first five years, an enrollment process is not required to commence operations for CAL FIRE-approved THPs that fully comply with requirements of this Order; however, HRC must submit a notice of commencement of operation to the Regional Water Board at least 10 days prior to commencement of operations for a specific THP.

81. THPs, or portions of a THP in the UER watershed, enrolled under Order R1-2004-0030 or R1-2006-0039 prior to November 30, 2016 will retain coverage under, and be subject to the terms and provisions of, those Orders.

82. The Regional Water Board Executive Officer, upon finding that a plan may violate any of the terms of the Order, may at any time notify HRC that they must refrain from commencing, or cease, operations.

83. Regional Water Board staff will continue to review and inspect all proposed THPs in the UER watershed as part of the CAL FIRE review team pursuant to the FPRs. In addition, staff will conduct regular inspections of harvest areas, roads, riparian zones, and unstable areas to verify and evaluate compliance with the requirements of this Order and watershed conditions.

84. Prior to November 30, 2021, before operations may commence on an approved THP, HRC must apply for enrollment of the THP under this Order by submitting an enrollment application to the Regional Water Board Executive Officer. The enrollment application must be signed by a designated representative of HRC certifying that the THP complies with the terms and provisions of this Order. Prior to enrollment, Regional Water Board staff will evaluate the THP for compliance with the Order, and at that time may require additional measures for water quality protection as warranted and as consistent with this Order. Timber harvesting activities must not commence until HRC receives written notification from the Regional Water Board Executive Officer that the THP is covered under this Order. It is anticipated that Projects which have had thorough Regional Water Board staff involvement in the review and approval process will receive written notification of coverage within ten (10) working days of receipt of a complete application.

85. Water quality issues identified on any particular THP and not resolved prior to THP approval by CAL FIRE, shall be resolved to the satisfaction of Regional Water Board Executive Officer, prior to enrolling that THP under this Order.

ADDITIONAL FINDINGS

86. The Regional Water Board finds that all the combined measures required under this Order, as itemized below, are protective of water quality standards within the UER

watershed: the transition from even-aged to uneven-aged management under HRC's ownership; harvest rate limits throughout the UER and for each subwatershed that limit canopy reduction and anticipated peak flow changes; enhanced riparian protection; geologic review of all harvest activities; management practices designed to prevent or minimize sediment discharge; the limited timber harvest activities in high risk areas; cleanup and remediation of existing sediment source discharge sites; ongoing oversight of HRC's management activities through participation in the THP review process; and the monitoring and reporting program.

87. State Water Board Resolution No. 68-16 Statement of Policy with Respect to Maintaining High Quality of Waters in California (Policy) requires that regional water boards, in regulating the discharge of waste, to maintain high quality waters of the state, require that any discharge not unreasonably affect beneficial uses, and not result in water quality less than that described in regional water board's policies. The Policy applies whenever a) there is high quality water, and b) an activity which produces or may produce waste or an increased volume or concentration of waste that will discharge into such high quality water. "Existing quality of water" has been interpreted to mean baseline water quality, the best quality that has existed since the Policy was adopted in 1968. Thus, the Regional Water Board must determine baseline water quality and compare with current water quality objectives. If the baseline water quality is equal to or less than the objectives, the water is not "high quality" and the Policy is not triggered. In this case the water quality objectives govern the water quality that must be maintained or achieved. (*Asociación de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Board* (2012) 210 Cal. App. 4th 1255, 1270 (AGUA).)

88. If baseline water quality is better than water quality objectives, the Policy is triggered and baseline water quality must be "maintained" unless the Board makes the requisite findings. To permit a proposed discharge that will degrade high quality water, the Board must find that the discharge 1) will be consistent with maximum benefit to the people of the state; 2) will not unreasonably affect present and anticipated beneficial uses of the water; and 3) will not result in water quality less than that prescribed in water quality plans and policies. (*AGUA* at 1278.) In addition, the Board must ensure the discharge is utilizing the "best practicable treatment or control" to ensure pollution or nuisance will not occur and that the highest quality consistent with the maximum benefit to the people of the state will be maintained. (*Id.*)

89. Following a century of logging, and in particular, following the post-World War II era of intensive tractor logging, water quality conditions in Elk River in 1968 were likely already impacted by sediment. Further impairment occurred after 1968 as a result of excessive and poorly-regulated logging and large storm events. The capacity of the UER for sediment is limited by the ongoing aggradation in the impacted reach and resulting nuisance conditions and compromised beneficial uses. Unless and until its capacity can be expanded through sediment remediation and channel restoration, nuisance conditions abated, and beneficial uses supported, the Regional Water Board

determined that the nonpoint source load allocation be defined as zero. Even with the implementation of current and much improved management practices and stringent restrictions described, ongoing timber harvesting and associated activities will result in some sediment discharge, further exacerbating the already impaired condition. Therefore, in addition to addressing existing, ongoing discharges, this Order addresses water quality impacts that have already occurred.

90. This Order requires compliance with water quality objectives in receiving water in order to restore the beneficial uses, and requires compliance with water quality objectives in receiving water through implementation of stringent management practices designed to minimize discharges including harvest rate restrictions, riparian protection, roads management, landslide prevention, and wet weather prescriptions, limited logging activities in high risk areas, and continued efforts to inventory, prioritize and implement cleanup and remediation of existing sediment source discharge sites. This Order authorizes discharges from certain cleanup and restoration activities as well as from ongoing timber harvesting and associated activities. Cleanup and restoration activities may result in small short term discharges associated with placement of large wood into streams or excavation to stabilize or remove fill material stored in channels and adjacent riparian zones. The potential impacts of minor short term discharges are outweighed by the benefits of long term sediment control derived by such projects.

91. To the extent that the UER had existing higher quality water in 1968, the Regional Water Board finds that the authorization of some sediment discharges from ongoing timber operations (subject to proper management and stringent restrictions) and cleanups is necessary to accommodate important economic and social development in the area and is consistent with the maximum benefit to the people of the state. The Regional Water Board recognizes that a significant portion of in-stream sources are likely to be mobilized and transported to the impacted reach over time, regardless of whether or not timber operations are conducted. Allowing some timber harvest activity to continue enables HRC's participation in cleanup and restoration efforts. The Order requires control and remediation of existing sediment inputs to the extent feasible, and monitoring to determine whether implementation is leading to measurable improvements. The Order also limits logging activity in the most sensitive areas to allow active measures to be taken by the Watershed Stewardship Program to improve downstream beneficial uses. The Order ensures that any new discharges are subject to the best practicable treatment or control.

92. Compliance with the terms of this Order should result in improvement in water quality in the UER and impacted reach. The monitoring and reporting program in Section IV of this Order is designed to provide a feedback mechanism to ensure that management measures are implemented and functioning as intended and provide data on in-stream sediment conditions. This Order is consistent with Resolution No. 68-16 because it will result in a net benefit to water quality by improving existing environmental conditions currently impacted by past logging activity. The Order is

designed to protect or recover in-stream beneficial uses and does not promote or authorize the permanent lowering of high quality waters.

93. As lead agency under the California Environmental Quality Act (CEQA), the Regional Water Board provided notice of intent to adopt a mitigated negative declaration (SCH No. 016082077) for this Order on August 29, 2016 (Cal. Code Regs., tit. 14, § 15072).[13] The mitigated negative declaration reflects the Regional Water Board's independent judgment and analysis. After considering the document and comments received during the public review process, including revisions made at the November 30, 2016 adoption hearing to Specific Requirements for wet weather requirements, riparian management zones, and the delineation of high risk areas, the Regional Water Board hereby determines that the proposed project, with incorporated project design features and mitigation measures, will not have a significant effect on the environment. The documents and other material, which constitute the record, are located at 5550 Skylane Blvd, Suite A, Santa Rosa, CA 95403. The Regional Water Board will file a Notice of Determination within five days from the issuance of this Order. Mitigation measures necessary to reduce or eliminate significant impacts on the environment, and monitoring and reporting are incorporated as conditions of approval below.

94. The Regional Water Board has reviewed the contents of this Order, its accompanying Initial Study and Mitigated Negative Declaration, written public comments and testimony provided after notice and hearing. The Order prescribes requirements that implement the Basin Plan, in consideration of relevant factors pursuant to water code section 13263. This Order establishes requirements to implement the Basin Plan, prevent nuisance conditions, and attain beneficial uses in the watershed. The Order supports the Regional Water Board adopted sediment load allocation for the UER watershed, while still permitting discharges from timberland management, including harvesting. Compliance with the terms of this Order is the regulatory mechanism by which HRC will comply with the Porter-Cologne Water Quality Control Act and Basin Plan. This Order is a component of the Regional Water Board's overall strategy to restore ecosystem functions, abate nuisance flood conditions, attain ambient water quality objectives and recover beneficial uses. In-stream remediation and channel restoration is anticipated as a means of recovering the ecosystem functions of the impacted reaches of Elk River, in combination with reduction in sediment loads from the upper watershed.

[13] The draft Order and associated Initial Study and Mitigated Negative Declaration developed pursuant to the California Environmental Quality Act (CEQA) to analyze potential impacts from the proposed Order were originally released for public comment on December 4, 2015. Revisions to this Order do not alter the original analysis and conclusions that all project design features and mitigation measures will reduce potential environmental impacts to a less than significant level. Nevertheless, the Regional Water Board is reissuing the entire CEQA package in order to provide interested members of the public an additional opportunity to comment on the environmental documents.

THEREFORE, IT IS HEREBY ORDERED that pursuant to Water Code section 13263, the Regional Water Board hereby adopts Order No. R1-2016-0004, and directs the Executive Officer to file all appropriate notices.

IT IS FURTHER ORDERED that this Order supersedes Order No. R1-2006-0039 (Elk River WDR) (as amended by Order No. R1-2008-0100), *Monitoring and Reporting Program No. R1-2008-0071*, for HRC's THPs, or portions of THPs, in the Elk River watershed not enrolled under Order R1-2004-0030 or R1-2006-0039 prior to November 30, 2016. THPs, or portions of THPs, enrolled under Order R1-2004-0030 or R1-2006-0039 prior to November 30, 2016 will retain coverage under, and be subject to the terms and provisions of, those Orders. This Order supersedes Cleanup and Abatement Order Nos. R1-2004-0028 and R1-2006-0055.

IT IS FURTHER ORDERED that, no more than five years after adoption of this Order, HRC and Regional Water Board staff shall provide an update to the Regional Water Board on the status of the Order implementation and watershed condition. The update shall include the evaluation of compliance and assessment of the efficacy of this Order based on review of the annual work plans and five-year report, progress of Elk River Stewardship Program efforts directed at remediation, and any other relevant information. Staff shall include any recommendations for modifying Order requirements.

IT IS FURTHER ORDERED that pursuant to Water Code section 13263, Humboldt Redwood Company, LLC, shall comply with the following on its timberlands in the Elk River watershed:

I. SPECIFIC REQUIREMENTS[14]

A. Forest Management

1. HRC shall utilize uneven-aged single-tree and small group selection silviculture as defined in California Code of Regulations, title 14, section 913.1 within its timberlands in the UER watershed. Variable Retention may be used in some instances to address certain stand conditions, such as high levels of whitewood or hardwood species, animal damage, or general poor form and vigor due to past logging history. Other silvicultural methods that may be applied infrequently include Rehabilitation of Understocked Areas, Seed Tree Removal, and Sanitation Salvage. HRC shall not utilize the clearcut harvest method.

2. HRC shall not utilize group selection harvest method as defined in California Code of Regulations, title 14, section 913.2 within Riparian Management Zones.

3. Subwatershed average annual harvest rates from Table 4.3 of the ROWD (Attachment D) fall near or below 2% equivalent clearcut acres averaged over

[14] Several of the Specific Requirements are from HRC's ROWD. These include: I.A.1-2; I.B.1.a-d; I.B.2.b; I.B.4-6.a-b; I.D.1-8; I.E.1-4; I.G.1-2; I.I.1-2; IV.A.1-2

any 10 year period and are generally reasonable. Harvest rates above this threshold may cause concern for cumulative impacts on water quality. Where an individual, or multiple, THP(s) would result in an average annual harvest rate in any subwatershed above 2% equivalent clearcut acres over any 10 year period, the Executive Officer may decline to enroll the THP(s), or portions of the THP, or may require additional mitigations or monitoring as a condition of enrollment.

4. Harvesting in High Risk Areas
    a. High risk areas are defined as those areas identified in HRC's ROWD amendment request dated October 4, 2016 submitted to the Regional Water Board with associated map titled Sensitive Bedrock Sub-Basin and Elk River Geologic Map.

    b. For the first five year period following adoption of this Order timber harvesting activities on HRC's timberlands in the high risk areas, as described in Findings 60 and 61 of this Order, is limited to units of THP 1-12-110 HUM.

    c. At the required update to the Regional Water Board no later than five years from the date of adoption of this Order, the Regional Water Board will consider the Order conditions limiting harvest activities in high risk areas, and after public notice and comment will provide staff direction on potential changes to the harvest limitations. Any changes to this Order regarding harvest limitations in the subsequent five year period or beyond shall consider available data and information to assess watershed conditions, including beneficial use recovery in the impacted reach, and shall be subject to a 30-day review and public comment period and Regional Water Board hearing. In the absence of changes to this Order, harvesting in high risk areas for the period beginning five years after the adoption of this Order shall be limited to the acreage included in Table 4.3 (revised March 11, 2016) of the ROWD.

B. Riparian Zone Protection in High Risk Areas
1. Class I Watercourse Riparian Protection
    a. Riparian Management Zones (RMZs) for Class I watercourses extend to 150 feet on both sides of the channel;
    b. No harvesting within 50 feet of Class I watercourses;
    c. Retain the 18 largest conifer trees per acre (measured along 435 feet of watercourse length and within 100 feet of the watercourse and lake transition line); and
    d. Between 50 feet and 150 feet of Class I watercourses, retain a minimum of 50% post-harvest conifer canopy coverage.

2. Class II Watercourse Riparian Protection
    a. Riparian Management Zones (RMZs) for Class II watercourses extend up to 200 feet or to the hydrologic divide on both sides of the channel;

b. No harvesting within 30 feet of Class II watercourses; and
c. Between 30 feet and 200 feet or to the hydrologic divide of Class II watercourses, retain a minimum of 60% post-harvest conifer canopy coverage.

3. Class III Watercourse Riparian Protection
   a. Riparian Management Zones for Class III watercourses extend to 100 feet or to the hydrologic divide on both sides of the channel;
   b. No harvesting within 20 feet of Class III watercourses; and
   c. Between 20 feet and 100 feet or the hydrologic divide of Class III watercourse, retain a minimum of 70% post-harvest conifer canopy coverage.

4. Only single tree selection shall be utilized in RMZs for Class I, II, and III watercourses. No group clearing shall take place in these RMZs.

5. No ground based equipment with the exception of at existing roads and permitted new road construction within:
   a. 150 feet of a Class I watercourses;
   b. 100 feet of a Class II watercourse;
   c. 50 feet of a Class III watercourse, or to the closest hydrologic divide.

6. Erosion control practices in riparian management zones:
   a. Implement erosion controls including surfacing all segments of road and skid trails within riparian areas with pavement, rock, slash, mulch, straw, or other adequate materials to prevent the discharge of sediment to a watercourse;
   b. Trap and filter all road and skid trail surface drainage within riparian areas to prevent the discharge of sediment to watercourse; and
   c. Cover all disturbed soil areas with slash, mulch, straw, or other adequate materials, or apply other effective erosion control measures to prevent the discharge of sediment to a watercourse.

7. Avoid tractor crossings in unchanneled swales.

8. Retain trees along the center line of swales and areas of subsurface flow paths.

C. Riparian Zone Protections outside High Risk Areas
   1. Outside the identified High Risk Areas, HRC shall implement ERSC WA prescriptions for riparian protection as specified in section 6.3.3.7 of the HCP and as outlined in the ROWD submitted by HRC on September 22, 2015.

D. Road Management
   1. All roads shall be hydrologically disconnected from watercourses to the extent feasible.

2. HRC shall implement management practices and specifications described in Appendix B of the ROWD to prevent and minimize sediment discharge from active roads.

3. By October 15, 2018, HRC shall upgrade all roads to meet the storm-proofed standard as described above in Finding 46 and Appendix B of the ROWD.

4. By October 15, 2018, HRC shall treat those road related controllable sediment discharge sources currently identified in Attachment C.

5. HRC shall address any newly-discovered road-related CSDSs within a year of discovery in accordance with the ARIP (section 6.2 of the ROWD).

6. HRC shall inspect all roads within their Elk River ownership at least annually between April 1 and October 15.

7. HRC shall inspect storm-proofed roads as soon as conditions permit following any storm event that generates 3 inches or more of precipitation in a 24-hour period, as measured at the Elk River rain gauge.

8. Within one year of identifying new sediment discharge sources from roads HRC shall document, notify the Regional Water Board, and implement measures to prevent or minimize sediment discharge at any new controllable sediment discharge sources identified during the road inspections.

E. Landslide Prevention

1. Prior to conducting timber harvesting activities or construction or decommissioning roads and watercourse crossings on its ownership in the UER, HRC shall prepare and submit an engineering geologic report to the Regional Water Board Executive Officer for review and approval.
   The engineering geologic report shall be prepared by a California Licensed Professional Geologist (PG) in conformance with the guidelines of California Geologic Survey Note 45 to evaluate the potential impacts of the proposed harvesting to water quality. At a minimum, the report shall characterize geologic hazards using a combination of the following data and methods of investigation:
   - Existing hazard maps derived from slope stability models;
   - Available maps and reports;
   - Aerial photographs;
   - Field investigation and mapping; and
   - Applicable studies and technical models.

2. The PG shall evaluate potential effects on slope stability and surface soil erosion, and landslide related sediment discharge from the proposed management

activity, identify vulnerable areas, and describe specific mitigation measures needed to avoid and minimize potential effects for identified areas of concern. The mitigations shall be based on the potential hazard, and where appropriate, shall include, but are not necessarily limited to the following:

- Avoid and minimize canopy removal in areas with elevated landslide hazard;
- Avoid and minimize activities upslope of existing landslide;
- Avoid and minimize activities on vulnerable portions of deep seated landslides; and
- Stabilization of existing landslides where applicable by methods such as planting, manipulating drainage, buttressing, and other feasible engineering techniques.

3. The engineering geologic report may be submitted before or during the THP review process conducted by CAL FIRE, or by request of the Executive Officer. The Regional Water Board staff shall review the engineering geologic report and may request additional information or require additional conditions be incorporated to further reduce or mitigate the potential for sediment discharge. If additional information or mitigation is required, HRC shall not proceed with the proposed activity until demonstration that the potential impacts to the beneficial uses of water will be adequately mitigated.

4. HRC shall maintain and update the landslide inventory included in Appendix C of the ROWD according to the specifications described in the Monitoring and Reporting Program in Section IV of this Order.

F. Wet Weather Requirements

1. Road construction or reconstruction may not take place between September 15 and May 1 except in response to failure of a road segment or watercourse crossing that is resulting in ongoing or imminent sediment discharge.

2. Between October 1 and May 1, timber falling and cable yarding are permitted. Ground-based yarding and mechanical site preparation are prohibited.

3. Additional wet weather operations shall be consistent with the ROWD and HCP wet weather prescriptions.

G. Erosion Control Plans

1. HRC shall prepare and submit an inventory of CSDS within, and in the vicinity of, the logging area for all THPs it submits in the UER. Any CSDS not previously inventoried and treated as part of the Road Management activities described in Section I.D. of this Order shall be inventoried and scheduled for treatment concurrently with THP operations, including those off-road sites from the master treatment schedule in the vicinity of the THP.

2. These CSDS will be subject to the following:
   a. Each CSDS shall be inventoried in an ECP, which will include: a description of the current condition of each site, an estimate of the potential sediment volume that could discharge from the site, a narrative description of the proposed management measures, and a schedule for implementation;
   b. Inventoried CSDS must be treated per the site specific ECP schedule;
   c. The ECP shall be submitted to the Regional Water Board for review and approval with the THP it is associated with; and
   d. If treatment of such sites "strands" any other CSDS, HRC does not relinquish responsibility for also treating the stranded sites. For logistical reasons, it is recommended that measures be taken to prevent sites from becoming stranded.

H. Feasibility Study for Control of In-channel Sediment Sources within HRC's Ownership Boundaries

HRC shall conduct a feasibility study to evaluate potential methods to control, trap, or meter sediment from in-channel sources in the UER before such sediment can be transported to the impacted reach. The feasibility study shall identify potential methods to reduce transport of sediment from tributaries in the UER to the impacted reach that may include design and implementation of small scale pilot projects. If the pilot projects demonstrate the success of methods to reduce sediment discharge from in-channel sources, HRC shall develop a plan to implement these methods on a wider scale throughout the UER.

1. By October 15, 2017, HRC shall submit to the Regional Water Board Executive Officer for approval, an initial plan describing in-channel sediment sources, potential methods to control, meter, or trap sediment from these sources, and propose pilot scale projects to test the effectiveness of proposed methods.

2. Starting October 15, 2018, HRC shall submit to the Regional Water Board Executive Officer for approval, annual updates on progress in implementing the feasibility study.

3. By October 15, 2020, HRC shall submit to the Regional Water Board Executive Officer for approval, the final feasibility study, including results of pilot scale projects, description of feasible methods to control sediment from in-channel sources, and a detailed workplan to implement full scale projects to control in-channel sediment sources throughout their ownership, including an implementation schedule.

I. Implementation and Maintenance of the Sediment Reduction and Master Treatment Schedule

1. This Order supersedes and incorporates the requirements of Cleanup and Abatement Order (CAO) R1-2004-0028 for HRC's ownership in the Mainstem Elk

River and South Fork Elk River and CAO R1-2006-0055, for HRC's ownership in the North Fork Elk River.

2. By October 15, 2018, HRC shall complete corrective action for all remaining road related CSDS described in the master treatment schedule in Attachment C. HRC will continue to prioritize and treat CSDS associated with legacy skid trails according to the schedule described in the master treatment schedule. The annual report described in Section IV.B.1. shall include a list of those sites treated during the previous year and those scheduled for treatment during the upcoming year.

J. Alternatives Methods of Compliance
Many measures proposed in the ROWD are incorporated as enforceable specific requirements above. Additional water quality protection measures include subwatershed harvest rates, limited harvesting and additional riparian protections for Class II and III streams in high risk areas, and a feasibility study for controlling in-channel sediment sources. HRC may propose and submit for approval by the Regional Water Board, alternative measures that can be demonstrated to provide beneficial uses protection and nuisance abatement that is equal or better than that provided by these specific requirements. Any proposed alternative measures shall be submitted in writing to the Regional Water Board Executive Officer. The proposal shall include a description of the alternative measure(s), accompanied by supporting documentation that the alternative measures will achieve equal or better protection than those specific requirements. The Executive Officer shall bring any meritorious proposal to the Regional Water Board for its consideration after public notice and a hearing.

II. GENERAL REQUIREMENTS

A. HRC shall comply with all applicable water quality standards, requirements, and prohibitions specified in the Basin Plan as modified, and policies adopted by the State Water Board.

B. HRC shall allow Regional Water Board staff entry onto all land within the Elk River Watershed covered by the WDR including appurtenant roads for the purposes of observing, inspecting, photographing, videotaping, measuring, and/or collecting samples or other monitoring information to document compliance or non-compliance with this Order.

C. HRC shall comply with all water quality related HCP prescriptions, conditions included in an approved THP, and any additional mitigation measures identified and required pursuant to CAL FIRE CEQA process.

D. HRC shall comply with all mitigation measures identified in Attachment A of the Initial Study and Mitigated Negative Declaration.

E. This Order does not authorize discharges from the aerial application of herbicides or pesticides. HRC shall submit a ROWD prior to any proposed aerial application of pesticides that could discharge to waters of the state.

F. HRC shall notify the Regional Water Board in writing at least 30 days prior to any proposed ground-based application of pesticides within 100 feet of Class I, Class II or Class III watercourses. The notification shall include the type of pesticide(s), method and area of application, projected date of application, and measures that will be employed to assure compliance with applicable water quality requirements.

G. Water quality issues identified on any particular THP and not resolved prior to THP approval by CAL FIRE, shall be resolved to the satisfaction of Regional Water Board Executive Officer, prior to commencement of that THP.

H. HRC shall maintain copies of all correspondence and records collected and prepared to document compliance with this Order and provide access to Regional Water Board to review and copy.

I. No discharge of waste into the waters of the state, whether or not the discharge is made pursuant to waste discharge requirements, shall create a vested right to continue the discharge. All discharges of waste into waters of the state are privileges, not rights. (Wat. Code, § 13262, subd.(g).)

J. Prior to implementing any change to the project or activity that may have a significant or material effect on the findings, conclusions, or conditions of this Order, HRC shall obtain the written approval of the Regional Water Board Executive Officer.

K. The Regional Water Board may reopen this Order to add to or modify the conditions of this Order, with notice and as appropriate in response to monitoring results or to implement any new or revised water quality standards and implementation plans adopted and approved pursuant to the Porter-Cologne Water Quality Control Act or the Clean Water Act.

L. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process or sanctions as provided for under applicable state law.

M. Should it be determined by HRC or the Regional Water Board that unauthorized discharge of waste are causing or contributing to a violation or an exceedance of an applicable water quality requirement or a violation of a WDR prohibition (below), HRC shall:

1. Implement corrective measures immediately following discovery that applicable water quality requirements were exceeded or a prohibition violated, followed by notification to the Regional Water Board by telephone or email as soon as possible, but no later than 48 hours after the discharge has been discovered. This notification shall be followed by a report within 14 days to the Regional Board, unless otherwise directed by the Executive Officer, that includes:

   a. the date the violation was discovered;
   b. the name and title of the person(s) discovering the violation;
   c. a map showing the location of the violation site;
   d. a description of recent weather conditions prior to discovering the violation;
   e. the nature and cause of the water quality requirement violation or exceedance or WDR prohibition violation;
   f. photos of the site documenting the violation;
   g. a description of the management measure(s) currently being implemented to address the violation;
   h. any necessary maintenance or repair of management measures;
   i. any additional management measures which will be implemented to prevent or reduce discharges that are causing or contributing to the violation or exceedance of applicable water quality requirements or WDR prohibition violation;
   j. an implementation schedule for corrective actions; and,
   k. the signature and title of the person preparing the report.

N. HRC shall revise the appropriate technical report (i.e. ECP, Inventory, or other required information as applicable) immediately after the report to the Regional Board to incorporate the additional management measures that have been and will be implemented, the implementation schedule, and any additional inspections or monitoring that is needed.

O. Emergency Maintenance
If there is an imminent threat to life, property, or public safety, or a potential for sediment discharge with catastrophic environmental consequences, HRC will notify Regional Water Board staff of the emergency and the planned or implemented action within 14 calendar days. HRC shall meet with the Regional Water Board Executive Officer within six months of a major fire to discuss modifications to this Order as may be warranted due to changed conditions.

III. DISCHARGE PROHIBITIONS

A. The discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

B. The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities which could be deleterious to fish, wildlife, or other beneficial uses is prohibited.

IV. MONITORING AND REPORTING

This Monitoring and Reporting Program (MRP) is issued pursuant to Water Code section 13267, subdivision (b) and requires HRC to implement the monitoring and reporting described below. The Regional Water Board has delegated its authority to the Executive Officer to revise, modify, and reissue the MRP.

A. Monitoring
HRC shall monitor watershed conditions according to the monitoring program described below.

1. Inspections
<u>Roads</u>
a. HRC shall inspect all roads within the UER according to the following schedule:
   i. At least once annually between April 1 and October 15 to ensure that drainage structures and facilities are intact and fully functional, and to identify any active or imminent road-related failures of the road prism, cutbanks, or fills which can deliver sediment to streams, and identify and schedule any corrective action needed to control sediment discharge;

   ii. As soon as conditions permit following any storm event that generates 3 inches or more of precipitation in a 24-hour period, as measured at HRC's UER rain gauge.

<u>THP areas</u>
b. HRC shall inspect the entire logging area of all active THPs, including roads, harvest units, and CSDS sites, a minimum of three times per year according to the following schedule:

   i. By October 15 to assure project areas are secure for the winter; and/or immediately following cessation of winter period timber harvest activities;

   ii. Between October 15 and April 1 after at least 3 inches of cumulative rainfall has fallen within a 24 hour period and as soon as conditions permit, assess the effectiveness of management measures designed to address controllable sediment discharges and to determine if any new CSDS sites have developed;

iii. Between April 1 and June 15 to assess the effectiveness of management measures designed to address existing CSDS sites and to identify if any new CSDS sites have developed.

2. Landslides Monitoring
HRC shall conduct the following monitoring to identify new or reactivated mass wasting activity:

a. HRC shall maintain and update the landslide inventory included in Appendix C of the ROWD according to the specifications described below;
b. HRC shall inspect harvest THP units at least annually during the life of the THP and through the three year erosion control maintenance period following completion of the plan. The inspections shall cover both harvested areas as well as RMZs and channel zones and shall be designed to identify any new, or reactivated mass wasting, including open slope landslides and streamside landslides;
c. Additional on-the-ground monitoring and reporting to identify new, or reactivated mass wasting activity shall include HRC field staff (i.e. forestry, physical sciences), notifying the HRC Geology Department in the event a new or recently active landslide is observed during the course of daily duties (i.e. road inspections, wildlife surveys, aquatics monitoring, THP layout and logging supervision);
d. HRC shall obtain new aerial photographs of the Upper Elk River watershed at intervals no greater than 5 years;
e. HRC shall utilize color, high-angle, stereo pair aerial photographs at a scale of 1:12,000 of the UER to update the landslide inventory; and
f. By June 15, 2022, HRC shall conduct a representative survey of streamside landslides.

3. Water Quality Monitoring
HRC shall continue to conduct the following water quality trend monitoring, including Aquatic Trends Monitoring (ATM) every three years and Hydrology Trends Monitoring (HTM) annually, according to the sampling procedures described in detail in the ROWD and applicable Standard Watershed Operating Protocols for the following parameters:

a. Pebble counts
b. Pool dimension and frequency
c. Large wood
d. Riparian and overstory canopy measurements
e. Water temperature
f. Fish surveys

g. Channel cross section measurements
h. Hydrology and suspended sediment

B. Reporting

HRC shall provide the following reports to the Regional Water Board Executive Officer according to schedule specified below. Reports must contain sufficient information that Regional Water Board staff can clearly identify the types of work planned and monitoring conducted throughout the UER including key results, findings, problems encountered, and corrective actions taken. HRC shall summarize any information pertinent to corrective actions that have been or need to be taken to ensure adequate water quality protection.

1. Annual Summary Report and Work Plan

By January 31 of each year, HRC shall submit to the Regional Water Board a summary report of all management activities, including monitoring, conducted during the previous calendar year and a work plan, describing all management activities planned for the current calendar year (January 1 to December 31). HRC shall certify that the activities included in the report are in compliance with the provisions of this Order.

Regional Water Board staff will review and may provide written comments and or request additional information as necessary by February 15. If requested, HRC shall submit a revised final annual work plan to the Regional Water Board by March 1.

Regional Water Board and HRC staff shall also meet annually, if requested by either party, to review proposed work to discuss the timing of and type of activities planned for the year.

The annual work plan is a planning document. The actual work conducted in the upcoming year may differ from what is described in the plan due to changes in conditions or other considerations. HRC shall notify the Regional Water Board no less than quarterly in writing when it becomes apparent that a deviation from the current annual work plan is necessary. The notification shall include a description of how the work differs from the annual work plan and an explanation for the change. The annual summary shall describe all of the management activities actually conducted during the previous year.

The annual report shall include, at a minimum, the following information:

a. Timber harvest

The report shall at a minimum describe all harvesting conducted during the previous year as well as anticipated harvest planned for the coming year pursuant to Section I.A. of the Order, including;

i. Acres by subwatershed;
ii. Silviculture method;
iii. THP name and number;

b. Roads
HRC shall describe all road work conducted during the previous year and work planned for the upcoming year, including a description and map locations of all road construction, reconstruction, and maintenance work, pursuant to Section I.D. of the Order.

c. Inventory of CSDS
HRC shall provide a detailed list of CSDS sites treated during the previous year and sites that are proposed for treatment prior to that calendar year's winter period. The list of sites shall include remaining CSDS from the master treatment schedule, road related CSDS identified during annual road inspections, CSDS identified in ECPs for individual THPs, and any other CSDS identified during the previous year, including those associated with watercourse crossings, roads, skid trails, gullies, road-related and non-road-related landslides, and any other sediment generating features associated with timber harvest activities. For each CSDS site scheduled for treatment, the annual work plan shall contain:
i. A treatment site identification number and location shown on a scaled map;
ii. The volume of sediment to be treated;
iii. Treatment status (pending or completed); and
iv. A description of the selected treatment alternative.

d. Restoration Projects
HRC shall provide a description of any restoration projects conducted during the previous year and that are scheduled for implementation during the upcoming year. Restoration projects that shall be included in the annual report include any projects implemented as part of the Feasibility Study for control of in-channel sediment sources or the Stewardship Program, including:
i. Large wood augmentation for the purposes of improving fish habitat and sediment routing. Methods could include falling riparian zone trees or placement of logs using heavy equipment;
ii. Construction of off-channel sediment detention basins;
iii. Streambank stabilization using large wood, excavation, planting, or other bioengineering methods;
iv. Removal or reconstruction of watercourse crossings and near stream road segments;
v. Excavation of in-stream sediment deposits.

e. Inspections
The annual summary report shall describe all inspections of roads, erosion control plans associated with timber harvest plans, and landslides conducted during the previous year according to the specifications described in Section IV.A. The annual summary report shall include at a minimum, the following information for each inspection:
   i. date of the inspection;
   ii. inspector(s) name;
   iii. area or sites inspected;
   iv. observations, including problems identified that result, or have the potential to result in controllable sediment discharge, including discharge notifications;
   v. actions needed to prevent or minimize sediment discharge;
   vi. actions taken to prevent or minimize sediment discharge;
   vii. a brief evaluation of the causes of the erosional problems and the adaptive management measures that must be taken to prevent recurrence.

f. Landslide Reporting
The annual summary report shall include an updated landslide inventory, describing any landslide activity observed within the past year, including;
   i. A map showing locations of landslide activity;
   ii. Whether landslide is new or reactivation of existing landslide;
   iii. Estimated volume of sediment discharged; and
   iv. Management activities (such as timber harvesting or road work) that may reasonably be considered to have caused or affected landslide activity.

g. Water Quality Trends Monitoring Data
The annual summary report shall include water quality and hydrology monitoring data collected during the previous year as specified in Section IV.A., including: stream flow, sediment, water temperature, channel form, and large wood in the channel, according to the specifications of the ROWD.

h. Watershed Stewardship Report
The annual report shall describe HRC's participation in Elk River Watershed Stewardship. The report shall provide a brief description of its participation in meetings as well as its contributions supporting stewardship efforts.

2. Five-year Synthesis Report

Following adoption of this Order, HRC shall provide a five-year synthesis and evaluation of the effectiveness of its management activity in preventing and minimizing discharges of sediment and protection of water temperature increases that may impact the beneficial uses of water in UER.

By no later than November 15, 2021, HRC shall submit the first five year synthesis report to the Regional Water Board for approval by the Executive Officer. By no later than October 15, 2020, the content of the report will be developed in consultation with Regional Water Board staff in order to assure that the report will be useful to evaluate compliance with the General and Specific requirements of the Order and inform decisions regarding potential revisions to the Order. The five year update and evaluation shall include the following information:

a. Harvest Summary
HRC shall submit a summary of total acres harvested over the previous five year period, by:
    i. Acres harvested by subwatershed;
    ii. Silviculture method;
    iii. THP name and number.

b. Road update
HRC shall submit a summary report of roadwork conducted throughout their ownership in the UER. The purpose of the report is to provide a status report on the road network and the effectiveness of their program for controlling sediment discharge from roads. The report shall include the following:
    i. Total length of active roads, including total amount of seasonal and permanent roads;
    ii. Total length of road that meets the stormproofed standard (this shall confirm that HRC's entire road network has been stormproofed);
    iii. Total length of road decommissioned over the previous five year period;
    iv. A map of the current road network.

c. Landslide Summary
An updated landslide inventory and evaluation of the effectiveness of management measures intended to reduce the potential for management related landslides. The updated inventory shall be prepared by a PG and shall include a description of all landslide activity identified during the previous five years based on field observations, interpretation of updated aerial photographs, and other available data sources, including;
    i. An updated landslide inventory, describing all landslide activity observed within the past five years and whether observed landslides are new or reactivation of existing landslides;
    ii. Estimated volume of sediment discharged by landslides over the previous five year period by subwatershed;
    iii. A map showing locations of landslide activity that has occurred during the previous five years;

iv. A description of data sources (aerial photograph, road inspection, THP layout, etc.);
v. Copies of aerial photographs of the UER from the previous five year period (may be scanned); and
vi. A discussion of overall landslide activity during the previous five years and any conclusions that can be made with respect to an association between management and landslide activity. This section shall include a discussion of potential modifications to management practices necessary to further minimize management related sediment discharge.

d. Water Quality Trends
HRC shall submit a water quality trends reports, providing a summary of water quality monitoring results for the previous five years. This report shall be developed in coordination with the Watershed Stewardship Program, to the extent possible. The summary should provide a discussion of any observable water quality trends detected during the previous five years and any conclusions that can be made, in particular with respect to sediment loads, anadromous salmonid habit, and any possible association between management activities and in-stream conditions. This section shall include a discussion of potential modifications to management practices necessary to further minimize management related sediment discharge.

e. Restoration Summary
HRC shall submit a summary report of all restoration projects it has conducted, participated in, or contributed to, within the Elk River watershed. Restoration activities are those projects designed to control in-stream sediment production and transport, improve beneficial uses of water, and abate nuisance conditions, and may include, but are not necessarily limited to:
i. Stabilizing banks through provision of root cohesion on banks and floodplains;
ii. Filtering sediment, chemicals, and nutrients from upslope sources;
iii. Supplying large wood to the channel, which maintains channel form and improves in-stream habitat complexity;
iv. Maintaining channel form, in-stream habitat, and an appropriate sediment regime through the restriction of sediment inputs or metering of sediment through the system;
v. Moderating downstream flood peaks through temporary upstream off-channel storage of water;
vi. Maintaining cool water temperatures through provision of shade and creation of a cool and humid microclimate over the stream;

vii. Providing both plant and animal food resources for the aquatic ecosystem in the form of, for example, leaves, branches, and terrestrial insects.

f. Effectiveness Monitoring Summary
HRC shall submit a summary report(s) describing the results of their effectiveness monitoring programs for roads throughout the UER and timber harvest related management practices in Railroad Gulch. The reports shall include a description of monitoring methods used, the location of sites evaluated, the results of the monitoring, a discussion the results, and any conclusion regarding the effects of their management practices with respect to sediment production from roads, watercourse crossings, harvest units, landslides, in-channel sources, and sensitive riparian zones.

V. APPLICATION AND ENROLLMENT PROCEDURE

Pursuant to this Order, for the first five years following adoption of this Order, HRC must apply to the Regional Water Board Executive Officer for coverage of individual THPs as described below. After five years, an enrollment process is not required to commence operations for CAL FIRE-approved THPs that fully comply with requirements of this Order, unless notified in writing by the Regional Water Board Executive Officer that the plan is not eligible for coverage.

For the first five years, before operations may commence on an approved THP, HRC must apply for enrollment of the THP under this Order by submitting an enrollment application to the Regional Water Board Executive Officer. The enrollment application must be signed by a designated representative of HRC certifying that the THP complies with the terms and provisions of this Order. Prior to enrollment, Regional Water Board staff will evaluate the THP for compliance with the Order, and at that time may require additional measures for water quality protection as warranted. Timber harvesting activities may not commence until HRC receives written notification from the Regional Water Board Executive Officer that the THP is covered under this Order. It is anticipated that Projects which have had thorough Regional Water Board staff involvement in the review and approval process will receive written notification of coverage within ten (10) working days of receipt of a complete application.

After the first five years, HRC must submit a notice of commencement of operation to the Regional Water Board at least 10 days prior to commencement of operations for a specific THP.

The Regional Water Board Executive Officer, upon finding that a plan may violate any of the terms of the Order, may at any time notify HRC that they must refrain from commencing, or cease, operations.

VI. RESCISSION AND DENIAL OF COVERAGE

The Executive Officer may rescind or deny coverage for a THP under this Order if, based on substantial evidence, the Executive Officer makes any of the following determinations:

1. The THP does not comply with Terms and Provisions of this Order;

2. The THP is reasonably likely to result in or has resulted in a violation or exceedence of any applicable Water Quality Standards, US EPA approved load allocation, or other water quality requirement[15];

3. The THP has varied in whole or in any part from the approved THP in any way that could adversely affect water quality;

4. The THP is the subject of an unresolved water quality or procedural issue including, but not limited to, a non-concurrence filed by the Regional Water Board staff with CAL FIRE;

5. The THP meets the Terms and Provisions of this Order, but may still result in a discharge of waste that could adversely affect water quality from any of the following:
    a. An observable increase in sediment discharge from landslides, channel or streambank erosion, or surface or gully erosion associated with harvest activities;
    b. A measurable and significant increase in turbidity or suspended sediment concentration as a result of harvest related activities;

6. Any operations on an individual, or multiple, THP(s) that would result in an average annual harvest rate in any subwatershed above 2% equivalent clearcut acres over any 10 year period that has resulted, or would be likely to result in any of the following:
    a. An observable increase in sediment discharge from landslides, channel or streambank erosion, or surface or gully erosion associated with harvest activities;
    b. A measurable and significant increase in turbidity or suspended sediment concentration as a result of harvest related activities; or

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[15] "Water Quality Requirements" means a water quality objective (narrative or numeric), prohibition, TMDL implementation plan, policy, or other requirement contained in a Water Quality Control Plan (Basin Plan) adopted by the Regional Water Board and approved by the State Water Board, and all other applicable plans or policies adopted by the Regional Water Board or State Water Board, including, but not limited to, State Water Board Resolution No. 68-16, (Statement of Policy with Respect to Maintaining High Quality Waters in California).

7. There are substantive errors or inaccuracies found in information submitted as part of the THP and enrollment application package that, if known at the time of application, would have resulted in a denial or limitation of coverage under this Order.

Upon receipt of a written notice of rescission or denial of coverage for a THP under this Order, the coverage of the THP under this Order is immediately terminated. Upon termination, Discharger shall immediately cease all THP activities other than activities necessary to control further discharges. Projects that are denied coverage may be required to submit a report of waste discharge for site-specific individual WDRs.

CERTIFICATION

All reports required by this Monitoring and Reporting program or other information requested by the Regional Water Board determination of compliance shall be signed by a duly authorized representative of HRC. Any person signing a document under this requirement shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Any person failing to furnish technical or monitoring reports or falsifying any information therein is guilty of a misdemeanor, and may be subject to civil liability. (Water Code section 13268)

VII. Certification:

I, Matthias St. John, Executive Officer do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, North Coast Region, on November 30, 2016.

Matthias St. John
Executive Officer

LIST OF ATTACHMENTS

Attachment A – Map
Attachment B – Upper *Elk River: Technical Analysis for Sediment* (Tetra Tech, 2015)
Attachment C – Master Sediment Reduction and Master Treatment Schedule
Attachment D – HRC's August 28, 2015, Report of Waste Discharge with amendments dated March 11, 2016 and October 4, 2016.

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Attachment No. 2: TMDL Action Plan and Basin Plan Amendment

[Add a new sub-section to the Water Quality Control Plan for the North Coast Region implementation chapter (Chapter 4) with the following Action Plan. This section will be added after the "ACTION PLAN FOR THE KLAMATH RIVER TOTAL MAXIMUM DAILY LOADS ADDRESSING TEMPERATURE, DISSOLVED OXYGEN, NUTRIENT, AND MICROCYSTIN IMPAIRMENTS IN THE KLAMATH RIVER IN CALIFORNIA AND LOST RIVER IMPLEMENTATION PLAN." In addition to adding the following language, several editorial revisions will be made, including appropriate changes to the Title Page, Table of Contents, Summary of Basin Plan Amendments (Appendix 1), page numbers, table and figure numbers, footnote numbers, and headers and footers to reflect the new language. The final locations of tables and figures in relation to the text may also be changed to accommodate the existing formatting of the Basin Plan.]

ACTION PLAN FOR THE UPPER ELK RIVER SEDIMENT TMDL

The Elk River Watershed is located in Humboldt County in northern California and drains into Humboldt Bay, south of the City of Eureka. Due to excessive sedimentation, the entire 58.3 square mile (37,310 acres) Elk River Watershed was placed on the Impaired Waters List for Section 303(d) of the Clean Water Act in 1998. This sediment TMDL addresses impairments in the 44.2 square mile (28,288 acres) Upper Elk River Watershed, which is predominantly timberland and includes impacted reaches wherein the most sediment has been stored and subsequent effects observed. The Program of Implementation described below includes nonregulatory actions that are designed to address sedimentation throughout the watershed. The Action Plan for the Upper Elk River Sediment TMDL (hereinafter known as the TMDL Action Plan) does not establish sediment load allocations for landuse in the Martin Slough or Lower Elk River West subwatersheds, nor for activities in the Lower Elk River subwatershed that are downstream of Berta Road.

The TMDL Action Plan includes a phased total maximum daily load (TMDL) for sediment and describes the implementation actions necessary to attain water quality standards in the Upper Elk River Watershed. The goal of the TMDL Action Plan is to achieve sediment related water quality standards, including the protection of the beneficial uses of water in the upper watershed and prevention of nuisance conditions. The TMDL Action Plan establishes the sediment load consistent with current conditions in the impacted reaches, identifies a process for assessing and implementing necessary and feasible remediation and restoration actions, and describes a program of implementation to be considered and incorporated into regulatory and non-regulatory actions of the Regional Water Board and other stewardship partners in the watershed.

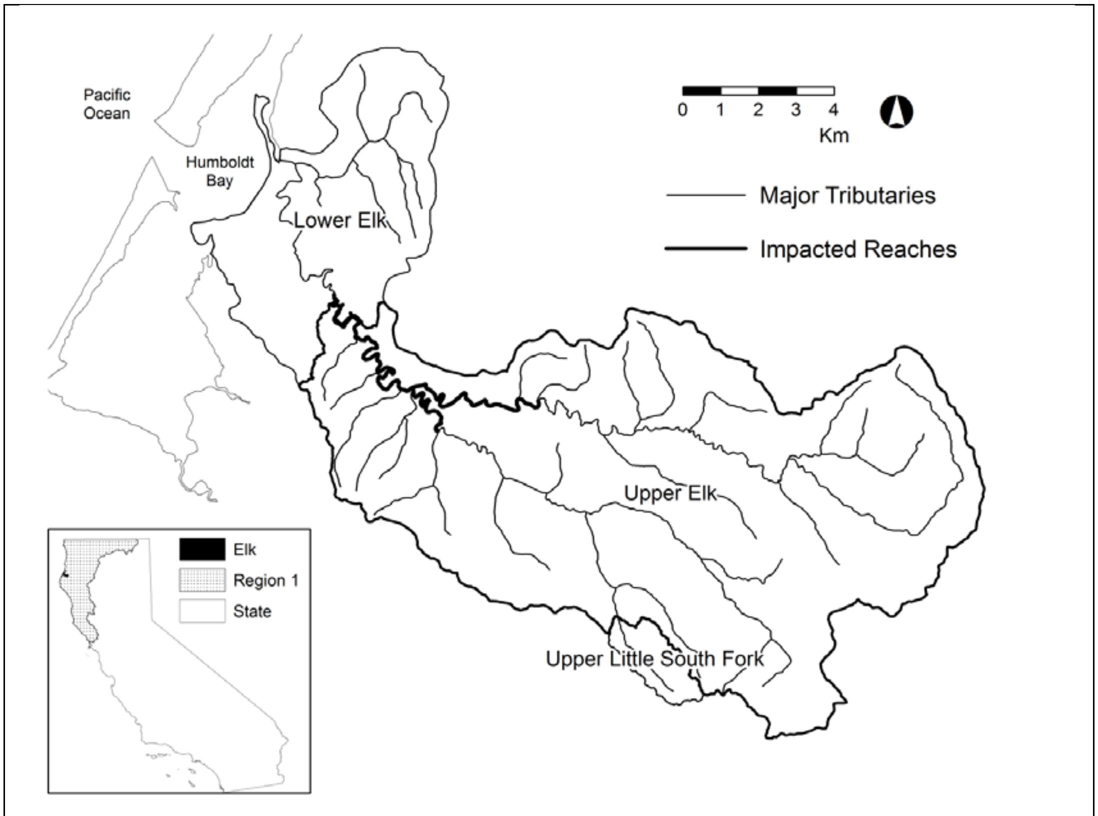

Figure 1: Elk River Watershed Delineation

I. Problem Statement

Site specific assessment of water quality conditions in the Upper Elk River Watershed confirm that sediment discharges from timberlands in the upper watershed and sedimentation in the impacted reaches, combining with other natural (e.g., tectonics, geology, soil characteristics, geomorphology, climate and vegetation) and anthropogenic (e.g., pre-Forest Practices Act logging, ranching, farming, roads, and residential development) factors exceed the water quality objectives for sediment, suspended material, settleable matter, and turbidity and result in adverse impact to several beneficial uses, including domestic water supplies (MUN), agricultural water supplies (AGR), cold water habitat (COLD); spawning, reproduction and early development (SPWN); rare, threatened, or endangered species (RARE), and recreation (REC-1 and REC-2). Sedimentation in the impacted reaches also has resulted in conditions of nuisance, including increased rates and depth of annual flooding and loss of property, use of property, access to property, and risk to human health and welfare. The impacted reach extends from the confluence of Brown's Gulch on the North Fork Elk and Tom Gulch on the South Fork Elk to the mainstem Elk River at Berta Road and is contained within the delineated boundaries of the Upper Elk River Watershed.

II. Source Analysis

Multiple natural and anthropogenic factors influence the behavior of sediment in the Elk River Watershed. Table 1 summarizes the estimated sediment loads, organized by source category and analysis time period. The presented estimates represent the data collection and assessment efforts of multiple federal, state, private and nonprofit entities over the course of more than 10 years. The estimates combine the results of numerous Elk River specific studies, which constitute a rich and abundant dataset. Nonetheless, there is inherent uncertainty in the estimates, derived from necessary assumptions and conservative margins of safety. The estimates provide an adequate and reasonable basis for establishing a TMDL and load allocations. An adaptive management framework allows for adjustments to the program of implementation, as new data become available. Primary natural factors include: tectonics, geology, topography, geomorphology, climate and vegetation. Geological features are an especially important factor in sediment production in the Upper Elk River, which is dominated by young, fine-grained, erodible geology. Primary anthropogenic or land use-related factors include: timber harvest, yarding, road building and use, and legacy practices (e.g., pre-Forest Practice Rules). The interaction between inherent watershed characteristics, types of management practices, and timing of stochastic events such as earthquakes or large storm events, influence the magnitude and timing of sediment production. Increased sediment production results from greater incidence of landsliding, surface and gully erosion, and increases in channel erosion from increased peak flows and higher runoff.

Sediment transported from the upper sub-watersheds has deposited in low gradient channel and floodplain reaches, impacting residential and agricultural communities with increased incidence of overbank flooding, defined as nuisance conditions. Ongoing sediment loading continues to result in aggradation of fine sediment, encroachment of riparian vegetation, and impairment of beneficial uses, though the total volumes of delivered sediment have decreased since the 1988-1997 time period. The causes of reduced sediment loading have not been clearly established. But, improvements in management practices in the 2004-2011 period, as well as smaller magnitude peak flow events and a limited number of relatively wet years in this period, likely play a role. Cross sectional changes observed over the past three decades starting in 1988 indicate an estimated 640,000 cubic yards of sediment have accumulated in the impacted reaches. An estimated 25% of the annual sediment inflow to the impacted reaches causes aggradation and further worsens nuisance conditions.

The sediment source analysis identifies the key sediment source categories that produce sediment in the Upper Elk River Watershed. Sediment discharges resulting from timber harvest and other land-management activities in the most recent analysis time period (2004-2011) are (in order of significance): in-channel sources (headward channel incision, bank erosion, and streamside landslides), discharges from existing land use-related sediment discharge sites, other road-related discharges, and harvest-related discharges.

Table 1: Summary of Upper Elk River volumetric loading ($yd^3 \cdot mi^{-2} \cdot yr^{-1}$) by sediment source category and analysis time period

	Sediment Source Category	1955 - 1966	1967 - 1974	1975 - 1987	1988 - 1997	1998 - 2000	2001 - 2003	2004 - 2011
Anthropogenic	In-Channel: Low Order Channel Incision	67	23	14	21	32	12	14
	In-Channel: Management-Related Bank Erosion & Streamside Landslides	186	141	54	219	240	240	160
	Road-Related Landslides	99	29	15	307	3	20	25
	Road Surface Erosion	52	78	87	137	55	56	22

Table 1: Summary of Upper Elk River volumetric loading ($yd^3 \cdot mi^{-2} \cdot yr^{-1}$) by sediment source category and analysis time period

Sediment Source Category		1955 - 1966	1967 - 1974	1975 - 1987	1988 - 1997	1998 - 2000	2001 - 2003	2004 - 2011
	Land Use-related Sediment Discharge Sites	30	60	80	65	39	73	39
	Post-Treatment Sediment Discharge Sites	0	0	0	0	13	4	24
	Skid Trails	4	12	11	12	26	15	15
	Open Slope Landslides	189	82	6	201	118	51	5
	Harvest Surface Erosion	2	6	2	5	6	5	4
	Anthropogenic Loading	**629**	**431**	**268**	**966**	**531**	**476**	**308**
	Natural Loading	**152**	**132**	**93**	**167**	**176**	**176**	**144**
	Total Loading	**781**	**563**	**360**	**1,133**	**707**	**652**	**452**

III. Water Quality Indicators

Water quality indicators and associated numeric targets are not independently enforceable and are designed to measure progress towards attaining water quality objectives for suspended material, settleable material, turbidity and sediment. The water quality indicators are divided into hillslope and instream, as identified in Tables 2 and 3, respectively. The hillslope indicators and numeric targets in Table 2 are designed to inform Board actions and can be incorporated into orders, as appropriate and to the maximum extent feasible. The instream water quality indicators are designed to help assess the overall effectiveness of the program of implementation and confirm progress towards attainment of applicable water quality standards.

Attainment of water quality objectives is partly dependent on the control of sediment discharges from the Upper Elk River Watershed to minimize increased sediment production and other controllable water quality factors (e.g., altered hydrology and reduction in large woody debris recruitment trees).

Table 2: Hillslope Water Quality Indicators and Numeric Targets†

Indicator	Numeric Target	Associated Area
Common Road Indicators		
Hydrologic connectivity of roads to watercourses	100% of road segments hydrologically disconnected from watercourses	All roads
Sediment delivery due to surface erosion from roads	Decreasing road surface erosion	
Sediment delivery due to road-	Decrease in sediment delivery from new	

Table 2: Hillslope Water Quality Indicators and Numeric Targets†		
Indicator	**Numeric Target**	**Associated Area**
related landslides	and reactivated road-related landslides	
Common Harvest-Related Indicators		
Sediment delivery due to surface erosion from harvest areas	100% of harvest areas have ground cover sufficient to prevent surface erosion	All harvest areas
Sediment delivery from open slope landslides due to harvest-related activities	Decrease in sediment delivery from new and reactivated open-slope landslides	All open slopes
Sediment delivery from deep seated landslides due to harvest-related activities	Zero increase in discharge from deep-seated landslides due to management-related activities	All deep-seated landslides
Common Management Discharge Site Indicators		
New management discharge sites	No new management discharge sites created	Class I, II, and III watercourses
Specific Upper Elk River Watershed Indicators		
Headward incision in low order channels	Zero increase in the existing drainage network	Class II/III catchments
Peak flows	Less than 10% increase in peak flows in 10 years related to timber harvest	Class II/III catchments
Channels with actively eroding banks	Decreasing length of channel with actively eroding banks	Class I, II, and III watercourses
Characteristics of riparian zones (i.e., 300 feet on either side of the channel) associated with Class I and II watercourses	Improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover	Class I and II watercourses
Characteristics of riparian zones (i.e., 150 feet on either side of the channel) associated with Class III watercourses	Improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover	Class III watercourses

† The hillslope indicators and numeric targets in Table 2 are designed to inform Board actions and can be incorporated into orders, as appropriate and to the maximum extent feasible.

Table 3: Instream Water Quality Indicators and Numeric Targets		
Instream Indicator	**Numeric Target**	**Associated Area**
Bankfull Channel Capacity	Channel cross-sectional area sufficient to contain the historic bankfull discharges: Upper Mainstem = 2,250 cfs (for drainage area of 43 mi^2) Lower North Fork, = 1,170 cfs (for drainage area of 22.5 mi^2) Lower South Fork = 1,015 cfs (for drainage area of 19.5 mi^2)	Impacted reaches near the confluence of North and South Forks Elk River, with target discharge scaled to drainage area at measurement location

Table 3: Instream Water Quality Indicators and Numeric Targets		
Instream Indicator	**Numeric Target**	**Associated Area**
Chronic turbidity	Clearing of turbidity between storms to a level sufficient for salmonid feeding and surface water pumping for domestic and agricultural water supplies	Salmonid feeding—watershed-wide historic range of salmonids Water supplies—Impacted reaches

IV. Sediment TMDL and Load Allocation, including Margin of Safety and Consideration of Seasonal Variation

TMDLs must be established at levels necessary to attain and maintain the applicable water quality standards with seasonal variations and a margin of safety (MOS) (40 CFR Part 130.7(c)(1).) The TMDL represents the maximum amount of a pollutant that can be discharged to a waterbody, taking into account critical conditions of stream flow, loading, and water quality parameters. The TMDL is equivalent to the loading capacity of the waterbody for the pollutant in question.

The Upper Elk River Sediment TMDL is set equal to the loading capacity of the waterbody. The loading capacity of the Upper Elk River Watershed is defined as the total sediment load (natural and management-related) that can be discharged into the Upper Elk River and its tributaries without impacting beneficial uses of water, causing an exceedance of water quality objectives, reducing the quality of high quality water, or creating nuisance conditions. Because capacity for sediment is limited by the ongoing aggradation in the impacted reaches, the loading capacity for additional sediment is defined as zero until the capacity of the impacted reaches can be expanded.

All the sediment delivered to the stream channels in the Upper Elk River Watershed is attributed to management-related nonpoint source pollution and natural background. Due to the lack of sediment loading capacity in the impacted reaches, the nonpoint source load allocation is defined as zero. This approach incorporates a conservative, implicit MOS[1] and includes seasonal variation of sediment production through estimating sediment loads on an annual time step. The zero load allocation is necessarily conceptual since, using current technology and techniques, no amount of land use restriction can physically result in zero loading of non-point source sediment (i.e., the control of all natural and anthropogenic sediment delivery from the tributary system). This regulatory loading capacity will guide the program of implementation and will be maintained until the sediment loading capacity of the impacted reaches has been expanded. The zero load allocation does not constitute an effluent limitation or a waste load allocation, and the Board has discretion on how to implement it in WDRs, waivers or other actions to reduce and eliminate waste discharges. Once the loading capacity has been expanded, the Regional Water Board can reevaluate the load allocation and establish a second phase of the TMDL, as appropriate.

[1] Estimating the sediment loading capacity of a natural system as zero is inherently conservative since no amount of source control, remediation, and restoration can completely eliminate sediment transport downstream. In addition, the TMDL is derived from the sediment source analysis, which likewise incorporated multiple conservative assumptions when applying measurements of surface erosion, landslide, and stream bank erosion across all the subwatersheds.

V. Watershed Efforts

Throughout the Elk River Watershed, many individuals, groups, and agencies have been working to assess, enhance, and restore beneficial uses and assess, abate, and prevent nuisance conditions related to sedimentation and flooding. These groups include, but are not limited to the Regional Water Quality Control Board, State Water Resources Control Board , Bureau of Land Management, National Oceanographic and Atmospheric Administration, U.S. Fish and Wildlife Service, U.S.D.A. Forest Service Redwood Sciences Laboratory and National Resources Conservation Service, U.C. Cooperative Extension, California Department of Fish and Wildlife, California Department of Forestry and Fire Protection, Board of Forestry, California Coastal Conservancy, Humboldt County Board of Supervisors and Planning Department, Redwood Community Action Agency, Salmon Forever, Friends of Elk River, CalTrout, Elk River Residents Association, Humboldt Redwood Company, Green Diamond Resource Company, individual residents and landowners, and other watershed stakeholders.

In February 2012, the Regional Water Board, in coordination with Redwood Community Action Agency, held a Restoration Summit to explore strategies for restoration of the low gradient reaches of Elk River impacted by stored sediment deposits. The primary purpose of this summit was to convene affected landowners, resource agency staff, technical experts, potential funders, and diverse stakeholders to discuss approaches to addressing long-standing channel restoration, excess sediment loads, nuisance flooding, and related issues in the impacted reaches of the Elk River Watershed. A conclusion of the Restoration Summit was to pursue funding for full-scale data collection and sediment and hydrodynamic modeling from the top of the impacted reaches to Humboldt Bay, so as to characterize existing conditions and inform sediment remediation and channel restoration activities necessary to prevent nuisance and recover beneficial uses.

In 2014, the State Water Resources Control Board executed a contract with CalTrout, relying primarily on funds from the State's Cleanup and Abatement Account, but including contributions from the California Coastal Conservancy and Humboldt Redwood Company, to conduct the Elk River Recovery Assessment. The Elk River Recovery Assessment is designed to assess the fate and transport of fine sediment from the top of the impacted reaches downstream to Humboldt Bay. The Elk River Recovery Assessment requires the collection of sediment and hydraulic data, which is used to populate full scale hydrodynamic and sediment transport models within which several different remediation and restoration scenarios can be tested. The Elk River Recovery Assessment will provide the feasibility assessment from which a remediation action plan can be developed in coordination with the Elk River Watershed Stewardship Program.

In 2015, Humboldt County was awarded 319(h) grant funds to develop and initiate an Elk River Watershed Stewardship Program through which to develop consensus-based recommendations with respect to health and safety, sediment remediation and habitat restoration, and science and coordinated monitoring needs in the Elk River Watershed. The Elk River Watershed Stewardship Program developed under this contract will provide the framework within which to implement non-regulatory components of phase 1 of the TMDL.

VI. Program of Implementation

The Program of Implementation identifies a combination of regulatory and non-regulatory actions that will lead to the attainment of water quality objectives, recovery of beneficial uses, protection of high quality waters, and prevention of nuisance conditions in the Upper Elk River Watershed. Implementation of phase 1 requires control of all existing and potential future sediment sources in the upper watershed while the Elk River Recovery Assessment is completed and the Elk River Watershed Stewardship Program is developed, initiated, and successfully results in the activities necessary to expand the sediment loading capacity of the impacted reaches and abate nuisance conditions. The Regional Water Board can recalculate, as appropriate, the sediment TMDL following remediation and restoration of the impacted reaches, by assessing the expanded capacity of the watershed to transport sediment and water more normally. Normal sediment and water transport occurs when 1.5 to 2-year flood events are contained within the bankfull stream channel. As appropriate, the Regional Water Board may modify the program of implementation for a second phase of the TMDL Action Plan if the sediment TMDL is recalculated.

There are three main components of the program of implementation associated with phase 1 of the TMDL Action Plan, including:

a. Waste Discharge Requirements (WDR) or waiver of WDRs: Applicable regulatory programs to reduce sediment loads from new and existing sediment sources on lands in the Upper Elk River Watershed, so as to reduce sediment loading toward the load allocation;
b. Elk River Recovery Assessment: A non-regulatory feasibility assessment of the sediment remediation and channel restoration activities, which in combination with sediment load reductions, are necessary to improve hydraulic and sediment transport in the Elk River Watershed; and
c. Watershed Stewardship Program: A non-regulatory program under which implementation of health and safety projects, remediation and restoration activities, and science and coordinated monitoring serves to support beneficial use enhancement and a trajectory of watershed recovery, including abatement of nuisance flooding and an expansion of sediment loading capacity.

Implementation actions associated with each of the three components of the program of implementation are identified in Table 4.

<u>WDRs</u>: WDRs are the primary regulatory mechanism utilized by the Regional Water Board to control the nonpoint source pollution resulting from past and ongoing timber harvesting activities, the dominant land use in Upper Elk River Watershed. Existing adverse cumulative impacts from current and past land management practices combined with watershed characteristics (such as sensitive geology and altered hydrologic conditions) require that additional actions be taken beyond those currently being implemented in the Upper Elk River Watershed. Updated management actions are necessary to prevent continued impact to beneficial uses and contributions to downstream nuisance conditions that result from ongoing timberland management. The WDRs will consider the unique watershed factors that influence the discharge of sediment so as to properly update management practices and better manage watershed effects.

The Regional Water Board has discretion in developing WDRs that can allow individual dischargers to tailor a compliance strategy. Humboldt Redwood Company (HRC) is the largest landowner, with 79 percent ownership of the Upper Elk River Watershed. In 2016, the Regional Water Board will consider adoption of WDRs to address waste discharges and other controllable water quality factors on lands within the Upper Elk River Watershed owned by HRC. The WDRs shall provide for implementation of rigorous best management practices (BMPs) with variation according to the sediment loading risk of individual sub-watersheds.

Other landowners include Green Diamond Resource Company (GDRC), Bureau of Land Management (BLM), and individual non-industrial timberland owners. As part of its ownership WDRs for timber harvesting and roads, GDRC has a South Fork Elk Management Plan. (Order No. R1-2012-0087 Waste Discharge Requirements for Discharges Related to Green Diamond Resource Company's Forest Management Activities Conducted within the Area Covered by Its Aquatic Habitat Conservation Plan in the North Coast Region, Humboldt and Del Norte Counties). The South Fork Elk Management Plan shall be modified to be consistent with the TMDL Action Plan and available for Regional Water Board consideration in 2016. The BLM manages the Headwaters Forest Reserve comprising about 7,472 acres of old growth coast redwood as part of the National Landscape Conservation System. The 2004 Management Plan for the Headwaters Forest Reserve focuses on restoration, research, and recreation/education and is being updated. BLM management of the Headwaters Forest generally provides benefits to water quality in the Elk River Watershed. Any BLM projects expected to discharge sediment can be enrolled and regulated as a Category B project under the USFS Waiver. (Order No. R1-2015-0021 Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Federal Land Management Activities on National Forest System Lands.) Non-industrial timber management Plan (NTMP) owners must enroll under the General NTMP WDRs in Tier B (Order No. R1-2013-0005 General Waste Discharge Requirements for Discharges for Timber Operations on NTMPs). Tier B requires that a landowner submit an erosion control plan (ECP) for their entire NTMP area. Other timberland owners may enroll individual THPs under the General Timber WDRs (Order No. 2004-0030) with any additional conditions identified during THP review to make consistent with the TMDL Action Plan.

<u>Elk River Recovery Assessment</u>: The State Water Resources Control Board executed a contract with CalTrout in 2014 to conduct full scale sediment and hydrodynamic modeling from the top of the impacted reach to the river's outlet at Humboldt Bay, with a final deliverable due in 2017. This is a non-regulatory assessment of the feasibility of improving conditions in the impacted reaches of the Upper Elk River Watershed. The final assessment report is expected to result in the technical foundation for a remediation action plan by which to initiate recovery of ecosystem functions and beneficial uses in the Elk River and abate nuisance conditions. Potential recovery actions may include dredging, new channel construction, off-channel sediment detention basins, levee construction or modification, vegetation management, infrastructure improvements, creation of inset floodplains, high flow channels, and placement of instream large woody debris. Pilot remediation permitting and implementation projects are planned for 2016-2018. Full scale remediation and restoration permitting will proceed with larger-scale actions to be initiated in approximately 2020. Monitoring and maintenance is anticipated for an extended period (e.g., ten to twenty years) following completion of remediation efforts.

<u>Watershed Stewardship Program</u>: This is a non-regulatory, participatory program that engages residents, community members, scientists, land owners, land managers, and regulatory agencies in developing a collaborative planning process that seeks to enhance conditions in the Elk River Watershed. The Elk River Watershed Stewardship Program will work to accomplish the following goals:

a. Seek common ground among diverse participants.
b. Identify strategies and solutions to:
    i. Improve the hydrologic, water quality, and habitat conditions of Elk River;
    ii. Reduce nuisance flooding and improve public transportation routes during high water conditions; and
    iii. Improve residential and agricultural water supplies.
c. Promote coordinated science and monitoring.

In 2016, a steering committee comprised of Humboldt County, University of California Cooperative Extension, Natural Resources Conservations Services, CalTrout, and the Regional Water Board will initiate the Elk River Watershed Stewardship Program. Initial program funding is provided by 319(h) grant funds from the US EPA and will support the stewardship efforts through 2018.

Table 4: Upper Elk River Sediment TMDL Implementation Actions[‡]		
Topic	Responsible Parties	Actions
Sediment Source Control	Humboldt Redwood Company	Humboldt Redwood Company shall implement its revised WDRs adopted by the Regional Water Board to implement phase 1 of the Upper Elk River Sediment TMDL and a zero load allocation.
Sediment Source Control	Green Diamond Resource Company	Green Diamond Resource Company shall implement its South Fork Elk management plan including any revisions approved by the Regional Water Board to implement phase 1 of the Upper Elk River Sediment TMDL and a zero sediment load allocation.
Sediment Source Control	Non-Industrial Timberland Owners	Prior to any timberland management activities, non-industrial timberland owners shall enroll under the General NTMP WDR in Tier B (Order No. R1-2013-0005 General Waste Discharge Requirements for Discharges for Timber Operations on NTMPs) or a future Order that replaces Order No. R1-2013-0005.
Sediment Source Control	Other Timberland Owners	For other timber harvest plans, landowners shall enroll individual THPs under the General Timber WDRs (Order No. 2004-0030) or a future Order that replaces Order No. R1-2004-0030 and incorporate any additional conditions identified during the timber review process as necessary to be consistent with the TMDL Action Plan.
Sediment Source Control	Bureau of Land Management	The Bureau of Land Management shall request enrollment of any projects with potential sediment discharges under the U.S. Forest Service Waiver (Order No. R1-2015-0021) or a future Order that replaces Order No. R1-2015-0021.
Sediment Remediation	CalTrout	By 2017, CalTrout will produce a final report detailing the results of full-scale sediment and hydrodynamic modeling, including feasible remediation and restoration activities sufficient to achieve water quality standards and return the watershed to a trajectory of recovery.
Watershed Stewardship	Humboldt County, the Steering Committee, and the Watershed Stewardship Program	By 2016, in coordination with a steering committee, Humboldt County will initiate a watershed stewardship program for the Elk River Watershed in conformance with the 319(h) grant contract, including establishment of: a Health and Safety workgroup responsible for developing recommendations appropriate for resolving water supply, flooding, and road access issues; a Science and Coordinated Monitoring workgroup responsible for developing recommendations appropriate for improving the effectiveness of water quality, sediment and flow monitoring efforts throughout the watershed; a Sediment Remediation workgroup responsible for developing recommendations appropriate for remediating instream stored sediment and improving floodwater conveyance, sediment transport, and ecosystem function. Final reports documenting the workgroup's recommendations, including plans and schedules are due in 2018.
TMDL and Watershed Stewardship Effectiveness	Regional Water Board	By 2021, the Regional Water Board shall evaluate the available information to assess the degree to which the efforts of the Watershed Stewardship Program are making sufficient progress towards achievement of health and safety, coordinated monitoring, and sediment remediation improvements. By 2026, the Regional Water Board shall evaluate the available information to assess the degree to which recommended health and safety, coordinated monitoring, and sediment remediation improvements have been achieved. By 2031, the Regional Water Board shall evaluate the available information to assess the degree to which water quality

Table 4: Upper Elk River Sediment TMDL Implementation Actions‡		
Topic	Responsible Parties	Actions
		objectives are attained and beneficial uses are restored throughout the watershed, and nuisance flooding conditions are abated.
TMDL and Watershed Stewardship Effectiveness	Regional Water Board	By 2031 or upon attainment of water quality objectives, the Regional Water Board shall re-evaluate the sediment loading capacity and load allocation for the Upper Elk River Watershed and revise accordingly.

‡ The zero load allocation does not constitute an effluent limitation or a waste load allocation, and the Board has discretion on how to implement it in WDRs, waivers or other actions to reduce and eliminate waste discharges.

VII. Monitoring and Adaptive Management

The Program of Implementation relies on coordinated monitoring and adaptive management as the basis for tracking trends, updating scientific understanding, and modifying implementation actions over time. The Regional Water Board has identified four primary goals for near and long-term monitoring in the Elk River: (1) evaluate compliance with WDR/waiver requirements and verify that the provisions of the WDRs are being implemented as designed and permitted; (2) evaluate the effectiveness of management measures, management modifications, and remediation efforts aimed at reducing sediment loads and improving conditions in the impacted reaches; (3) track whether conditions are trending toward numeric targets, water quality objectives, and beneficial use support via the Watershed Stewardship Program; and (4) inform when and how to reevaluate the loading capacity.

A combination of monitoring resources is anticipated to achieve these goals. The WDRs will require monitoring and reporting from the landowners in the Upper Elk River Watershed. The Elk River Recovery Assessment will provide reach-scale targets defining channel and habitat conditions. In addition, pilot remediation projects will be implemented as part of the Elk River Recovery Assessment, including effectiveness monitoring to assess which techniques should be brought full-scale. Finally, the Science and Coordinated Monitoring workgroup of the Watershed Stewardship Program will recommend monitoring and special studies as necessary to address the resource protection goals of the group and answer specific questions.

Regional Water Board staff will report to the Regional Water Board annually on the status and progress of implementation activities. Approximately five years after adoption, Regional Water Board staff will conduct a formal assessment of the effectiveness of the implementation plan and make any necessary revisions to this TMDL Action Plan. This includes a review of the sediment source analysis for the Upper Elk River, sediment deposition in the impacted reach and Lower Elk River, and the need for a Lower Elk River sediment TMDL, using Recovery Assessment tools and other available data, as appropriate. During reassessment, the Regional Water Board will consider how effective the requirements of the TMDL program of implementation are at meeting the TMDL, achieving water quality objectives, and protecting the beneficial uses of water in the Upper Elk River Watershed. The success of the TMDL will be assessed based on water quality trends in the Upper Elk River Watershed, particularly the attainment of water quality standards in the impacted reach. Ultimately success is achieved when nuisance conditions are abated, and beneficial uses are supported.

Attachment No. 3: December 4, 2015 Initial Study Supporting the Preparation of a Mitigated Negative Declaration Waste Discharge Requirements for Timber Harvesting and Related Land Management Activities Conducted by Humboldt Redwood Company, LLC. In Upper Elk River, Humboldt County, California

California Environmental Quality Act
(CEQA)

INITIAL STUDY

Supporting the Preparation of a Mitigated Negative Declaration

Waste Discharge Requirements
for
Timber Harvesting and Related Land Management Activities
Conducted by Humboldt Redwood Company, LLC.
In Upper Elk River,
Humboldt County, California

December 4, 2015

<u>California Regional Water Quality Control Board, North Coast Region</u>
5550 Skylane Blvd.
Santa Rosa, CA
95403

Prepared By:
California Regional Water Quality Control Board, North Coast Region
Nonpoint Source Pollution Control Unit

TABLE OF CONTENTS

Figures

Attachments

A. PROJECT TITLE:

Waste Discharge Requirements for Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC, In the Upper Elk River Watershed, Humboldt County.

B. LEAD AGENCY

California Regional Water Quality Control Board, North Coast Region
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C. CONTACT PERSON:

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D. PROJECT LOCATION

Upper Elk River watershed, tributary to the Humboldt Bay in Humboldt County California.

E. PROJECT DESCRIPTION

This Project consists of adoption of Waste Discharge Requirements (Order) by the California Regional Water Quality Control Board, North Coast Region (Regional Water Board) that, if adopted, would establish water quality requirements for nonpoint source waste discharges and other controllable factors related to timber harvesting and associated activities conducted by Humboldt Redwood Company, LLC (HRC), a timberland management company, in the Upper Elk River (UER) watershed, Humboldt County, California.

The Order establishes enforceable general and specific requirements to achieve compliance with water quality objectives in receiving water through implementation of stringent management practices designed to minimize discharges. The main elements include:

- Limits on the intensity and areal extent of timber harvesting including a temporary prohibition on harvesting in high risk areas within the UER;
- Management practices to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;

- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Riparian management zones, in which retention of riparian vegetation, exclusion of ground based logging equipment, and enhanced erosion control serves to minimize sediment inputs from streamside areas and preserve and restore riparian shade to protect water temperature;
- Restoration of stream channels and riparian zones to control sediment and improve salmonid habitat, including:
  - Large wood augmentation for the purposes of improving fish habitat and sediment routing. Methods could include falling riparian zone trees or placement of logs using heavy equipment;
  - Construction of in-stream or off-channel sediment detention basins;
  - Streambank stabilization using large wood, excavation, planting, rip-rap, or other methods;
  - Removal or reconstruction of watercourse crossings and near stream road segments; and
  - Excavation of in-stream sediment deposits.
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

The potential impacts of those activities included in this Project and the specifics of the Order are described in section H of this initial study. The draft Order and supporting documentation are attached to this initial study.

Environmental Setting and Regulatory Background

The Elk River watershed is a 33,700 acre (52.7 mi^2) watershed located in coastal northern California, draining into Humboldt Bay just south of the city of Eureka, in Humboldt County (Figure 1). Elk River has relatively steep forested headwater slopes and flows across a primarily grassland coastal plain into the central portion of Humboldt Bay, across from the bay inlet. The watershed is made up of six Calwater (version 2.2) planning watersheds: Martin Slough, Lower Elk River, Lower North Fork Elk River, Upper North Fork Elk River, Lower South Fork Elk River, and Upper South Fork Elk River. The Mediterranean climate of the Elk River watershed is characterized by mild, wet winters and a prolonged summer dry season. Mean annual precipitation ranges from 39 inches at Eureka, located on the coast, to 60 inches in Kneeland, which is near the top of the watershed, 2,657 feet above sea level, and approximately 12 miles inland from Humboldt Bay. Roughly 90% of the annual precipitation occurs as rainfall between October and April. Elevation ranges within the watershed range from 2800 feet in the headwaters of the watershed to

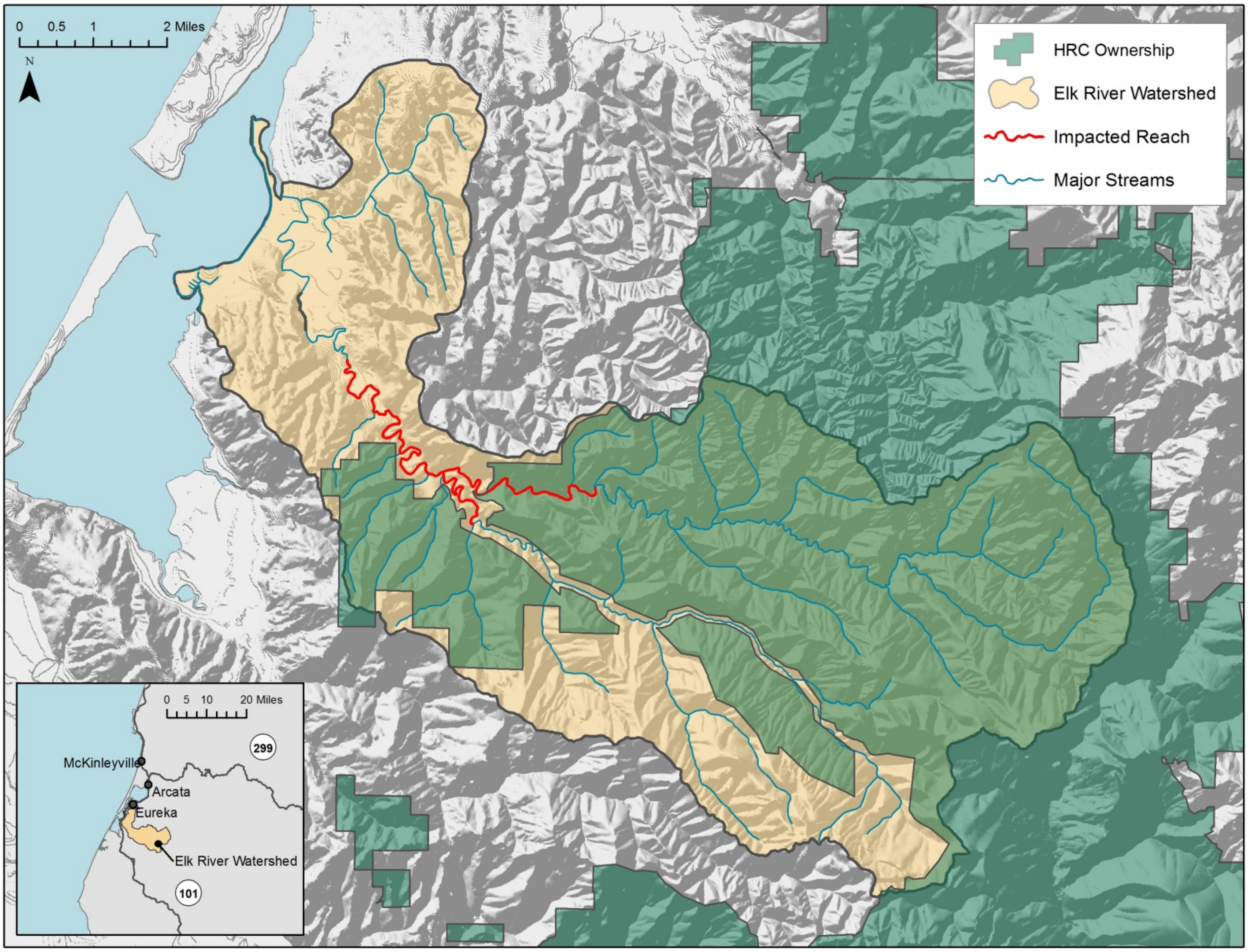

Figure 1. Elk River and Vicinity

sea level at its confluence with Humboldt Bay. Ridge-top areas can be fairly gentle with slopes typically steepening to ≥ 40% approaching watercourses.

HRC lands account for approximately 66% of the watershed: 98% of the North Fork Elk Basin, 50% of the South Fork basin, and a small section of the mainstem region near the confluence of the two major forks. This area is referred to as the Upper Elk River (UER). Other ownerships within the UER include the Bureau of Land Management (Headwaters Forest Reserve), Green Diamond Resource Company, the City of Eureka, and mixed private residential and agricultural ownerships. Approximately 85% of the land in the UER is owned by the two industrial timber management companies (HRC and Green Diamond) and is managed for growing conifer and hardwood trees for the production of saw and chip logs and other renewable forest products such as bio-fuel, split products, firewood, and burls.

In 1997, the Regional Water Board and other state agencies began to receive reports from downstream residents of increased turbidity, channel filling, and flood frequency. In December 1997, California Department of Forestry and Fire Protection (CAL FIRE), California Department of Fish and Wildlife (DFW, then California Department of Fish and Game), California Geological Survey (CGS) and the Regional Water Board determined, based on field observations and aerial photograph data, that the Elk River Watershed was one of five Humboldt County watersheds that were significantly cumulatively impacted by sediment discharges following the large storm events in late 1996 and early 1997. Following this determination, a series of regulatory and non-regulatory actions designed to increased land use controls to reduce sediment discharges from timber harvesting activities have been implemented.

Over time, sediment transported from the upper tributaries has been deposited in low gradient downstream reaches at the confluence of the North and South Fork Elk River (hereinafter referred to as the impacted reach) and has resulted on going aggradation, encroachment of riparian vegetation onto relatively recent fine sediment deposits, and an increased incidence of overbank flooding which has impacted the residential community for the past 20 years. It is estimated that over 600,000 cubic yards (yd^3) of sediment produced by management activities over the past two decades are stored within the low gradient stream reaches of the UER. In addition to elevated sediment loads, hydromodification from channel stabilization, removal of large woody material, dredging, and channel constrictions in lower portion of the watershed such as bridges and roads have diminished the ability of the river to assimilate increased sediment loads.

In addition to the stored sediment within the impacted reach, elevated sediment production from in-stream sources within lower order watercourses further up in the watershed is being transported through the system downstream.

There is a strong association between land management practices that were used during the period between 1988 and 1997 and the impairment of beneficial uses of water in the UER. Data from field observations and interpretation of aerial photographs show that sediment production rates during this time greatly exceed long term natural background rates due to several factors, including an approximate four-fold increase in logging under then-owner, the Pacific Lumber Company (PALCO), during this time period, poorly regulated logging practices, a series of winters with above average precipitation and large storm events, and potentially of a magnitude 7.2 earthquake off Cape Mendocino in 1992.

Starting in 1997, the Regional Water Board issued Cleanup and Abatement Orders (CAO) that required the inventory, prioritization, treatment, and monitoring of existing sediment sources associated with land management activities, prevention of creation of new sediment sources, and monitoring of in-stream sediment-related indices. Treatment of controllable sediment discharge sources (CSDS) related to roads, off-road sites, and landslides throughout HRC's ownership in the UER watershed have been conducted under Cleanup and Abatement Order (CAO) Nos.

R1-2004-0028 (for the South Fork and Mainstem Elk River) and R1-2006-0055 (for the North Fork Elk River). The majority of road related sites have been treated as of the end of 2015. Treatment of all road related sites is scheduled to be completed by the end of 2017. Over 12,300 acres have been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trails, were identified. By 2011, 80% of the top 100 sites with the greatest potential for environmental impact were treated. In 2012, HRC submitted a new master treatment plan to schedule treatment of the remaining sediment sources in the watershed. As of 2014, corrective action had been implemented at approximately half of these sites. The Order requires HRC to continue to treat sites that annually based on priority and proximity to timber operations and other sediment control work .

In 2006 the Regional Water Board adopted Order No. R1-2006-0039, Elk River Watershed-Wide Waste Discharge Requirements (2006 WDR). Among other requirements, the 2006 WDR includes receiving water limitations on peak flow increases and sediment discharge from harvest-related landslides; and rate of harvest (ROH) limitations based on two scientific models.

In October 2008, HRC acquired ownership of PALCO's timberland holdings throughout Humboldt County, including the approximately 22,000acres in the UER. Since acquiring the property, HRC has implemented a significantly different silvicultural management strategy throughout their ownership that predominantly utilizes partial harvesting methods, such as selection silviculture. Partial harvesting results in post-harvest conditions that are less susceptible to mass wasting and increased erosional processes as compared to clearcut harvesting.

On September 22, 2015, pursuant to Water Code section 13260(a), HRC submitted a report of waste discharges (ROWD) for its timber harvesting and related management activities. The ROWD includes HRC's proposed long term timber management strategy, including proposed measures designed to prevent or minimize water quality impacts from activities associated with its forest management.

F. PURPOSE AND NEED

The 2006 WDRs are not tailored to the management practices of HRC, and do not comprehensively address HRC's obligations for cleanups and TMDL implementation. The Order needs to reflect current conditions, and all parties agree that a more comprehensive and readable permit is desirable. In addition, it is agreed that remaining requirements for erosion control from the two CAOs should be incorporated for a more efficient management of related monitoring and reporting.

The purpose of the revised Order is to provide a water quality regulatory structure for HRC to prevent and/or address discharges of waste and other controllable water quality factors associated with timber harvest activities in the UER. The WDR is informed by the total maximum daily load (TMDL) sediment source analysis for the UER and overwhelming evidence pointing to the lack of assimilative capacity in the impacted reach.[1] The WDR provides for implementation of strict best management practices (BMP) prepared with the collaboration and cooperation of HRC, some that vary according to the sediment loading risk of subwatersheds. The WDR provides a five year interim program where HRC will refrain from timber harvest activity in high risk subwatersheds to allow time for stewardship efforts to move forward and improve conditions in the impacted reach.

The Order prescribes general and specific requirements that HRC conduct timber harvesting and associated management activities to reduce the potential for sediment and temperature impacts, including best management practices intended to implement applicable water quality standards from the Water Quality Control Plan for the North Coast Region (Basin Plan) (NCRWQCB, 2011). The proposed Order is attached to this Initial Study.

G. CONSISTENCY WITH PLANS AND POLICIES

Timber Harvesting Under the California Forest Practice Rules
CAL FIRE is the state agency responsible for overseeing timber harvesting activities through implementation of the Forest Practice Rules (FPRs)(Cal. Code Regs., tit. 14, §895 *et seq.*[2]). Under the Z'Berg-Nejedly Forest Practice Act, non-federal landowners proposing to harvest timber are required to have an approved timber harvest plan (THP) prior to commencing timber harvesting.

The FPRs include rules for protection of the beneficial uses of water, including rules for enhanced protection in watersheds with listed anadromous salmonids. The FPRs provide measures designed to prevent sediment discharges (see FPR §§914, 934 [harvesting practices and erosion control]; §923, 943 [prescriptions for construction, reconstruction, use, maintenance, and decommissioning of road sand landings]; §916.4, 936.4 [requiring evaluation of sites that could adversely impact beneficial uses of water and treatment of such sites when feasible].) FPR section 916.9 requires that every timber operation in watersheds with listed anadromous salmonids shall be planned and conducted to comply with the terms of a Total Maximum Daily Load (TMDL) if one has been established for the receiving waters within the plan area. The FPRs also provide measures to limit reductions in riparian shade to protect water temperature.

Additionally, CAL FIRE is the CEQA Lead Agency for timber harvesting operations in California. The Secretary of Resources has certified that regulation of timber harvesting operations by CAL FIRE is exempt from CEQA's requirements to prepare an Environmental Impact Report (EIR) or Negative Declaration. A THP that is approved by CAL FIRE is considered the functional equivalent of an EIR under

[1] The term "impacted reach" applies the North Fork Elk River below Browns Gulch, the South Fork Elk River below Tom Gulch, and the mainstem of Elk River from the confluence of the North and South Forks downstream to Bertas Road.
[2] Citations to the Forest Practice Rules contained in Title 14 of the California Code of Regulations will be indicated by "FPR" followed by the relevant § number.

CEQA. The Regional Water Board, the California Department of Fish and Wildlife (DFW), the California Geologic Survey, and other agencies are responsible agencies charged with the multidisciplinary review of THPs for compliance with CEQA. All timber harvesting activities in the UER watershed will first be certified by CAL FIRE and considered to have completed the CEQA Functional Equivalent process. Regional Water Board staff participate in the THP review process, which provides a mechanism to ensure compliance with the Order and a supplemental CEQA review for individual THPs. Applicable FPRs and other mitigations identified in the THP review process are included as enforceable provisions of the Order.

Endangered Species Act and Habitat Conservation Plan
All of HRC's ownership in the UER watershed is covered by a multi-species state and federal Habitat Conservation Plan (HCP), which was approved in 1999 by the California Department of Fish and Game (now CDFW), the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFW). The state and federal Incidental Take Permits (ITP) issued for aquatic species including Chinook salmon, Coho salmon, cutthroat trout, steelhead trout, southern torrent salamander, tailed-frog, red-legged frog, foothill-yellow legged frog, and the northwestern pond turtle are most relevant to protection of the Beneficial Uses of UER. The management measures for water quality protection of the HCP were the subject of the federal Environmental Impact Statement and state Environmental Impact Report which led to the issuance of the ITP in conformance with the federal Endangered Species Act.

In 2005, as per the HCP requirements, PALCO conducted a watershed analysis of the Elk River and Salmon Creek watersheds. Watershed-specific prescriptions were developed for these watersheds that included riparian and landslide protections. The watershed analysis was revisited in 2014, and additional updates to the specific prescriptions were made. The revised sections of the HCP addressing Hillslope and Riparian Management Zone Prescriptions and Control of Sediment from Roads and Other Sources are included as enforceable provisions of the Order.

Master Agreement of Timber Operations
The CDFW has jurisdiction over the conservation, protection, restoration, enhancement, and management of fish, wildlife, native plants, and habitat necessary for sustainable populations of those species under state law, including Fish and Game Code , section1600 *et seq*. In August of 2006, HRC submitted a notification to CDFW for a long-term master harvesting operation lake and stream bed alteration agreement (MATO) pursuant to Fish and Game Code section1602 and 1605(g) for road work activities associated with the HCP. The MATO was issued in May 2011, and subsequently updated in June 2015. Section 10 of the MATO provides a detailed list of conditions necessary for protection of fish and wildlife resources from impacts of covered activities subject to the agreement.

Land Use Zoning
Current land uses in the UER are largely determined by local zoning regulations which have zoned 82% of the area as timber production zone. Most of the UER (75%) is privately managed for industrial timber harvest, with the exception of the

federally managed Headwaters Forest Reserve (located in the South Fork Elk River subbasin) and a small portion dedicated to private residential and agricultural uses in the lower South Fork Elk River valley.

H. SPECIFICS OF PROPOSED PROJECT AND GENERAL ENVIRONMENTAL CONCERNS

This section describes the potential impacts of timber harvesting and related management activities and the measures incorporated into the Order to mitigate those impacts.

General Effects of Timber Harvesting

The UER has been utilized primarily for timber harvesting since the 1850s. A wide range of environmental effects at varying spatial and temporal scales can result from timber harvesting. In addition, the impacts can vary greatly depending on factors such as pre-harvest stand condition and harvesting practices used. For example, clearcutting an old growth stand can have significantly different results than thinning a suppressed stand second growth stand. Removal of trees diminishes the structure of a forest stand for a period of time. However, a forest is a dynamic environment, which even under natural conditions, changes constantly as trees grow, mature, and die and are replaced by new trees. A portion of the trees in a forest can be harvested and the remaining stand may retain much of the inherent qualities of a mature forest that support a watershed's physical and ecological integrity. This is not the case with intensive harvesting practices such as clearcutting, which transforms a forest stand into essentially non-forest conditions for a period of time until trees grow back. When an old-growth forest is clearcut, as occurred in UER beginning in the mid-1800s and continuing episodically through the end of 1900s, its inherent ecological integrity and unique characteristics may be lost for centuries. The majority of the timber in the UER is now in a condition of varying stages of second growth conifers and hardwood, with the exception of approximately 5,000 acres of intact old growth forest remaining in the Headwaters Forest Reserve in the Little South Fork Elk River. Impacts resulting from timber harvesting are not limited solely to those caused by tree removal, but also those caused by ground disturbance and changes to watershed hydrology associated activities such as road construction and use and transporting trees to roads and landings. Water quality impacts from this history of timber management activities are mostly associated with increased sedimentation resulting in:

a. Impaired domestic and agricultural water quality;
b. impaired spawning habitat; and
c. increased rate and depth of flooding due to channel in-filling by sediment.

These impacts result from a complex interaction between inherent watershed characteristics, such as geology and geomorphology, external natural processes such as climate and timing of stochastic events (i.e. large storms, earthquakes, fires) and type of management practices and extent and rate of watershed area disturbed. Increased sediment production is the result of greater incidence of landsliding, surface and gully erosion, and increases in channel erosion due to higher runoff rates. Much of the increased sediment production is associated with roads, skid trails, and landings, with the highest potential for sediment discharge occurring at road watercourse crossings.

HRC practices uneven-aged silvicultural techniques, such as selection and variable retention systems that result in generally continuous forest cover and a mix of age classes. Harvest management design criteria (referred to as prescriptions) are designed to capture mortality, improve the health of timber stands, and restore native species compositions more similar to what exited prior to the onset of widespread harvesting in the watershed. As the extent of mortality and inferior trees within a stand decreases from successive entries, the harvest orientations turn more towards spacing and concentration of growth on the best phenotypes of the desired species. Unless dictated by inordinate mortality, HRC's selection harvest entries into the watershed are planned to occur on 10-20 year intervals within an individual stand. Regeneration objectives are achieved through a combination of natural and artificial regeneration. HRC's silvicultural policy is based on the following:

- Operate without traditional clear-cutting;
- Harvests will retain elements of the original stand such as snags, green trees; stand structure, and other features important for a variety of functions for biotic organisms;
- Harvest less than growth so forest stand volume increases over time;
- Uneven-aged management will be employed on well-stocked conifer stands; and
- No harvest of old growth.

The overall result of timber harvesting as described in HRC's management strategy is a "managed" forest, which is qualitatively different from an untouched old growth forest. However, the management strategy is designed to retain much of the wildlife and watershed functions of the forest and will maintain or improve those values over current conditions. While it is difficult to quantify, when the proposed rate of harvest and partial harvesting methods are considered together with the emphasis on landslide avoidance strategy, landslide hazard analysis, and land management prescriptions, the potential for watershed impacts from timber harvesting is considered to be fairly low. That said, new discharges of sediment from harvesting and associated activities can be significant due to the existing impacted and degraded water quality of the watershed.

Measures to Prevent Sediment Discharge

Specific requirements to prevent new sediment discharge and address existing discharges fall into several categories discussed below, including forest management (including harvest rate limits), a temporary prohibition on harvesting in subwatersheds with high risk of sediment discharge, riparian protections, roads management, landslide prevention, wet weather restrictions, inventory and treatment of existing controllable sediment sources, and watershed restoration efforts. In addition, the Order includes a monitoring and reporting program designed to evaluate the effectiveness of sediment control measures, identify where additional measures are necessary, and track in-stream water quality trends. Management measures in separate categories often overlap, and also provide benefits relevant to other categories. For example, riparian protections can preserve shade and prevent increases in water temperature as well as reducing sediment discharge and landslides.

Forest Management/Harvest Rate
Tree removal can result in reduced interception, evaporation, and evapotranspiration of rainfall by forest canopy and can therefore increase the volume of precipitation that infiltrates and remains in soils, increasing pore pressure, and altering stream hydrographs by increasing the magnitude and shortening the duration of peak flows in watercourses. Increased pore pressures can increase the likelihood and magnitude of slope failures. Changes in hydrographs can result in channel scour and increases in bank failures. Tree roots enhance the strength of shallow soils, increasing the soil's ability to resist failure. When trees are harvested their roots gradually decay, reducing the soil reinforcement they provide and increasing the potential for shallow landslides. Harvesting trees can result in increased soil moisture and runoff and decreased root strength, which can contribute to landsliding and increased erosion throughout a watershed. These impacts can be reduced or prevented by limiting canopy removal through silvicultural prescriptions and/or harvest rate limits.

The rate of harvest in a watershed is an important management variable. Various studies cite specific thresholds for the rate of harvest, above which, cumulative impacts become more likely to occur and have linked specific processes to watershed impacts, such as increased peak flows from road and canopy removal (Lisle et al. 2000, Lewis et al. 2001), landslide related sediment discharge (Reid, 1998), road density (Cedarholm et al. 1981, Gucinski et al. 2001, Trombulak et a, 2000), or equivalent clearcut area[3] (USDA Forest Service, 1974). Watershed-wide average annual harvest rates required under the Order equate to less than 1.5% equivalent clearcut acres. These rates are lower than required under the 2006 WWDRs, which allowed annual harvest rates of 1.9% in the North Fork and 1.8% and upwards in the South Fork. Based on the transition to unevenaged management under HRC's ownership, the proposed average annual harvest rate throughout the UER is less than 1.5% equivalent clearcut acres, the harvest rate above which Klein et. al (2012) found elevated chronic turbidity levels. In addition, the Order requires that the rate of harvest in any subwatershed not exceed 2% equivalent clearcut

[3] Equivalent clearcut area (ECA) is a widely used methodology developed by the United States Forest Service (USFS) to account for the relative impacts of different types of silvicultural treatment. It assigns a weighting factor of one to clearcutting and a value less than one for partial harvesting silvicultural treatments. The weighting factor for a silvicultural treatment is multiplied by total area treated under each silviculture to arrive at a normalized disturbance calculation. Therefore, 100 acres of selection harvest, which is typically assigned a ECA factor of 0.5, would be counted as 50 equivalent clearcut acres.

acres per year averaged over any 10 year period. This is to ensure that proposed harvest rates are generally below a threshold that would cause concern for contributing to ongoing cumulative impacts on water quality and contribute towards control of sediment and improvement of impaired beneficial uses of water.

Riparian Zone Management
Under natural conditions, the riparian areas in the UER created complexity in stream channels, both in the steep upper watershed as well as in depositional reaches. A riparian zone helps maintain healthy stream ecosystems and supports beneficial uses by:

- Stabilizing banks through provision of roots cohesion on banks and floodplains;
- Filtering sediment from upslope sources;
- Filtering chemicals and nutrients from upslope sources;
- Supplying large wood to the channel, which maintains channel form and improves in-stream habitat complexity;
- Helping to maintain channel form, in-stream habitat, and an appropriate sediment regime through the restriction of sediment inputs or metering of sediment through the system;
- Moderating downstream floods peaks through the temporary upstream storage of water;
- Helping maintain cool water temperatures through provisions of shade and creation of a cool and humid microclimate over the stream; and
- Providing both plant and animal food resources for the aquatic ecosystem in the form of, for example, leaves, branches, and terrestrial insects.

Alteration of physical processes in riparian zones have led to reduced complexity, including reduction in the trees available within riparian areas for recruitment to streams, increased surface erosion and landsliding, and destabilization of stream channels. Subsurface erosion of soil pipes is prevalent in the UER, particularly in swales above small headwater channels. Preferential flow through soil pipes results in internal erosion of the pipe, which may produce gullies by tunnel collapse. Considerations of the interactions between sediment processes, water temperature, and riparian trees are essential for evaluating and avoiding these management related impacts to streams. Management of riparian zone must be designed to preserve and restore the function of riparian vegetation and hillslope processes, including retention of adequate riparian zone trees and avoiding use of roads and heavy equipment on vulnerable hillslopes and swales.

The Order relies in part on water quality protection derived from the Elk River/Salmon Creek Watershed Analysis Revisited (ERSC WA), prepared by HRC in June 2014 pursuant to the provisions of their HCP. The ERSC WA establishes forest management prescriptions pertaining to slope stability and riparian protection established in consultation with state and federal resource agencies. The Order includes as enforceable provisions those prescriptions designed to prevent or minimize sediment delivery to Class I, Class II, and Class III watercourses, with additional water quality protections. These are summarized below:

Protection measures for Class I RMZs include:

- RMZs for Class I watercourses extend to 300 feet on either side of the channel;
- No harvesting within 50 feet of Class I watercourses;
- Retain the 18 largest conifer trees per acre (measured along 435 feet of watercourse length and within 100 feet of the watercourse and lake transition line);
- Between 50 feet and 150 feet of Class I watercourses, retain a minimum of 200 square feet of basal area per acre;
- Post-harvest basal area shall not be lowered below 150 square feet per acre between 150 feet to 300 feet from a Class I watercourses.

Protections measures for Class II RMZs include:

- RMZs for Class II watercourses extend up to 200 feet on either side of the channel;
- No harvesting within 30 feet of Class II watercourses;
- Between 30 feet and 100 feet of Class II watercourses, retain a minimum of 60% post-harvest conifer canopy coverage watercourses;
- Basal area shall not be lowered below 150 square feet per acre between 30 feet and 200 feet from a Class II watercourse.

Specific requirements for Class III protection measures include:

- RMZs for Class III watercourses extend to 100 feet on either side of the channel;
- No harvesting within 20 feet of Class III watercourses;
- Basal area shall not be lowered below 150 square feet per acre between 20 feet and 100 feet from a Class III watercourse.

Additionally, only single tree selection will be utilized in RMZs. No small group openings will take place. No ground based equipment, with the exception of at existing roads and permitted new road construction, is allowed within 150 feet of a Class I watercourses, 100 feet of Class II watercourses, and 50 feet of a Class III watercourse or to the closest hydrologic divide.

Erosion control practices in RMZs will implement the highest feasible erosion control methods including surfacing all segments of road and skid trails within riparian areas with pavement, rock, slash, mulch, straw, or other adequate materials. Practices that trap and filter all road and skid trail surface drainage within riparian areas to prevent the discharge of sediment to watercourses will also be used. Tractor crossings in un-channeled swales are to be avoided, and trees along the centerlines of swales and in areas of subsurface flow paths will be retained.

Control of Sediment from Roads

The Elk River sediment source analysis as well as other sediment TMDLs adopted for watersheds throughout the North Coast Region have identified logging roads as one of the most significant sources of anthropogenic sediment discharge. Logging roads can alter hillslope hydrologic processes and increase sediment discharge from surface and gully erosion and landslides. Roads can contribute to landsliding by undermining and over steepening slopes and placing poorly compacted fill material on steep slopes. Roads also intercept and concentrate shallow groundwater and surface runoff, which can cause gully erosion and saturate vulnerable slopes, increasing the potential for failure. Road crossings of watercourses are subject to the force of high stream flows and failure usually results in direct delivery to streams. Road crossings of watercourses are one of the most common controllable sediment sources. Management practices to reduce the potential for road related sediment discharge have become standard in timberlands throughout the North Coast. Inventory and treatment of existing controllable sediment sources from roads is addressed under a separate heading below.

A programmatic approach to road construction, reconstruction, maintenance, decommissioning and regular inspections is essential to controlling sediment discharge from roads. A widely used reference document for planning, designing, constructing, reconstructing, maintaining, and decommissioning roads on forestlands in the North Coast is the Handbook of Forest and Ranch Roads (Weaver and Hagans, 1994). The Handbook contains a comprehensive suite of measures for forestland roads that Regional Water Board consider adequate and necessary to control sediment discharge from roads. Roads that have implemented all feasible site specific sediment control measures as described in the Handbook are referred to as "stormproofed."

Stormproofed roads incorporate the design features as summarized below into construction of new roads or reconstruction of existing roads:

- Hydrologically disconnecting road segments from watercourses and minimizing concentration of surface runoff by installing drainage structures at sufficient intervals to disperse runoff so as to avoid gully formation and minimize erosion of the road surface and inside ditches;
- Identifying and treating potential road failures (mostly fill slope failures) that fail and deliver sediment to streams;
- Designing watercourse crossings to minimize the potential for crossing failure and diversion of streams and sizing adequately to accommodate estimated 100-year flood flows (including wood and sediment);
- Inspecting and maintaining roads annually; and
- Avoiding or limiting wet weather road use to well rocked, paved, or chip sealed surfaces.

Sediment control measures for roads from the HCP largely rely on implementation of standards identified in Weaver and Hagans Handbook. Implementation of these road prescriptions are established as specific requirements of the Order. These requirements include:

- Implementing management practices and specifications to prevent and minimize sediment discharge from active roads;
- Upgrading of all roads by October 15, 2018, to meet the storm-proofed standard;

- Treating road-related controllable sediment discharge sources currently identified in the inventory by October 15, 2018;
- Maintaining and updating the inventory of controllable sediment discharge sources from roads;
- Inspecting all roads within their Elk River ownership at least annually between May 1 and October 15;
- Inspecting storm-proofed roads as soon as conditions permit following any storm event that generates 3 inches or more of precipitation in a 24-hour period, as measured at the Elk River rain gauge; and
- Notifying the Regional Water Board within one year of identifying new sediment discharge sources from roads; documenting and implementing measures to prevent or minimize sediment discharge at any new controllable sediment discharge sources identified during road inspections.

Landslide Prevention
Due to the weak geologic bedrock underlying much of the watershed, relatively high rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout much of the UER are naturally vulnerable to landsliding. Natural rates of landslide related sediment production vary based on the occurrence of landscape disturbance such as large storms, fires, earthquakes or other infrequent natural events. Timber harvesting and associated ground disturbance can result in increased rates of shallow landslides on vulnerable slopes due to decreases in root strength, increased soil moisture, altering hillslope hydrologic process, and oversteepening or loading slopes by cut and fill road construction.

Tree roots can enhance the strength of shallow soils, increasing the soil's ability to resist failure. When trees are harvested, their roots gradually decay, reducing the reinforcement they provide and increasing the potential for shallow landslides. The loss of root strength gradually increases over a period of several years, with the critical period of maximum loss occurring approximately 5 to 15 years after harvesting. Loss of root strength varies with species and intensity of harvest. Interception, evaporation, and evapotranspiration of rainfall by forest canopy can reduce the volume of precipitation that infiltrates and remains in soils. Harvesting trees can therefore result in increased soil moisture and runoff, which can contribute to landsliding and increased erosion. Construction of roads, skid trails, and landings can also increase landsliding. Excavations on vulnerable areas to construct roads and skid trails can undermine steep slopes. In addition, fill material placed on steep slopes on the outboard edge of roads can fail. Such failures can trigger larger failures on slopes below, often displacing large volumes of debris which can be transported considerable distances down slope.

The sediment source analysis found that landslide-related sediment production increased over two-fold above natural rates during the period between 1955 and 2001, with the highest rates (almost 5 times natural landslide rates) observed during the 1988 to 1997 time period. Open-slope landslides and road-related landslides were the dominant sediment sources during this period. Landslide-related sediment production has declined in the UER during subsequent time periods, notwithstanding large storm events that occurred in 2003 and 2006.

Declines in landsliding rates are thought to be partially the result of the HCP mass wasting avoidance strategy, which limits or precludes operations on areas identified as high landslide hazard as well as the ERSC WA prescriptions for landslide prevention.

HRC's approach for evaluating landslide hazards relative to proposed land use activities includes ERSC WA Prescriptions. As part of THP planning, a review of pertinent technical data are conducted to denote potential high risk slopes, including landslide inventories, regional geomorphic maps, stereoscopic aerial photographs, and a shallow landslide potential map developed using the SHALSTAB landslide model. The Order requires the implementation of the following prescriptions as part of HRC's hillslope management mass wasting strategy:

- Utilize a hillslope management checklist to identify areas that are particularly vulnerable to mass wasting;
- No harvesting or road construction or reconstruction on Class I inner gorges; and
- No harvesting or road construction or reconstruction on the following areas without characterization and development of measures to protect water quality prescribed by a PG:
  - Class II or III inner gorges
  - headwall swales;
  - other areas with very high mass wasting hazard (including slopes greater than 60%; and
  - earthworks (skid trails, landings, road prisms, or other earthen structures) exhibiting characteristics identified in the hillslope management checklist.

In addition to the hillslope management mass wasting strategy described above, HRC implements a comprehensive approach to preventing increases in landslide related sediment discharge that includes characterization of landslide hazards, designing projects to minimize impacts to slope stability based on site specific hazards, and ongoing monitoring of landslide activity to better understand landslide patterns and modify management practices based on observed activity. The California Geological Survey Note 45 provides guidelines for Engineering Geologic Reports for Timber Harvesting Plans, which must be prepared by California Professional Geologist (PG) who is familiar with watershed characteristics. The Order establishes requirements for characterization of geologic hazards by a PG and development of site specific mitigations. Characterization of landslide hazard should at a minimum consider the following information:

- Existing hazard maps derived from slope stability models;
- Available maps and reports;
- Aerial photographs;
- Field investigation and mapping; and
- Applicable studies and technical models.

During development of individual THPs, a PG evaluates potential effects on slope stability and surface soil erosion, and landslide related sediment discharge from the proposed management activity, identifies problem areas, and describes specific mitigation measures needed to minimize potential effects for identified areas of concern. The site-specific mitigations are based on the potential hazard process (likelihood of landslide initiation or acceleration in sediment mobilization or water flow, and the potential risk to water quality). Where appropriate, mitigations include, but are not necessarily limited to the following:

- Limit canopy removal in areas with elevated landslide hazard;
- Limit activities upslope of existing landslide and on vulnerable portions of deep seated landslides;
- Avoid road or skid trail construction on steep or vulnerable slopes; and
- Stabilization of existing landslides where applicable by methods such as planting, manipulate drainage, buttressing, and other feasible engineering techniques.

The Order establishes enforceable provisions to prevent increases in sediment discharge from landslides associated with HRC's timber harvest activities. The provisions entail an overall strategy that includes HRCs hillslope management mass wasting strategy from the ERSC WA, as well as additional measures included in their ROWD and those deemed necessary by Regional Water Board to prevent management related landsliding. These are summarized below as follows:

- Harvest rates throughout HRC's ownership in the UER that are less than those allowed under the limits set by the landslide reduction model under the current WDRs;
- Use of partial harvesting methods that retain a significant component of post-harvest root strength;
- Temporary prohibition of harvesting in high risk subwatersheds;
- Riparian protection zones, which include no harvesting within 50 feet of Class I watercourses, 30 feet of Class II watercourses, 20 feet of Class III watercourses and significant tree retention up to 300, 200, and 150 feet of Class I, II and III watercourses respectively;
- Review by licensed geologist of all proposed activities, including harvesting and construction or reconstruction of roads and watercourse crossings; and
- Implementation of HRCs ERSC WA hillslope management prescriptions.

Wet Weather Restrictions

Conducting timber operations during wet weather increases the potential for sediment production and discharge from roads, landing, and skid trails. Use of trucks and heavy equipment during saturated soil conditions can compact soil, create ruts which effect road drainage, and increase production of fine sediment. Typically the most effective way to prevent impacts from operations during saturated soil conditions is to avoid operations during the period of the year when rain is likely to occur. This allows for timely implementation of seasonal erosion control, completion and stabilization of construction and reconstruction of roads, landings, skid trails and watercourse crossings. In the North Coast, over 90% of average annual precipitation falls between October 15th and May 1st.

In order to minimize the impacts of conducting timber operations during wet weather, the Order applies the following seasonal restrictions:

- Road construction or reconstruction may not take place between September 15th and May 1st except in response to failure of a road segment or watercourse crossing that resulting in ongoing or imminent sediment discharge;
- No timber operations between October 15th and May 1st.

In addition, the following FPR restrictions on conducting timber operations during saturated soil conditions[4] apply:

914.7– "Tractor yarding or the use of tractors for constructing logging roads, landings, watercourse crossings, layouts, firebreaks or other tractor roads shall be done only during dry, rainless periods and shall not be conducted on saturated soil conditions that may produce significant sediment discharge."

915.1 – "Heavy equipment shall not be used for site preparation under saturated soil conditions that may produce significant sediment discharge; or when it cannot operate under its own power due to wet conditions."

923.4 – "Logging roads or landings shall not be constructed or reconstructed under saturated soil conditions that may produce significant sediment discharge, except that construction may occur on isolated wet spots arising from localized ground water such as springs, provided measures are taken to prevent significant sediment discharge."

Temporary Harvesting Prohibitions
Regional Water Board staff evaluated the relative risk of sediment production and discharge in each subwatershed in the UER based on probabilistic landslide hazard, bedrock geology, and observed sediment production from 2000-2011. This evaluation was used to establish a ranking of relative risk to water quality of low, moderate, or high for each subwatershed. Similarly, section 5.4 of the ROWD identifies five subwatersheds predominantly underlain by the Hookton Formation, a geologically young sandstone/siltstone bedrock unit that is highly vulnerable to surface erosion and mass wasting. These areas closely correlate with the Regional Water Board's assessment, and include: Clapp, Tom, and Railroad Gulches, McCloud Creek, and the Lower South Fork Elk River. Sediment production from these subwatersheds, which are also located directly above and adjacent to the impacted reach of the South Fork Elk River, is among the highest observed throughout the

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[4] **Saturated Soil Conditions** means that soil and/or surface material pore spaces are filled with water to such an extent that runoff is likely to occur. Indicators of saturated soil conditions may include, but are not limited to: (1) areas of ponded water, (2) pumping of fines from the soil or road surfacing material during timber operations, (3) loss of bearing strength resulting in the deflection of soil or road surfaces under a load, such as the creation of wheel ruts, (4) spinning or churning of wheels or tracks that produces a wet slurry, or (5) inadequate traction without blading wet soil or surfacing materials (FPR section 895.1).

UER. The five subwatersheds identified above are therefore appropriately considered as high water quality risk for the purposes of the Order. The Orders establishes a temporary prohibition on timber harvest activities in high risk subwatersheds. By refining water quality risk at a subwatershed scale, HRC can still engage in timber operations while refraining from activities in the most sensitive subwatersheds to allow active measures to be taken to improve downstream beneficial uses.

Inventory and Treatment of Controllable Sediment Discharge Sources
Timber harvesting and associated road construction and use have historically left disturbed areas throughout the landscape that have the potential to discharge sediment over extended periods of time. These legacy sites may include failing or failed watercourse crossings, road failures, road surfaces, landslides, unstable watercourse banks, soil stockpiles, skid trails, landings, exposed harvest units, or any other site discharging or threatening to discharge waste or earthen materials (referred to as controllable sediment discharge sites [CSDS]).

The identification, evaluation, and treatment of CSDS are important components of a strategy to prevent or minimize ongoing sediment discharge. The Order supersedes two existing CAOs No. R1-2004-0028 and R1-2006-0055 that required inventory, prioritization and treatment of CSDS related to roads, off-road sites, and landslides throughout HRC's ownership in the UER watershed. The majority of road related sites have been treated as of the end of 2015. Treatment of all road related sites is scheduled to be completed by the end of 2017. As a result of the CAOs, over 12,300 acres has been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trail, were identified. As a result, over 12,300 acres have been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trails, were identified. As of 2014, corrective action had been implemented at approximately half of these sites. HRC will continue to treat these sites annually according to the prioritization described in the master treatment schedule, as well as concurrently with timber operations for those sites located in the vicinity of THPs.

New active or potential sediment sources are also identified through implementation of an Annual Road Inspection Program (ARIP). This program requires that all accessible roads be inspected for maintenance needs at least once annually. CSDSs identified by ARIP, storm-triggered inspections, and active THP inspections are typically scheduled and treated within one year of discovery during the drier months of the year (May – November) and will be included in annual reports pursuant to the monitoring and reporting requirements of the Order. HRC maintains an inventory to track these new CSDS when identified and subsequently treated. Additional non-scheduled routine minor maintenance (i.e. shaping of road surface, cleaning of inboard ditches and culvert inlets, maintenance of energy dissipation/downspouts, and roadside brush maintenance) also occur as needed in response to road inspection results and management directive.

CSDSs not previously identified are also addressed by preparation and submittal of Erosion Control Plans (ECPs) for individual THPs. ECPs must include an inventory of

CSDS within the logging area of all THPs submitted by HRC. The inventory must include a description of each CSDS and corrective actions that can reasonably be expected to control sediment discharge from each site. Corrective action for each site must be implemented during the life of the THP. In addition, HRC must conduct three annual inspections of the THP project area including appurtenant roads and harvest units where timber operations are or have been active.

In-Stream Sediment Sources and Restoration

The sediment source analysis estimates that in-channel sources such as low order channel incision, bank erosion, and streamside landslides represent approximately 74% of the potential sediment load from the UER. In-channel sources such as these can be difficult to treat due to limited access and the potential for corrective action to result in short-term increased sediment discharge with no guarantee of long term improvements. The Order requires that HRC conduct a feasibility study to evaluate potential methods to control in-channel sources or trap or meter sediment in the UER before it can be transported to the impacted reach.

If the feasibility study identifies potential methods that may be effective in reducing in-channel sources, such methods should be tested through design and implementation of small scale pilot projects. If the pilot projects demonstrate the success of methods to reduce transport of sediment from tributaries in the UER to the impacted reach, HRC is to develop a plan to implement these methods on a wider scale throughout the UER. If the feasibility study concludes that no, or limited, effective methods for control of in-channel sources in the UER, resources that would have been used for that work should be committed to projects to improve beneficial use impairment in the impacted reach.

In-stream restoration and enhancement work consisting primarily of loading the stream with large wood placement to provide increased aquatic habitat complexity including pool development, sediment sorting, shelter and refuge has been implemented in the upper watershed since the 1990s. In addition to on-property conservation restoration and enhancement activities, HRC is also partnering with the Regional Water Board, other agencies, and NGOs to address chronic downstream health and safety concerns relative to water quality and domestic water supply, and winter storm flooding, including both financial and in-kind contributions to both the Elk River Recovery Assessment and Stewardship Projects.

HRC may conduct various types of restoration projects intended to improve fish habitat and control sediment delivery from in-stream and near-stream resources. Restoration activities covered under the Order would take place within the smaller, tributary watersheds to the South Fork and North Fork of Elk River, and would include projects such as:

- Large wood augmentation for the purposes of improving fish habitat and sediment routing. Methods could include falling riparian zone trees or placement of logs and stumps using heavy equipment;
- Streambank stabilization using large wood, excavation, planting, rip-rap, or other methods;

- Removal or reconstruction of watercourse crossings and near stream road segments;
- Construction of in-stream or off-channel sediment detention basins; and
- Excavation of in-stream sediment deposits.

Large wood performs important functions in stream channels: sorting sediment, scouring pools, and providing cover for fish. Individual pieces of large wood are episodically transported downstream during high, turbulent flow conditions, becoming temporarily lodged at new locations in the channel until they eventually decay or exit the watershed.
Large pieces of wood can catch other pieces, creating a log jam. As large wood moves through a stream, it changes flow dynamics, which can allow for both scouring and storage of sediment stored in the channel and on banks, resulting in pool and riffle formation, as well as improved salmonid habitat conditions.

Streambank stabilization is intended to remediate existing and prevent further in-channel failures adjacent to watercourses within the UER. Stabilization would be achieved using large wood, excavation, planting, rip-rap, or other methods. Removal or reconstruction of watercourse crossings will be done prevent and minimize erosion and hydrologic connectivity and road sediment delivery.

Removal or reconstruction of watercourse crossings and near stream road segments will reduce the hydrologic connectivity of the road system to the UER, reducing the amount of sediment that can potentially be delivered to the system and re-establishing more natural hillslope and instream hydrology.

Construction of in-stream or off-stream sediment detention basin will allow for attenuation of peak flows and sediment routing from the water column for later removal. Excavation of in-stream deposits would be done in order to prevent further downstream transport and eventual deposition of sediment within the nuisance reach.

REMEDIATION AND RESTORATION IMPACTS
This document addresses impacts from remediation and restoration described in the Order for treatment and control of CSDS and instream sediment control and restoration, including pilot projects for the instream feasibility study and HRCs voluntary restoration activities. As described above, the Order requires treatment of CSDS to reduce potential existing sediment inputs to the Elk River. By definition CSDSs have the potential to discharge sediment to waters of the state. The goal of treatment is to prevent the sediment from being mobilized and transported to waters. Implementation of corrective action on a CSDS often entails excavation of near-stream areas as well as channels and banks, installation of new drainage structures, disturbance of soil and loss of vegetation in riparian areas. These activities have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is in improve long-term site stability and decrease sediment discharge. Therefore, the result is going to be long term environmental benefit. In addition,

short term impacts can be minimized by implementation of appropriate management practices as described in the section below.

In addition, other restoration activities have the potential to result in impacts to the already-impaired UER, including:

- Increased erosion and short-term sediment discharges, short-term increases in turbidity and total suspended solids levels during construction and following construction;
- The introduction of hazardous materials (e.g. oil, grease, gasoline, hydraulic fluids and solvents) to the UER from construction staging locations;
- Re-routing of in-stream flows that could result in accelerated bank and channel erosion;
- Loss of riparian area function due to channel rocking or other stabilization activities;
- Increases in water temperature due to loss of riparian trees from felling; oil, fuel, and other fluids from heavy equipment being discharged to waters of the state;
- Siltation of spawning and rearing habitat for anadromous fishes;
- Mortality of fishes due to direct injury during in-channel construction activities;
- Permanent and temporary loss of shaded riverine aquatic habitat due to removal of established riparian vegetation along the banks of the UER;
- Temporary loss of fish passage during in-stream project work; and
- Increased aggradation, frequency, and magnitude of flooding in the nuisance reach due to upstream sediment mobilization and subsequent deposition.

Some restoration projects that involve construction and other work in waters of the United States (that are not included under timber activities) may require a federal permit pursuant to section 404 of the Clean Water Act or other federal law. Section 401 of the Clean Water Act requires each applicant for a federal license or permits to provide water quality certification from the state in which the activity will occur. All water quality requirements are contained in the main body of the WDR and most remediation and restoration activities are expected to be included as part of HRC's timber management activities. Nevertheless, in the event that the Army Corps of Engineers requires a Clean Water Act section 404 permit for a given restoration project in the UER, the Order contains a general water quality certification for coverage that may be requested by submitting a Notice of Intent (NOI) to the Regional Water Board.

While short term impacts may result from implementation of restoration projects, the desired outcome of this work is in improve long-term stability, decrease sediment discharge, improve streams capacity to meter or route sediment, and improve habitat for anadromous salmonids. Therefore, the result is going to be long term environmental benefit. In addition, short term impacts can be minimized by implementation of appropriate management practices as described below.

HRC's approach for conducting restoration includes utilizing the methods, techniques, and BMPs contained in the *California Department of Fish and Game Habitat Restoration Manual*, the *Handbook for Forest, Ranch & Rural Roads*, and the

Natural Resources Conservation Service Stream Restoration Design: National Engineering Handbook. In addition to these publications, HRC's MATO with CDFW (updated and revised in 2014) contains conditions and requirements for restoration activities. Attachment A of this Initial Study provides a comprehensive list of conditions enforceable under the MATO that are designed to prevent or minimize impacts with construction, reconstruction, or restoration work in stream, and near-stream zones.

Past restoration activities undertaken by HRC have demonstrated that proper implementation of the requirements, conditions, best management practices, and on-the-ground prescriptions contained in these documents can mitigate impacts from the listed restoration activities to less than significant. Where applicable, in-stream work, including placement of wood for enhancement of fish habitat or sediment storage, armoring of banks using unanchored wood structures, excavation of channels and stream banks to stabilize, trap, or remove excess sediment, shall be done in accordance with techniques in the California Salmonid Stream Habitat Restoration Manual (Habitat Restoration Manual). The placement and construction of such in-stream structures shall be planned and conducted to persist when subjected to large flood events.

Attachment A of this initial study include a list of Best management practices (BMPs) designed to prevent or minimize impacts, particularly sediment discharge and increased suspended sediment, associated with stream restoration and remediation. The Order requires HRC to utilize and implement Standard BMPs for Restoration Projects contained in Attachment A when implementing remediation and restoration activities, which include but are not limited:

- Temporal Limitations on restoration activities, which include seasonal, restrictions as well as restrictions based on
- Limitation on Earthmoving and construction Equipment to minimize soil and compaction;
- Erosion Control Requirements to stabilize areas disturbed during restoration work;
- Guidelines for minimizing impacts from channel excavation and stream bank stabilization;
- Limitations on work in streams and Wet Areas;
- Guidelines for temporary stream diversion and dewatering in flowing streams;
- Protection of Sensitive Species.

HRC has indicated a willingness and commitment to participation in watershed stewardship process to address beneficial use impairments in the impacted reach. In addition, the Order provides for limited timber harvesting in high risk watersheds based on a project proposal that when implemented must make a meaningful contribution to correcting beneficial use impairment in the impacted reach. Project proposals may include:

- Flood flow routing improvement (e.g. replace earthen approaches on bridge with culverts, riparian plantation thinning);
- Sediment storage reduction (e.g. slowing, trapping, removing) accumulated sediment in or delivering to the impacted reach;
- Water supply reliability (implement alternative supplies); and
- Infrastructure enhancement (E.g. roads, bridges, septics, raise houses).

These types of large restoration projects are beyond the scope of this CEQA analysis. Programmatic CEQA documentation has been previously developed and adopted by the Regional Water Board in its supplemental environmental documentation (SED) supporting the Temperature Policy and Policy in Support of Restoration. (Cal. Code Regs., tit. 14, § 15251, subd. (g); Cal. Code Regs., tit. 23, § 3782.) The SED analyzed and addressed potential impacts and mitigation measures of a full range of potential restoration projects that could be implemented. The SED includes a programmatic statement of overriding considerations if the State or Regional Water Board finds that a project's potentially significant, unavoidable environmental impacts could be acceptable in light of the benefits of attainment and protection of beneficial uses. Decision-makers will have the benefit of project-level review of any large-scale restoration projects.

INITIAL STUDY/ENVIRONMENTAL CHECKLIST

CEQA requires a Lead Agency to prepare an Initial Study to determine whether a project may have a significant effect on the environment (Cal. Code Regs., tit. 14, §15063(a)). A "significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance (Cal. Code Regs., tit. 14, §15382). If the Initial Study does not show that there is substantial evidence, in light of the whole record before the agency, that a project may have a significant effect on the environment, a Negative Declaration may be prepared. If the Initial Study identifies potentially significant effects, but identifies revisions or conditions to mitigate the effects to a point where clearly no significant effects would occur, a Mitigated Negative Declaration may be prepared (Cal. Code Regs., tit. 14, §15070).

Proposed requirements to be established in the Order would regulate timber harvesting and related management activities to protect, maintain, and restore water quality to meet Basin Plan objectives, avoid violations of prohibitions, abate or diminish nuisance conditions, and implement TMDL load allocations. The proposed Order is intended to provide additional water quality protection to timber and land management activities that are also subject to rules and restrictions of the California Forest Practice Rules and HRC's Habitat Conservation Plan. The proposed Order relies, in part, on existing prescriptive standards imposed by the FPRs and imposed through the CAL FIRE approved timber harvest plan review process. Conditions added to a THP during the approval process that are intended to protect water quality, such as riparian and hillslope protection and prevention of controllable sediment discharge from roads, are included in the Order and would become enforceable requirements.

For the purposes of this Initial Study, the Regional Water Board has evaluated the potential impacts of all land management activities, which includes timber harvesting (falling and yarding, log hauling), road construction, reconstruction, and maintenance), location of and use of skid trails and landings, and watercourse crossings, site preparation, and restoration activities.

Some of the requirements of the Order are intended to either mitigate or evaluate existing watershed impacts and have no potential for impacts. An example is the requirement that HRC maintain a landslide inventory, which consists of data gathering and interpretation for the purposes of understanding landslide distribution and evaluating and improving management practices. This is an activity that combines field investigation as well as remote sensing (review of aerial photograph) that has no reasonably foreseeable potential for causing significant adverse impacts.

The Order would not limit or change the land owner's responsibility to comply with existing requirements, authorities, or responsibilities imposed by other agencies. Where applicable, these requirements and authorities of other agencies are described in the following checklist.

For each CEQA factor, the Regional Water Board evaluated potential environmental effects from the Order. The following checklist describes the specific and general requirements included in the Order and mitigation measures to reduce potential impacts to less than significant levels.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors marked below would be potentially affected by this project, as indicated by the checklist on the following pages.

☒ Aesthetics	☐ Agriculture and Forestry	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Geology/Soils
☒ Greenhouse Gas Emissions	☒ Hazards and Hazardous Materials	☒ Hydrology/Water Quality
☐ Land Use/Planning	☐ Mineral Resources	☐ Noise
☐ Population/Housing	☐ Public Services	☒ Recreation
☒ Transportation/Traffic	☐ Utilities/Service Systems	☐ Mandatory Findings of Significance

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial study:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date

EVALUATION OF ENVIRONMENTAL IMPACTS

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from § XVII, "Earlier Analyses," may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. (Cal. Code Regs., tit. 14, §15063(c)(3)(D)). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
I. AESTHETICS -- Would the project**:**				
a) Have a substantial adverse effect on a scenic vista?			X	
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?			X	
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?				X

a-c) The majority of the land covered in the Order has been and will be managed consistent with the timberland management of the surrounding lands, which are primarily zoned for timber production. While individual THPs or portions thereof will be in view of communities adjacent to or within view of the THP, aesthetics will be consistent with ongoing timberland management in this area.

Many travelers are interested in this industry and land management as evidenced by attendance at the logging museum and mill tours at Scotia, and the exhibits at the Humboldt Redwoods State Park Visitors Center in Weott. It is part of many travelers' expectations to see areas of on-going timber management, saw mills, log trucks and lumber trucks in northern California, just as they expect to see orchards and row crops from Interstate-5, fishing boats and freighters in our harbors, residences in suburban areas, or office buildings and industrial parks in urban areas. The juxtaposition of the preserved redwood groves within the Headwaters Forest Reserve and these timber production zones is striking and interesting and exemplifies competing land and resource uses. The fact that the view of the portions of the landscape planned for timber production changes more over time is not found to be a significant adverse effect.

Forests are not static; a harvested area will not remain open ground over time. Trees that have been retained, especially redwoods, will expand their crowns to utilize the available sunlight. Redwood stumps will sprout and these sprouts generally grow rapidly. Planted conifers will grow in the open areas. Open areas will quickly regain a forested appearance.

The majority of HRC's land will be harvested using uneven aged management; the canopies of harvest areas would be largely retained, and views of bare or exposed ground would be screened by the canopy. Areas that were previously clearcut will regrow and subsequent areas harvested under the current management practices will much more closely resemble an intact forest. The appropriate finding is **less than significant impact**.

d) The proposed project would not create a new source of substantial light or glare, which would adversely affect day or nighttime views; therefore, the appropriate finding is **no impact.**

II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

a-c) HRC lands in the UER are not Prime Farmland, Unique Farmland, or Farmland of Statewide Importance or otherwise zoned for agricultural use. The proposed project would not involve converting or re-zoning agricultural land to non-agricultural use. There will be no change to agricultural resources in the project area over existing conditions due to timber harvesting activities covered under the Order; therefore, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?			X	
c) Result in a cumulatively considerable net increase of any			X	

criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?				
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Create objectionable odors affecting a substantial number of people?			X	

a-e) HRC's management activities covered by the Order include road work and heavy equipment use, which could generate dust, particulate matter, emissions from slash burning, and exhaust as part of logging equipment and vehicle use to transport logs, equipment, and workers to job sites, or conducting restoration activities, which could temporarily impact ambient air quality and possibly create objectionable odors.

Increases in road use, road construction, slash burning, logging equipment and vehicle use are not anticipated under the Order. A slight increase in vehicle emissions from Water Board and third-party inspections at various sites in the region could occur. Based on the temporary and geographically dispersed nature of emissions, it is reasonable to conclude that ambient air quality standards would not be violated nor would such emissions interfere with the attainment of ambient standards.

Because potential impacts to air quality are short-term and the Order requires compliance with all local, state, and federal regulations, including the federal Clean Air Act and applicable state air quality standards, activities covered by the Order are not expected to have a significant impact on air quality, and therefore, the appropriate finding is **less than significant impact.**

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
IV. BIOLOGICAL RESOURCES – Would the project:				
a) Have a substantial adverse effect, either directly or through habitat		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?				
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service?		X		
c) Have a substantial adverse effect on federally protected wetlands as defined by § 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		X		
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		X		
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X

a-c) The goal of the Order is to establish requirements for HRC to conduct timber harvest and related activities in compliance with applicable water quality standards and regulations. Therefore, requirements of the Order are designed to mitigate impacts to the habitat of riparian and aquatic species. These include protection and restoration of the beneficial uses of water, including those that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered. Adverse impacts to such habitat could potentially result from activities covered by the Order either directly from disruption of stream banks, channel, or riparian zone or indirectly from sediment discharges from up-stream or hillslope disturbances. The Order includes a wide range of specific requirements designed to prevent or minimize either direct or indirect adverse impacts to in-stream and riparian habitat. The primary mitigation strategy for avoidance of direct impacts to aquatic and riparian habitat is through RMZ prescriptions and limits on canopy removal as described in section H of this initial study.

The Order relies in part on implementation of the HCP and MATO for water quality improvements. These were prepared and approved by federal and state fish and wildlife agency specifically for the purpose of species protection. Further, CDFW is one of the agencies that participate in individual THP review process to add site-specific mitigation measures as appropriate.

While the Order is not explicitly designed to mitigate potential impacts to terrestrial species, approval of the Order and implementation of covered activities will not significantly alter conditions currently existing in the Project area.

The potential impacts to biological resources from the proposed Project are inferred from existing available habitat and expected post-harvest habitat included within each individual project (THP). Habitat is a reasonable surrogate for projecting the future existence of wildlife and plant species. The impacts to individual species that are anticipated to result from timber harvesting operations are described in each timber harvest plan and address Biological Resources in the following manner:

Birds
Maintenance of diverse forest stand conditions is necessary to provide habitat for the varied species of birds present within the Project area. Following completion of each management activities covered by the Order, significant retention of habitat types that are essential to bird species sensitive to logging-induced habitat changes will be maintained. Essential elements of habitat such as snags, green replacement trees and suitable nesting structures are being retained throughout the logging area and will continue to be retained during future projects as required by the HCP and the FPRs. Forest openings and young forest will continue to offer important habitat to many neotropical migrant birds. In addition, these early-seral areas foster abundant prey species populations—such as wood rats—for raptors.

Because of the gradual average stand age that will be maintained within the Project area throughout the life of the project due to HRC's unevenaged silviculture practices and requirements under their HCP, no significant adverse individual or cumulative effects to bird species are anticipated.

Mammals
Maintenance of a variety of seral stages is necessary to provide habitat for the various mammal species that may occur within the area. A significant retention of habitat type acres that are essential to mammal species will be maintained and disclosed for the project area following permitted management activity. Essential terrestrial habitat attributes such as snags, green replacement trees, and down woody debris for denning sites are being retained throughout the Project area, and will continue to be retained during future projects as required by the HCP and FPRs. Because of the significant amount of mid- to late-seral habitat that will be maintained within the area throughout the life of the project due to the landowner's sustainable silviculture practices and requirements under the landowner's HCP, no significant adverse individual or cumulative effects to mammal species are anticipated.

Rare and Uncommon Plants
The maintenance of diverse forest stand conditions on the landscape over time—especially of individual stages that are regionally restricted—is an essential element to the long-term protection of rare and uncommon flora. The numbers and distribution of rare plants in the redwood region are generally dependent on the diversity of soil types, microclimates, and land use.

Section 6.12 of HRC's HCP, Conservation Plan for Sensitive Plants, specifies measures necessary to avoid significant impacts to plants. These measures include surveys for sensitive plants or potential habitat conducted by a qualified botanist Any rare or endangered plants found during any botanical surveys that are required during harvesting. Listed plan species must be flagged or delineated from herbicide usage through an avoidance strategy wherein those populations will likewise be avoided inside the same flagged or delineated areas. In addition, Technical Rule Addendum #2 from FPR section 912.9 (Cumulative Impacts Assessment Checklist) requires an evaluation of any known rare, threatened, or endangered species or sensitive species that may be directly or indirectly affected by project activities. Because of the patchy distribution of rare and uncommon flora, and the relative lack of occurrence information in the redwood region, occurrence of many rare plants can only be ascertained through careful field surveys. Much of HRC's management activities covered under the Order are subject to site-specific botanical surveys designed to locate rare and uncommon flora. All feasible protection measures developed by a qualified botanist are implemented where necessary to avoid adverse impact.

Because a variety of seral stages are being maintained over time, and botanical surveys are conducted for each THPs and sensitive plants and potential habitat for sensitive plants are protected, no significant adverse individual or cumulative effects to plant species are anticipated.

Amphibians & Reptiles
Because the sensitive amphibian and reptile species have life-history traits that require cool and clean water, avoiding direct impact to Class I and II RMZs is the primary method of protection for amphibian and reptile species. Due to the uneven aged silviculture methods used by HRC, a variety of age classes and tree species will be retained within the project area following harvesting, and will continue to be retained. Maintenance of a variety of forest stand conditions is important because of the various life-history requirements of some amphibians and reptiles. Because significant acreage in streamside areas will be avoided by HRCs harvesting, no significant adverse individual or cumulative effects to amphibians or reptiles are anticipated.

Fish
Elk River, a major tributary to Humboldt Bay, provides important freshwater habitat for anadromous salmonids and steelhead. The watershed is home to five fish species listed under the Endangered Species Act (CDFW 2014). Salmonids are identified in North Coast watersheds as the most sensitive of the native cold-water aquatic organisms. They require clear, cold, well-oxygenated water; unimpaired migratory access to spawning grounds; clean, un-embedded gravels for spawning; and food, pools, and places to hide from predators for juvenile rearing.

Current habitat conditions throughout much of Elk River are substantially degraded by fine sediment. Stream substrate is very fine, potential spawning gravels are significantly embedded, pool depths and stream channel depths have been decreased by sediment filling (thus reducing salmonid ability to rear, avoid predators, and migrate during low-flow periods), and high suspended sediment concentrations and durations affect feeding and rearing behavior. However, there are still remaining reaches providing habitat and salmonid redd surveys conducted by HRC have shown steady increases since 2006.

The purpose of the Order is to ensure HRC's timber harvest and related activities are conducted in a manner that protects and restores beneficial uses of water in Elk River, including those associated with habitat for anadromous salmonids. Requirements of the Order that will likely result in decreased sediment production and ultimately in improved salmonid habitat include:

- Harvest limits, including Silviculture and rates, designed to minimize increases in peak flow and sediment production;
- Temporary prohibition on harvesting in subwatersheds with high risk of sediment production;
- Enhanced riparian zone buffers, including no harvesting adjacent to Class I and II watercourses, equipment exclusion zones, and tree retention standards;
- Measures to control sediment discharge from roads;
- Measures to control sediment discharge from off-road sites;
- Landslide prevention measures;
- Feasibility study for control of in-stream sediment sources.

As discussed in the section H, *Remediation and Restoration impacts*, implementation of corrective action on a CSDS and restoration projects often entail excavation of near-stream areas as well as channels and banks, installation of new drainage structures, disturbance of soil and loss of vegetation in riparian areas. These activities have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is to improve long-term site stability and decrease sediment discharge. Therefore, the result is long term environmental benefits. In addition, short term impacts can be minimized by implementation of appropriate management practices as summarized in section H and described fully in Attachment A. The Order requires HRC to utilize and implement the mitigations for construction impacts associated with remediation and restoration work contained in Attachment A.

Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and

animal communities living in the soil and on its surface (Cowardin, December 1979).
For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

HRC's timber operation in the Elk River must be conducted in compliance with their HCP, California Forest Practice Rules, and their CDFW MATO. All of these include provisions for avoidance and protection of wetland areas.

The HCP includes the following definition of those areas that may meet the definition of, or may contain, wetlands.

Channel migration zone (CMZ)—The boundary generally corresponds to the modern floodplain, but may also include river terraces that are subject to significant bank erosion. The area adjacent to watercourses constructed by the river in the present climate and inundated during periods of high flow. The floodplain is delineated by either the flood-prone area (twice bankfull depth) or the 100-year floodplain, whichever is greater.

Class I Waters—Fish are always or seasonally present onsite. Class I waters include habitat to sustain fish migration, spawning, and rearing. They also include domestic water supplies, such as springs, onsite or within 100 feet downstream from the project operations area.

Class II Waters—Non-fish bearing waters. Aquatic habitat is present for non-fish aquatic species, including in watercourses, streams, seeps, springs, lakes, ponds, and wetlands.

The HCP establishes riparian management zones for the above defined areas, which include no harvesting of tree and equipment exclusion, except for roads and permitted equipment crossings.

HRC forestry staff has received wetland and watercourse identification training. These trainings are internal but include guidance documents and presentations from CDFW, USFWS, NOAA, and CalFire During development of THPs, identification of watercourses and wetlands is conducted by forestry staff . Features are mapped and stored in a GIS database. Protection measures are applied based on watershed prescriptions and included in the permit for the proposed activity such as a THP or watercourse crossing. Generally, forestry staff locates the feature and if necessary wildlife, hydrology, fisheries, or botany staff provide input on the type and extent of the feature and any beneficial uses to native plants and animals that may be present. In questionable or marginal wet areas HRC botany staff trained in Army Corps of Engineers (ACOE) wetland determination/delineation establishes plots within the feature to provide guidance on classification and potential protections. While ACOE does not take jurisdiction over these features the technical documentation serves to reinforce classification of the site. All areas regarded as wetlands by ACOE definitions are afforded Class II protection measures during permitted projects. Wet areas that do not meet ACOE standards may still be considered for protection if aquatic habitat or a predominance of wetland vegetation is present. ACOE determinations follow guidance provided in *US Army Corps of Engineers (ACOE). 1987. Corps of Engineers Wetland Delineation Manual. Wetlands Research Program Technical Report Y-87-1* and *US Army Corps of Engineers (ACOE). Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region. Revised. 4-9-2007*.

Because the nature of permitted activities do not entail development or other permanent alteration of the landscape, no permanent impacts to wetlands are likely to occur as a result of activities covered under the Order, with the following exception. Newly constructed road crossings on watercourses frequently are constructed as culverted crossing structures. These structures entail placing fill material in a stream channel to as the base of a road prism.

The project will not have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status in local or regional plans, policies, or regulations, or by the CDFW, NMFS, or USFW. Such an impact will not occur because project activities are designed to protect and restore stream habitat, to provide a long-term benefit to both anadromous salmonids and other fish and wildlife. As a result, mitigation measures will ensure that any potentially significant impacts are avoided or mitigated to below a level of significance. Therefore, the appropriate finding is **less than significant with mitigation incorporation**.

d) Habitat for anadromous salmonids is impaired due to excess sediment. Spawning gravels have been covered by fine sediment, pools which provide cover have been filled, and increased turbidity due to elevated suspended sediment impairs their ability to feed. All of these factors inhibit the ability of anadromous salmonids to utilize Elk River for spawning, rearing, and migration. The purpose of the project, in conjunction with other aspects of the Regional Water Board's efforts related to the Elk River TMDL, is to reduce sediment and improve habitat for anadromous salmonids. Restoration efforts conducted pursuant to the Order have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is to improve long-term site stability and decrease sediment discharge. Therefore, the result is long term environmental benefits. In addition, short term impacts can be minimized by implementation of appropriate management practices as summarized in section H and described fully in Attachment A. The Order requires HRC to utilize and implement the mitigations for construction impacts associated with remediation and restoration work contained in Attachment A. The project will not substantially interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Therefore, the appropriate finding is **less than significant with mitigation incorporation**.

e) The Order does not preclude HRC from the need to comply with applicable local, state or federal laws and regulations. However, HRC lands are not within the jurisdiction of local policies and ordinances, therefore, the Order does not conflict with local regulation protecting biological resources, such as a tree preservation policy or ordinance. Therefore, the appropriate finding is **no impact.**

f) HRC's timberlands in the UER are covered by a State and federally approved habitat conservation plan and their management activities conducted as part of this Project will be conducted pursuant to the requirements of the HCP. Therefore, the appropriate finding is **no impact**.

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
V. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in '15064.5?			X	
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to '15064.5?			X	
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			X	
d) Disturb any human remains, including those interred outside of formal cemeteries?			X	

a-d) Cultural resources are non-renewable resources. The most significant direct adverse effects to cultural resources are expected to potentially result from logging, road construction and borrow pit extraction, or excavation conducted as part of a restoration ptoject. FPR section 929 provides directions to foresters preparing THPs to ensure that the significant archaeological and historical sites within the site survey area are adequately identified and protected. Development of THPs require that a professional archaeologist or a person with archaeological training conduct a field survey for archaeological and historical sites within the proposed plan area and a confidential archaeological addendum (CAA) is required by and enforced by CAL FIRE pursuant to the THP approval process. The CAA is designed to ensure that the significant archaeological and historical sites within the THP are adequately identified and protected.

However, restoration work may at times be conducted outside of areas covered under THPs. By definition, such projects will be conducted in areas that have been disturbed by past management activities. Therefore, it is unlikely that restoration activities would cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to section 15064.5, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains, including those interred outside of formal cemeteries. This includes "tribal cultural resources as defined in Public Resources Code section 21074." Most of the work is anticipated to occur in areas already disrupted and the likelihood of encountering historical archaeological and paleontological resources is low. In the event that restoration occurs in previously undisturbed areas, the project must include a cultural resources investigation and paleontological survey prior to any substantial disturbance as detailed in Attachment A.

The cultural resources investigation will include, at a minimum, a records search for previously identified cultural resources and previously conducted cultural resources investigations of the project parcel and vicinity. This record search should include, at a minimum, contacting the appropriate information center of the California Historical Resources Information System. In coordination with the information center or a qualified archaeologist, a determination regarding whether previously identified cultural resources will be affected by the proposed activity must be made and if previously conducted investigations were performed. The purpose of this investigation would be to identify resources before they are affected and avoid the impact.

In the event that the ground disturbances uncover previously undiscovered or documented resources, California law protects Native American burials, skeletal remains, and associated grave goods regardless of the antiquity and provides for the sensitive treatment and disposition of those remains (Health & Safety Code, section 7050.5; Public Resource Code, section 5097.9 et seq). Thus, the potential to cause a substantial adverse change in the significance of a historical resource or archaeological resource and the potential to disturb any human remains, including those interred outside of formal cemeteries is less than significant with mitigation incorporated.

Cultural sites that would potentially be impacted will be identified and protected as required by State regulations, prior to the initiation of timber operations. Therefore, any impacts to the cultural resources of the project area will be **less than significant**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?			X	
b) Result in substantial soil erosion or the loss of topsoil?		X		
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X

a)

i-iii) Elk River is located in a seismically active area with the potential for strong ground motion associated with movement on several nearby faults, including the San Andreas, the Cascadia subduction zone, and other active faults. The trace of the Freshwater Fault, a Quaternary active faults, crosses the northeastern portion of the watershed trending northwest-southeast.

While any personnel and structures in the region are exposed to ground shaking from these faults, HRCs management activities conducted under the Order will not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, or seismic-related ground failure, including liquefaction. Because the project does not involve these factors, the appropriate finding is **no impact**.

iv) The UER watershed is located in a tectonically active region and is underlain by the geologically recent and erodible Hookton Formation and Wildcat Group rocks, and sheared Yager terrane and Central Belt Franciscan rocks. Due to the weak underlying bedrock, relatively rapid rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout much of the UER are naturally vulnerable to landsliding.

Natural rates of landslides vary based on the occurrence of landscape disturbance such as large storms, fires, earthquakes, or other infrequent natural events. Timber harvesting and associated ground disturbance can result in increased rates of shallow landslides on vulnerable slopes due to decreases in root strength, increased soil moisture, altered hillslope hydrologic processes, and over-steepened or over-loading of slopes by cut and fill road construction.

HRC's approach for evaluating landslide hazards relative to proposed land use activities includes the ERSC WA prescriptions. Requirements to prevent increased landslide rates due to timber harvesting and associated activities are specified in sections I(D) of the Order and described on pages 13 through 15 of the initial study. As part of THP planning a review of pertinent technical data is conducted to denote potential high risk slopes, including landslide inventories, regional geomorphic maps, stereoscopic aerial photographs, and a shallow landslide potential map developed using the SHALSTAB landslide model. The Order requires HRC to implement the following prescriptions as part of its hillslope management mass wasting strategy:

- A hillslope management checklist to identify areas that are particularly vulnerable to mass wasting;
- No harvesting or road construction or reconstruction on Class I inner gorges;
- No harvesting or road construction or reconstruction on the following areas without characterization and development of measures to protect water quality prescribed by a PG;
    - Class II or III inner gorges,
    - Headwall swales,
    - Other areas with very high mass wasting hazard (including slopes greater than 60%, and
    - Earthworks (skid trails, landings, road prisms, or other earthen structures) exhibiting characteristics identified in the hillslope management checklist.

In addition to the hillslope management mass wasting strategy described above, a comprehensive approach to preventing increases in landslide related sediment discharge resulting from timber harvesting and associated activities includes characterization of landslide hazard, designing projects to minimize impacts to slope stability based on site specific hazards, and ongoing monitoring of landslide activity to better understand landslide patterns and modify management practices based on observed activity. The California Geological Survey Note 50 provides guidelines for Engineering Geologic Reports for Timber Harvesting Plans, which must be prepared by California Professional Geologist (PG) who is familiar with watershed characteristics. Section I(D) of the Order establishes requirements for characterization of geologic hazards by a PG during preparation of individual THP and development of site specific mitigations. Characterization of landslide hazard should at a minimum consider the following information:

- Existing hazard maps derived from slope stability models;
- Available maps and reports;
- Aerial photographs;
- Field investigation and mapping; and
- Applicable studies and technical models.

The report must be provided to Regional Water Board staff and other review team agencies during the initial review of each THPs, and must include an evaluation of potential effects on slope stability and surface soil erosion, and landslide related sediment discharge from the proposed management activity, identify problem areas, and describe specific mitigation measures needed to minimize potential effects for identified areas of concern. The mitigations should be based on the potential hazard process (likelihood of landslide initiation or acceleration in sediment mobilization or water flow, and the potential risk to water quality). Where appropriate, mitigations shall include, but are not necessarily limited to the following:

- Limiting canopy removal in areas with elevated landslide hazard;
- Limiting activities upslope of existing landslide and on vulnerable portions of deep seated landslides;
- Avoidance of road or skid trail construction on steep or vulnerable slopes:
- Stabilization of existing landslides where applicable by methods such as planting, manipulating road drainage, buttressing, and other feasible engineering techniques.

The Order establishes enforceable provisions to prevent increases in sediment discharge from landslides associated with HRC's timber harvest activities. The provisions entail an overall strategy that includes HRCs hillslope management mass wasting strategy from the ERSC WA, as well as additional measures deemed necessary by Regional Water Board to prevent management related landsliding. These are summarized below as follows:

- Harvest rates throughout HRC's ownership in the UER that are less than those allowed under the limits set by the landslide reduction model under the current WDRs;
- Use of partial harvesting methods that retain a significant component of post-harvest root strength;
- Temporary prohibition of harvesting in high risk subwatersheds;
- Riparian protection zones, which include no harvesting within 50 feet of Class I watercourses, 30 feet of Class II watercourses, 20 feet of Class III watercourses and significant tree retention up to 300, 200, and 150 feet of Class I, II and III watercourses respectively;
- Review by licensed geologist of all proposed activities, including harvesting and construction or reconstruction of roads and watercourse crossings; and

- Implementation of HRCs ERSC WA hillslope management prescriptions.

All of the mitigation measures described above are intended to prevent or minimize the potential increased management related landslides.

HRC's management activities covered by the Order will not expose people or structures to potential substantial adverse effects involving landslides. Proper implementation of the above conditions will minimize the potential impacts of the Order to expose people or structure to potential adverse effects to **less than significant with mitigation incorporation**.

b-c) Timber harvesting and related management activities have the potential to create large scale ground disturbance. Due to the weak underlying bedrock, relatively rapid rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout much of the UER are naturally vulnerable to erosion as a result of this disturbance. There are limited area along the boundary of HRC's property where potentially unstable slopes could fail, resulting in the potential for displaced material being transported onto adjacent properties. However, that potential impact is significantly minimized by implementation of landslide prevention strategies required by the Order.

HRC predominantly utilizes partial harvesting methods such as uneven-aged single-tree and small group selection, which result in post-harvest conditions that are less susceptible to mass wasting and increased erosional processes as compared to clearcut harvesting by way of retaining a measureable part of the existing vegetation allowing for raindrop interception, evapotranspiration, and tempering of peak flows that would otherwise result from clearcutting or even-aged harvesting prescriptions. One of the primary goals of the Order is to establish requirements for HRC to implement those management practices that prevent or minimize sediment discharges from erosion. These are found in sections I(A) – I(G) of the Order and include the following mitigation measures:

- HRC shall utilize uneven-aged single-tree and small group selection silviculture as defined in California Code of Regulations, tit. 14, section 913.1 within their timberlands in the Elk River watershed. HRC shall not utilize clearcut harvesting. Variable retention may be used in some instances as an alternative silviculture to address certain stand conditions, such as high levels of whitewood or hardwood species, animal damage or general poor form and vigor due to past logging history.
- HRC shall not utilize the group selection harvest method as defined in California Code of Regulations, tit. 14, section 913.2 within areas defined as Riparian Reserves.

- HRC shall not harvest more than 1.5% per year, averaged over five year periods, throughout its total land holdings in the UER watershed. This percentage will be measured in clearcut equivalent acres.[5]
- Harvesting in high risk watersheds is prohibited until such time as impaired beneficial uses in lower Elk River are restored.
- Avoid timber harvesting practices that are likely to trigger new landslides or exacerbate existing landslides, as follows:
    - No harvest within 100 feet of fish bearing streams (Class I) or streams that support aquatic habitat for non-fish species (Class II) and limited harvest on steep streamside slopes up to 300 feet from watercourses,
    - Retention of 150 square feet of basal area per in headwall swales (steep convergent slopes above the headwaters of stream channel)
    - Use of a shallow landslide model (e.g. SHALSTAB) to identify relative landslide hazard and restrict or limit harvesting on high hazard areas,
    - A Professional Geologist must evaluate the potential for sediment discharge from proposed timber harvest and road construction on vulnerable ground,
    - plant conifers to stabilize potentially active landslide deposits,
    - Maintain and update a landslide inventory from field review and periodic new aerial photographs to evaluate the effectiveness of management practices and modify them as appropriate, track landslide related sediment discharge, and identify restoration opportunities.
- Conduct an inventory to identify, prioritize, and treat existing sediment sources from past land use impacts
- Maintain roads to prevent or minimize road related sediment discharge as follows:
    - Contour roads to minimize concentration of surface runoff,
    - Construct watercourse road crossings to minimize potential for watercourse failure or stream diversions,
    - minimize the length of road surface draining directly to watercourses and stabilize the surface of segments;
    - remove potentially unstable fill material to the extent feasible;
    - inspect and maintain roads annually;
    - restrict wet weather road use.
- HRC must prepare erosion control plans to identify and treat existing controllable sediment discharge sources in the vicinity of timber harvesting areas.

HRC's management activities as part of the Project will be located on a geologic units or soils that are unstable, or that could potentially become unstable as a result of the project, and potentially result in on- or off-site

[5] Selection and Group Selection silviculture acres are converted to CCE acres by multiplying them by 0.5.

landslide. However, due to mitigation measures outlined above that combine characterization of landslide hazard, avoidance of the most vulnerable slope classes, and low intensity harvest, the potential for the Project to result in increased soil erosion, loss of topsoil, or landslides is less than significant. There is no reasonably foreseeable potential for the Project to result in lateral spreading, subsidence, liquefaction or collapse. Mitigation measures required under the Order are designed to prevent or minimize erosion, loss of topsoil, and therefore, the appropriate finding is **less than significant with mitigation incorporation.**

d) HRC's activities covered under the Order would not authorize projects such as building construction that are subject to the Uniform Building Code. Because the project does not involve this element, the appropriate finding is **no impact**.

e) HRC's activities covered under the Order would not involve septic tanks or alternative wastewater disposal systems. Because the project does not involve these elements, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
VII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			X	
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?				X

a) Forest activities can result in emissions through harvesting, wildfire, pest mortality and other natural and anthropogenic events. However, forestry is a net sink for carbon, the primary greenhouse gas. Plants absorb CO_2 from the air, and use the carbon as a building block of plant tissue through the process of photosynthesis. An acre of mature redwood can store between 600-700 ton/ac of CO_2, which is the highest of any forest type on Earth. Though redwood forests can store the largest amounts of greenhouse gases (GHGs) per acre of any forest type, the expanse of this forest type is not significant on a global level.

The proposed project will result directly and indirectly in carbon sequestration and CO_2 emissions. Carbon sequestration is achieved through silviculture including planting and active management of forest stands insuring the growing of trees that remove CO_2 from the atmosphere and store carbon in tree fiber. When a tree is harvested, most of the carbon-filled tree fibers become lumber that is sequestered in buildings while non-harvested trees, along with newly planted trees, continue to grow, often at increased growth rates due to the benefit of selective harvesting. To the extent these wood building products replace the demand for new concrete or steel building components; they reduce substantial CO_2 emissions that are associated with the manufacture of cement and steel. Some of the tree fibers such as branches and tops are left in the forest where they are sometimes burned to reduce fire hazard. However, the vast majority of this material is left to decay and will emit CO_2 overtime; but, it also supplements the forest soils and forest duff layer which serves as a substrate for more tree growth. In addition, redwood is a dominant species on HRC's timberlands in the UER and redwood slash decays more slowly than slash from hardwood and whitewood species. Further, when CO_2 is released by decaying slash, it is offset by rapid regeneration of tree stands (including stump sprouts from redwood and some hardwood species) and other vegetation that sequesters carbon. Some of this carbon-filled tree fiber, such as bark, shavings, and chips are used in other engineered building products or as fuel used to generate electricity. When this wood fiber is burned to generate electricity the stored carbon is released into the atmosphere, but it is being done in a controlled setting, while filling society's demand for renewable energy sources. Another factor to consider is that when wood biomass is used to generate electricity it directly reduces the amount of fossil fuels required which are non-renewable energy sources and generate CO_2 in more substantial quantities. Another point worth mentioning is that if this wood fiber were left to decompose naturally its stored carbon emissions would still nonetheless occur.

Forestlands are, in general, a carbon sink where CO_2 is captured and fixed by the process of photosynthesis, which removes carbon from the atmosphere and sequesters carbon in wood fiber. (OFRI 2006, USEPA, 2005). In California, forests in the North Coast, Cascade Northeast, and North Sierra regions were estimated to produce a net benefit of 7.2 million metric tons of CO_2 equivalents removed from the atmosphere each year. (California Energy Commission, 2004). Growing forests sequester and store more carbon over time until growth stagnates as trees reach a mature age. Older trees sequester carbon through new growth at a declining rate, but they remain pools of stored carbon until they decay through decline, death, or consumptive use.

The proposed project is one of numerous past, present, and future timber harvest projects on HRC ownership that combine to produce substantial net carbon sequestration benefits over time. HRC's timberlands are sustainably managed in accordance with the Order, its HCP, the FPRs, and Forest Stewardship Council (FSC) certification protocols which will help ensure sustained yield and strict environmental protection for wildlife and water quality. Timber harvests are scheduled across the ownership in management blocks, where timber stands are entered on intervals of every 20 years. Not all of HRC's timberland is dedicated to intensive forest management. Large areas of the ownership remain un-harvested or lightly harvested to provide various fish, wildlife, and ecosystem benefits. Under HRC's HCP for northern spotted owls and marbled murrelets, large areas of the property remain un-harvested for decades to provide long tern habitat for these and other species that required mid to late succession forest stands. In addition to these areas, the Order requires extensive riparian management zones (RMZ's) which extend like a web across the property. In the UER watershed, these RMZ consist of no or limited harvesting within 300 feet of Class I watercourses, 200 feet of Class II watercourses, and 100 feet of Class III watercourses. There are also numerous geologic features in the UER watershed, which will experience little or no timber harvesting. These wildlife, RMZ and geologic areas will be managed to develop into late succession forest stands, which will provide critical habitat for wildlife, protecting water quality and is a diversification of HRC's portfolio for carbon sequestration.

Following each THP, HRC manages slash to reduce fire risk and enhance forest soils that will host the next rotation of forest growth. Where necessary to facilitate site occupancy of desired tree species, Group-selection, Variable Retention or Rehabilitation areas are replanted and regenerated with healthy seedlings that combine with advanced regeneration and stump sprouts from harvested redwoods that immediately begin to fix carbon through photosynthesis. Because the seedlings require a substantial investment by HRC, there is a strong financial incentive to efficiently and effectively re-establish growing forests and timber production on harvested property. For the same reason, there is a strong incentive to protect growing tree stands from mortality that adds to forest fuels and to aggressively prevent and suppress wildfires before they can become catastrophic. HRC's management strategy as permitted by the Order will have the cumulative benefit of reducing the risk of catastrophic fire and related adverse impacts to GHG and carbon sequestration.

The project will also result in minimal impacts to the carbon stored in the duff layer and the soil. Because the harvesting conducted by HRC minimizes duff and soil disturbance, and HRC does very limited broadcast burning, primarily due to practicing un-evenaged management, the carbon stored in the duff layer is essentially intact following harvesting. HRC also has a policy to retain downed woody material for wildlife benefits, which also helps maintain soil productivity and is potentially a significant sink of carbon. Redwood/Douglas-fir forests that include sprouting species such as redwood and tanoak are likely to have less fluctuation in soil carbon given that the root systems of these species continue to survive following harvest.

HRC's management activities covered under the Order will likely result in sequestration of more greenhouse gas emissions than they will generate, either directly or indirectly, and therefore, the appropriate finding is **less than significant impact**.

b) The California Global Warming Solutions Act of 2006 (AB 32) is California's legislative effort aimed at reducing GHG emissions. Pursuant to AB 32, California Air Resources Board (CARB) must develop an implementation program and adopt control measures to achieve the maximum technologically feasible and cost-effective GHG reductions. AB 32 requires CARB to prepare a Scoping Plan to achieve reductions in GHG emissions in California. On June 26, 2008 CARB staff presented the initial draft of the AB 32 Scoping Plan for Board review. The AB 32 Scoping Plan contains the key strategies California will use to reduce the GHG emissions that are thought to cause climate change. With respect to forestry practice, the Scoping Plan provides:

The 2020 target for California's forest lands is to achieve 5 million metric tons of CO_2 equivalents ($MMTCO_2E$) reduction through sustainable management practices, including reducing the risk of catastrophic wildfire, and the avoidance or mitigation of land-use changes that reduce carbon storage. California's Board of Forestry and Fire Protection has the regulatory authority to implement the Forest Practice Act to provide for sustainable management practices and, at a minimum, to maintain current carbon sequestration levels. The federal government must do the same for lands under its jurisdiction in California. California forests are now a net carbon sink. The 2020 target would provide a mechanism to help ensure that this carbon stock is not diminished over time. The 5 MMTCO2E emission reduction target is set equal to the current estimate of the net emission reduction from California forests. As technical data improve, the target can be recalibrated to reflect new information. The project's forestry activities are consistent with these objectives.

The proposed project will not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases Therefore, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?		X		
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		X		
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
project area?				
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

a-b) HRC forest management activities can involve the transport and use of materials that would qualify as hazardous pursuant to the California Health and Safety Code section 25501(o). These materials include gasoline and diesel to fuel equipment, hydraulic fluid associated with equipment operations and machinery, and herbicides. The presence and use of gasoline, diesel, and hydraulic fluid would be limited to the amounts needed to operate heavy equipment and motorized equipment associated with management activities. The Order requires HRC to comply with all water quality related HCP prescriptions and conditions included in an approved THP and any additional mitigation measures identified and required pursuant to CAL FIRE's CEQA-equivalent process, and within the FPRs. This includes implementing the following prescriptions from the HCP that all company employees and hired contractors must adhere to when using gasoline, diesel, hydraulic fluid and herbicides on HRC property:

- Refueling of equipment and vehicles will be done outside of RMZs and Water crossings. Adding, draining, or depositing lubricants, coolants, or hydraulic fluids will not be done in RMZs and Water crossings and all such fluids shall be properly disposed (HCP 6.3.3.4(5)).
- As outlined in HRC Water Drafting Plan, trucks shall be checked daily for oil and fluid leaks. A catchment pan shall be placed under the truck at any place the truck may potentially leak oil. If a leak is identified and cannot be contained no water drafting may occur.
- HRC also has a Hazardous Material Clean-up Plan, which requires all operators and contractors to be trained in spill clean-up and containment procedures before they can work on HRC property. In addition, it is required for all operators and contractors to have a fuel spill clean-up kit at each work site before work can commence. If a spill does occur, the

plan requires the operator to clean-up the site immediately. In the event that this cannot be achieved, the operator is required to contact their supervisor and proceed with spill containment efforts. At this point, the supervisor would assess the situation and contact the necessary personnel to aid in clean-up efforts. Another plan requirement is that the Regional Water Quality Control Board must be notified of the spill if it has delivered, or has the potential to deliver into waters of the state.

- Necessary permits must be obtained by the county before the application of any herbicide.
- Application of herbicides must be at the direction of a certified applicator, and is trained in proper chemical use and application.
- All chemical application must be in compliance with the OSHA regulations, as discussed in HCP section 3.4.1.4.

The proposed Project would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, or a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. Therefore, the appropriate finding is **less than significant with mitigation incorporation**.

c) The proposed project would not result in the emission or handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. Therefore, the appropriate finding is **no impact**.

d) The proposed project is not located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5. Therefore, the appropriate finding is **no impact**.

e-f) The proposed project would not result in a change over current conditions related to activities near an airport or airstrip that would result in a safety hazard. Therefore, the appropriate finding is **no impact**.

g) The proposed project would not interfere with an emergency evacuation or response plan; therefore, the appropriate finding is **no impact**.

h) The proposed project would not expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands. The appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
IX. HYDROLOGY AND WATER QUALITY -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?		X		
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?		X		
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?		X		
f) Otherwise substantially degrade water quality?		X		
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
j) Inundation by seiche, tsunami, or mudflow?				X

a) The purpose of the Order is to implement the California Water Code, State and Federal Policy and regulation, and to achieve protection of the beneficial uses of water and water quality objectives established in the Basin Plan. The Order establishes specific and general requirements to implement management practices to ensure that discharges, or potential discharges from HRC’s timber harvesting and related activities in the UER watershed meet water quality standards. Potential impacts from HRC’s management activities in the UER Watershed would primarily consist of sediment discharges and increased water temperature.

The existing and potential beneficial uses of waters potentially affected by the proposed Project include:

- Municipal and Domestic Supply (MUN)
- Cold Freshwater Habitat (COLD)
- Wildlife habitat (WILD)
- Rare, Threatened, or Endangered Species (RARE)
- Migration of Aquatic Organisms (MIGR)
- Spawning, Reproduction, and/or Early Development (SPWN)
- Flood Peak Attenuation/Flood Water Storage (FLD)
- Wetland Habitat (WET)

The following waste discharge prohibitions from the Water Quality Control Plan for the North Coast Region (Basin Plan) pertain to timber harvest activities, including logging, road construction, and associated activities in the North Coast Region:

1. The discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

2. The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

Applicable water quality objectives include the following:

Sediment
The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Turbidity
Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

Temperature
The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional

Water Board that such alteration in temperature does not adversely affect beneficial uses.

At no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature.

At no time or place shall the temperature of WARM intrastate waters be increased more than 5°F above natural receiving water temperature.

Following a century of logging, and in particular, following the post-world war II era of intensive tractor logging, water quality conditions in Elk River were impaired for sediment. Further impairment occurred as a result of excessive and poorly-regulated logging and large storm events. The capacity of the UER for sediment is limited by the ongoing aggradation in the impacted reach and resulting nuisance conditions and compromised beneficial uses. Unless and until its capacity can be expanded through sediment remediation and channel restoration, nuisance conditions abated, and beneficial uses supported, any new discharges of sediment exacerbate and contribute to exceedances of water quality objectives. (See also Cumulative Impacts discussion below.)

For discharges associated with continued timber operations, combined measures required under the Order, as itemized below, are protective of water quality within the UER watershed: the transition from evenaged to unevenaged management under HRC's ownership; harvest rate limits throughout the UER and for each subwatershed that limit canopy reduction and anticipated peak flow changes; enhanced riparian protection; geologic review of all harvest activities; management practices designed to prevent or minimize sediment discharge; the temporary prohibition of timber harvest activities in high risk subwatersheds; ongoing oversight of HRC's management activities through participation in the THP review process; and the monitoring and reporting program. In addition to addressing existing, ongoing discharges, the Order attempts to address water quality impacts that have already occurred through the instream sediment feasibility study and voluntary restoration.

The Order authorizes discharges from certain cleanup and restoration activities as well as from ongoing timber harvesting and associated activities. Cleanup and restoration activities may result in small short term sediment discharges associated with placement of large wood into streams or excavation to stabilize or remove fill material stored in channels and adjacent riparian zones. The potential impacts of minor short term discharges provide benefits of long term sediment control derived by such projects. Compliance with the terms of the Order should result in continued improvement in water quality in the UER and impacted reach

The Elk River was identified in 1998 as impaired due to excessive sedimentation/siltation and was subsequently placed on the federal Clean Water Act section 303(d) list. At least five of the identified beneficial uses are considered impaired, including MUN, AGR, COLD, and to a lesser extent both REC-1 and REC-2. The primary beneficial uses of concern are domestic and agricultural water supplies and the cold freshwater habitat. For impaired water bodies, TMDLs must be established at levels necessary to attain and maintain water quality standards. A TMDL is the sum of individual waste load allocations (WLA) for point sources and load allocations (LA) for nonpoint sources and natural background. (40 CFR 130.2 (i).) Loading capacity is the greatest amount of loading that a waterbody can receive without violating water quality standards. (40 CFR 130.2(f).)

The Regional Water Board has developed a TMDL sediment source analysis that evaluated the historical, management, and physical factors associated with timber management in the UER watershed that have influenced sedimentation throughout the watershed. (Tetra Tech (2015) report.) In the UER watershed, all the land use-related sediment delivered to the stream channel is attributed to nonpoint source pollution and natural background. Due to the lack of assimilative capacity in the receiving water reach, the nonpoint source load allocation is defined as zero. A LA must be applied in the statutory context of the implementation mechanism, here Water Code section 13263. When water quality is already degraded, it may take time to achieve water quality objectives and immediate compliance may not be possible, even with complete cessation of a discharging activity. (See generally Nonpoint Source Policy at 13.) In the context of HRC's management activities and its impacts, the Order includes requirements designed to show measurable progress toward improving water quality over the short term and achieving water quality objectives in a meaningful timeframe. Additional efforts are needed and are being undertaken outside the scope of this Order to improve conditions in the impacted reach. Accordingly, the appropriate finding is **less than significant with mitigation incorporation.**

b) HRC's management activities covered under the Order will not deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. The appropriate finding is **no impact.**

c-d) HRC's management activities authorized under the Order will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. A substantial portion of the adverse impacts that occurred in the watershed since the mid-twentieth century as a result of logging and related activities was caused by increased erosion resulting from alteration of drainage patterns via hydrologically connected roads. Hydrologic connectivity increases the potential for the road segment to deliver road-derived runoff and sediment to a watercourse. When a road is hydrologically connected to a watercourse, it effectively increases the drainage area of the watercourse, producing hydrologic changes that can alter the magnitude and frequency of runoff delivery to the watercourse. Section 923.2(a)(5) of the FPR requires that all logging roads and landings be hydrologically disconnected from watercourses and lakes to the extent feasible in order to minimize sediment delivery from road runoff to watercourses and to reduce the potential for hydrologic changes that can alter the magnitude and frequency of runoff delivery to watercourses. The goal of hydrologic disconnection is to minimize sediment delivery and hydrologic change derived from road runoff being routed to a watercourse. Hydrologic disconnection is achieved by creating a road surface and drainage configuration that directs water to discharge from the road in a location where it is unlikely to directly flow into a watercourse.

In addition to the requirements of the FPRs, many of HRC's practices are designed specifically to prevent or minimize the potential to alter existing drainage patterns. Such practices are described in detail in section 6.3.3 of their HCP, *Control of Sediment from Roads and Other Sources* and are summarized as follows:

- Water crossings and associated fills and approaches shall be constructed or maintained to prevent diversion of flow down the road and to minimize erosion should the drainage structure become obstructed.
- The length of each hydrologically connected road segment is minimized, to the extent feasible,
- Drainage facilities and structures shall be installed at intervals along the road frequent enough to disperse road surface runoff so as to avoid gully formation and minimize erosion of the road surface, erosion of inside ditches and other drainage facilities, and erosion at the outfalls of drainage facilities and structures,
- Water captured by the road shall be diverted onto stable portions of the forest floor to dissipate energy and facilitate percolation to avoid creating channelized flow or erosion of mineral soil that discharges to waters of the State,
- Upon removal, temporary crossings shall be excavated to form a channel that is as close as feasible to the natural channel grade and orientation, and that is wider than the natural channel to minimize bank and channel erosion. Excavated side slopes shall be laid back to a 2:1 (50%) or natural slope.

The Order requires that HRC complies with all water quality related HCP prescriptions, including those above, and conditions included in an approved THP, and any additional mitigation measures identified and required pursuant to CAL FIRE's CEQA-equivalent process. In addition, and as discussed in more detail below, the Order includes additional requirements designed to eliminate or minimize additional sediment contributions that might exacerbate the flooding conditions in the downstream reach. The above-summarized mitigation measures required by the Order will ensure that HRC's management activities will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

e) HRC's management activities have the potential to alter hydrologic processes in the watershed, including increasing runoff rates. However, the entire project area is in a forested setting and no storm water drainage systems are present. The only pollutant that could potentially be conveyed by runoff from HRC's activities in concentrations high enough to be considered potentially significant is sediment. Mobilization and entrainment of sediment by flowing water are functions of the velocity, which is a function of discharge, slope and channel configuration. Due to increases in flow velocity and erosion potential, concentration of runoff in forested setting such as the UER can be considered to also result in runoff being polluted by sediment. Increased runoff and erosion are among the most common and widespread impacts of timber harvesting in watersheds throughout the North Coast, including in the UER watershed. As discussed in detail in section H, increased runoff rates from timber harvesting and related ground disturbance can result from the following processes:

- removal of forest canopy reduces the amount of precipitation that is intercepted and evaporated or removed from shallow soil by evapotranspiration;
- compaction or removal of permeable topsoil layers by heavy equipment use and road construction, decreases the amount of precipitation that infiltrates into soil;
- interception of shallow groundwater by cutting into hillslopes to construct roads;
- concentration of runoff on road surfaces.

The Order includes requirements designed specifically to prevent or minimize impacts such as those resulting from increased runoff and erosion. Implementation of the Specific Requirements of the Order will reduce the potential for increased runoff and erosion:

- Limits on the harvesting intensity and areal extent of timber harvesting;
- Methods to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;

- Retention and protection of riparian vegetation to preserve and restore shade, prevent increases in solar radiation, and meet the temperature objective;
- In-stream and riparian zone restoration;
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

The mitigation measures required by the Order and summarized above will ensure that HRC's management activities will not create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

f) Section H of this Initial Study provide a discussion of the potential impacts to water quality from HRC's management activities in the UER watershed as well as management measures designed to mitigate those impacts. Management measures described in this Initial Study and implemented by Specific Requirements in Section I of the Order are adequate to mitigate all reasonably foreseeable impacts from excess sediment and elevated water temperature.

- Limits on the harvesting intensity and areal extent of timber harvesting;
- Methods to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;
- Retention and protection of riparian vegetation to preserve and restore shade, prevent increases in solar radiation, and meet the temperature objective;
- In-stream and riparian zone restoration;
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

In addition, as discussed in the sections on *Inventory and Treatment of Controllable Sediment Discharge Sources*, implementation of corrective action on a CSDS and restoration projects often entail substantial excavation of near-stream areas as well as channels and banks, installation of new drainage structures, disturbance of soil and loss of vegetation in riparian areas. These activities have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is in improve long-term site stability and decrease sediment discharge. Therefore, the net result is typically going to be long term environmental benefit. In addition, short term impacts can be minimized by implementation of appropriate management practices as summarized below and described fully in Attachment A.

No other pollutant sources or impacts to water quality are expected, and with implementation of the mitigation measures required under the Order HRC's management activities will not substantially degrade water quality. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

g - j) HRC activities covered under the Order do not authorize placing housing or structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map. The covered activities will not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, or inundation by seiche, tsunami, or mudflow. Because the project does not involve this element, the appropriate finding is **no impact.**

There are several residents living at or below the confluence of the South Fork and North Fork Elk River within the 100-year flood plain. As discussed in previous sections of this initial study, nuisance flooding conditions exist in the impacted reach of the Elk River watershed. Discharges of sediment from past logging in the watershed have aggraded stream channels in the low gradient reaches of Elk River, significantly reducing channel capacity. Flooding of roads, fields, fences, and homes occurs at intervals that are much more frequent than occurred historically. The cross-sectional area of the stream channel has been significantly reduced by deposits of fine sediment. Cross-section data indicates there are over 280,000 yd^3 of instream stored sediment in the lower North Fork, nearly 100,000 yd^3 in the lower South Fork and nearly 260,000 yd^3 in the upper mainstem. The fine sediment deposits in the impacted reach of the UER have become rooted in place by the encroachment of vegetation, further slowing winter floodwaters, causing streams to spill over their banks at elevated frequency and magnitude. One of the results of increased flood magnitude is that for a flood of a given return interval, the water surface would potentially be higher and flood waters extend out further from top of bank, therefore placing structures inside of the 100-year flood zone that were previously outside it. However, elevated flood heights already exist. The Order is designed to reduce sediment discharges and minimize increases in peak flows from canopy removal that caused increased flooding and encourage participation in efforts to remediate flooding.

- Limits on the harvesting intensity and areal extent of timber harvesting;
- Prohibition on harvesting in high risk subwatersheds;
- Enhanced stream and riparian zone protection;
- Methods to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;
- In-stream and riparian zone restoration;
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

In particular, the permit requirement prohibiting harvesting in high risk subwatersheds can be lifted by HRC conducting a project, or projects, designed to improve flooding conditions or reduce conditions exacerbating flooding.

The activities covered by the Order are designed, through use of extensive BMPs and mitigations, to have less than significant impact to the beneficial uses of Elk River. With proper implementation, HRCs management and restoration activities should, over time, improve the conditions within the UER, thus having a positive impact.

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
X. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				X
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

a) Activities covered under the Order would not divide an established community. Any land use planning associated with the Order is not urban, but rather intended for management and utilization of HRC's timberlands. Because the project does not involve these elements, the appropriate finding is **no impact**.

b) Activities covered under the Order must comply with all applicable local, state and federal regulations, which include land use plans, policies, or regulations of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance). Because of the fact that all of the activities covered under this Order will occur on private land zoned as timber production zone, and will be conducted pursuant to State and Federal regulations which are intended for the purpose of avoiding or mitigating environmental effects. There will not, therefore, be any conflict and there is **no impact**.

c) All of HRC ownership in the UER watershed is covered by a multi-species state and federal Habitat Conservation Plan approved in 1999. The state and federal Incidental Take Permits (ITP) issued for aquatic species including Chinook salmon, Coho salmon, cutthroat trout, steelhead trout, southern torrent salamander, tailed-frog, red-legged frog, foothill-yellow legged frog, and the northwestern pond turtle are most relevant to protection of the Beneficial Uses of the UER. The management measures for water quality protection of the HCP were the subject of the federal Environmental Impact Statement and state Environmental Impact Report which led to the issuance of the ITPs in conformance with the state and federal Endangered Species Acts. The adoption and implementation of the Order will not conflict with any applicable conservation plan that may apply to HRC's activities. The appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XI. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

a-b) The Order do not authorize mining activities or other activities that could affect mineral resources. Therefore, HRC's activities covered under the Order will not result in loss of availability of mineral resources; therefore, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?				X
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

a-f) Implementation of some HRC's activities may result in localized increases in noise levels. Such increased noise levels would likely be associated with heavy equipment operation associated with harvesting, yarding, road construction and/or restoration activities. These impacts would be temporary, associated with the use of heavy equipment and would, therefore, not considered to be a significant impact. The proposed project does not change the exposure of people to potential adverse effects involving noise due to vegetation management and other HRC's activities over current conditions. Noise levels due to HRC's activities will remain the same whether or not the Order is adopted and implemented. Activities covered under the Order do not impact noise levels. Because no change is foreseeable, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING -- Would the project:				
a) Induce substantial population				X

growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

a-c) The proposed project does not involve construction of new homes, businesses, or infrastructure. Any new road construction would not be for the purpose of urban or residential development, but would be intended to facilitate HRC activities such as timber harvest and related management activities. The project would also not displace people or existing housing. Because the proposed project does not involve these elements, the appropriate finding is **no impact**.

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XIV. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?				X
Police protection?				X
Schools?				X

Parks?				X
Other public facilities?				X

a) The proposed project does not involve new or physically altered government facilities. Because the proposed project does not involve these elements, the appropriate finding is **no impact.**

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XV. RECREATION --				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

a-b) This area is private property and is zoned as a Timber Production Zone. This land is not open to the public for recreational use. Conventional logging operations are not known to have caused significant adverse impacts to recreation resources in the area in the past therefore, none are anticipated for this THP, either singly or cumulatively.

Because the proposed project does not involve increasing the use of recreational facilities or construction of new recreational facilities, the appropriate finding is **no impact.**

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XVI. TRANSPORTATION/TRAFFIC -- Would the project:				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?			X	
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?			X	
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e) Result in inadequate emergency access?				X
f) Result in inadequate parking capacity?				X
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X

a-b) Log truck traffic has historically occurred on roads within the UER. Main-line haul routes include the use of HRC's private road system in the UER as well as Humboldt County roads in the lower portion of the UER and in the Lower Elk River valley. Continuation of hauling operations at historical or current levels is not expected to cause a significant adverse impact to traffic on these roads. Work performed during timber operations would occur on private property and would not affect the existing traffic load of the road system. Mobilization of heavy equipment to conduct restoration activities may contribute temporary amounts of minor traffic to the road system, but such traffic volumes are not anticipated to be significant. Therefore, the appropriate finding is **less than significant impact.**

c) The proposed project does not involve air traffic. Because the proposed project does not involve this element, the appropriate finding is **no impact.**

d) The proposed project does not involve installation of hazardous design features. Because the proposed project does not involve this element, the appropriate finding is **no impact**.

e-f) The proposed project does not affect emergency access or parking capacity; therefore, the appropriate finding is **no impact**.

g) The proposed project does not involve alternative transportation. Because the proposed project does not involve this element, the appropriate finding is **no impact**.

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	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XVII. UTILITIES AND SERVICE SYSTEMS Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or			X	

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
are new or expanded entitlements needed?				
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the providers existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X

a-c) The proposed project does not involve the expansion or construction of wastewater or storm water treatment facilities. Such projects would not be eligible for coverage under the Order, and would have to be regulated by either a Waste Discharge Requirement or NPDES permit. Because the proposed project does not involve expansion or construction of wastewater or storm water treatment facilities, the appropriate finding is **no impact**.

d) The proposed project does not authorize the development of new water supplies or change the need for existing water supplies. Water supplies may be used to serve vegetation removal or construction activities (e.g., for dust abatement) in the project area. Such use will be short term in duration and relatively minor in scope. Water supplies would come from existing developed sources with existing water rights on HRC's lands. If short-term water drafting from streams in the vicinity of the project area is required for a project, HRC would be required to comply with all applicable current regulations. Because no change is foreseeable, the appropriate finding is **less than significant impact.**

e) HRC's activities covered under the Order would not require service by wastewater treatment facilities. Because the proposed project does not involve this element, the appropriate finding is **no impact.**

f) The proposed project would not affect solid waste generation or landfill capacities over current conditions. Because no change is foreseeable, the appropriate finding is **no impact**.

g) The proposed project will not involve solid waste and is not subject to federal, state, and local statutes and regulations related to solid waste, therefore the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE --				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?			X	

a) The Order is a permit developed under the authority of the California Water Code, for the specific purpose of implementing the Basin Plan standards, protecting the beneficial uses of water and the water quality objectives required for that purpose, and to prevent nuisance and pollution. The Regional Water Board developed the Specific and General requirements of the Order to regulate HRC's management activities so that they can derive the economic benefits from their timberlands in the UER watershed while still protecting and restoring the environmental values related to water quality. The requirements of the Order are designed specifically to mitigate potential impacts to water quality from HRC's management activities. As discussed in more detail in the Hydrology and Water Quality section above, the UER watershed is sediment impaired, and additional discharges may further exacerbate this condition. The Order includes requirements designed to show measurable progress toward improving water quality over the short term and achieving water quality objectives in a meaningful timeframe.

Requirements of the Order do not address those potential environmental impacts that are not related to water quality, such as terrestrial plants or animals. As described in more detail in section G above, timber management and associated activities are regulated by other state and federal laws and policies. All of HRC's activities regulated by the Order must also comply with their multi species habitat conservation plan (HCP). The majority of their activities will be conducted under a THP that has gone through the multi-agency CEQA functional equivalent review process as required by the FPRs. In addition, any activities that is likely to substantially modify a river, steam or lake must be covered under the MATO issued by CDFW to avoid, minimize, and mitigate potential impacts.

The continuation of HRC's timber harvesting and related management activities in the UER watershed with mitigation measures required by the Order and applicable state and federal regulations does not, therefore, have the potential to degrade the quality of the environment, reduce the habitat of fish or wildlife species or cause their population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or pre-history. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

b) The UER watershed is already cumulatively impaired for sediment. Water quality impacts from historic timber management activities are mostly associated with increased sedimentation resulting in impaired domestic and agricultural water quality, impaired spawning habitat, and increased rate and depth of flooding due to channel in-filling by sediment. These impacts result from a complex interaction between inherent watershed characteristics, such as geology and geomorphology, external natural processes such as climate and timing of stochastic events (i.e. large storms, earthquakes, fires) and type of management practices and extent and rate of watershed area disturbed. In spite of all of the efforts to control sediment discharge, conditions in downstream impacted reaches remain impaired and the stream channel continues to aggrade. Even with implementation of greatly improved management practices, ongoing timber harvesting and associated activities will result in some increased sediment discharge, further exacerbating the already impaired condition. When water quality is already degraded, it may take time to achieve water quality objectives and immediate compliance may not be possible, even with complete cessation of a discharging activity. The Order includes stringent waste discharge requirements designed to minimize new sediment production and to control and remediate existing sediment inputs to the extent feasible. HRC's projected harvest rates are generally reasonable, and the Order provides that the rate of harvest in any subwatershed shown in the UER not exceed 2% equivalent clearcut acres per year averaged over any 10 year period. This is to ensure that proposed harvest rates are generally below a threshold that would cause concern for contributing to ongoing cumulative impacts on water quality. In addition, a temporary prohibition on activities that are likely to generate additional sediment production in high risk areas is appropriate while active measures are taken to improve downstream beneficial uses. Monitoring will be required to determine whether implementation is leading to measurable improvements.

Sediment control activities such as inventory, prioritization, and treatment of controllable sediment discharge sources and development of feasible projects to trap, meter, or remove sediment in tributary streams, in combination with potential restoration actions downstream, could produce a cumulative impact in the UER watershed. The Order requires annual reporting that will provide a mechanism for watershed-wide project planning by documenting activities conducted in the previous year and activities planned for the following year. The annual work plans allow Regional Water Board staff the opportunity to evaluate and comment on restoration work planned for the year ahead and request that projects with the potential to cause short term impacts be more broadly dispersed throughout the watersheds or staggered in time. In addition, the five year summary reports provide a longer term evaluation of the effectiveness of the provisions of the Order. Water quality monitoring is to be conducted independently by HRC as well as in coordination with the watershed stewardship process to evaluate trends and ensure that projects are conducted in a manner that does not create a cumulatively considerable impact. HRC will also continue to conduct effectiveness monitoring to evaluate the impacts from restoration and sediment control projects. Post project monitoring is useful to inform project proponents and agency staff with respect to the effectiveness of methods, and improve them as warranted.

HRC's activities conducted in compliance with the Order will not adversely individually or cumulatively affect the quality or the beneficial uses of the waters of the State. The environmental protection afforded by the adoption of the Order, including the implementation of the management plan described in the ROWD and requirements of the Order, will provide sufficient controls on any potential impacts. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

c) HRC's management activities conducted pursuant to the requirements of the Order will not have effects that will cause substantial adverse effects on human beings, directly or indirectly. With the exception of vehicles traveling on public highways to access the Project area and transport equipment and timber products, HRC's management activities will take place exclusively on privately owned timberlands, which is removed from large population centers. Private individuals live, work, and travel in close proximity to areas affected by HRC's management activities. A small segment of people and communities in areas surrounding UER are likely to be directly or indirectly involved in HRC's activities and therefore derive an economic benefit from them. Timber harvesting and related activities, both those covered under the Order such as road construction and reconstruction, as well as activities not covered, such as processing logs at a mill, is important components of the local economy. Therefore, timber harvesting in the UER watershed will result in a small but significant economic benefit to nearby communities.

Property owners, mainly residential, living downstream from HRC's timberlands have been significantly harmed by impacts from excess sediment deposition, the vast bulk of which was produced by past logging activities. The impacts include damage to property by increased flooding magnitude and frequency, financial impacts due to decreased property values and increased flood insurance rates, loss or impairment of domestic water supplies, and threats to public safety by restricted access into or out of neighborhoods due to increased flooding of roadways. Due to the current impaired condition and lack of assimilative capacity in the impacted reach, the nonpoint source load allocation is defined as zero. As such, the Order establishes stringent requirements for control of sediment from ongoing timber harvesting. In addition to sediment control, all feasible measures to stabilize or remove sediment already are being evaluated; both pursuant to the feasibility study required under the Order and as part of the watershed stewardship program. Significant public and private resources are currently committed, or anticipated to be committed, to restoration and remediation efforts to improve water quality conditions and relieve effected residents. It is the expectation that HRC will continue to participate in these restoration and remediation efforts. Restoration and remediation efforts in the UER as well as the impacted reach combined with the additional layer of environmental protection provided by the Order is expected to ensure that adverse impacts to the water resources of local communities from HRC's activities improve over time.

The Regional Water Board determines that the project will not have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly. Therefore, the appropriate finding is **less than significant.**

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Attachment No. 4 November 30, 2016 Initial Study Supporting the Preparation of a Mitigated Negative Declaration Waste Discharge Requirements for Timber Harvesting and Related Land Management Activities Conducted by Humboldt Redwood Company, LLC. In Upper Elk River, Humboldt County, California

California Environmental Quality Act
(CEQA)

INITIAL STUDY

Supporting the Preparation of a Mitigated Negative Declaration

Waste Discharge Requirements
for
Timber Harvesting and Related Land Management Activities
Conducted by Humboldt Redwood Company, LLC.
In Upper Elk River,
Humboldt County, California

August 30, 2016

California Regional Water Quality Control Board, North Coast Region
5550 Skylane Blvd.
Santa Rosa, CA
95403

Prepared By:
California Regional Water Quality Control Board, North Coast Region
Nonpoint Source Pollution Control Unit

TABLE OF CONTENTS

Figures

Attachments

A. PROJECT TITLE:

Waste Discharge Requirements for Nonpoint Source Discharges and Other Controllable Water Quality Factors Related to Timber Harvesting and Associated Activities Conducted by Humboldt Redwood Company, LLC, In the Upper Elk River Watershed, Humboldt County.

B. LEAD AGENCY

California Regional Water Quality Control Board, North Coast Region
5550 Skylane Blvd., Suite A, Santa Rosa, CA 95403

C. CONTACT PERSON:

James Burke
Senior Engineering Geologist
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D. PROJECT LOCATION

Upper Elk River watershed, tributary to the Humboldt Bay in Humboldt County California.

E. PROJECT DESCRIPTION

This Project consists of adoption of Waste Discharge Requirements (Order) by the California Regional Water Quality Control Board, North Coast Region (Regional Water Board) that, if adopted, would establish water quality requirements for nonpoint source waste discharges and other controllable factors related to timber harvesting and associated activities conducted by Humboldt Redwood Company, LLC (HRC), a timberland management company, in the Upper Elk River (UER) watershed, Humboldt County, California.

The Order establishes enforceable general and specific requirements to achieve compliance with water quality objectives in receiving water through implementation of stringent management practices designed to minimize discharges. The main elements include:

- Limits on the intensity and areal extent of timber harvesting including a temporary limit on harvesting in high risk areas within the UER;
- Management practices to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;

- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Riparian management zones, in which retention of riparian vegetation, exclusion of ground based logging equipment, and enhanced erosion control serves to minimize sediment inputs from streamside areas and preserve and restore riparian shade to protect water temperature;
- A feasibility study to evaluate methods to control sediment and improve salmonid habitat, including:
    - Large wood augmentation for the purposes of improving fish habitat and sediment routing. Methods could include falling riparian zone trees or placement of logs using heavy equipment;
    - Construction of in-stream or off-channel sediment detention basins;
    - Streambank stabilization using large wood, excavation, planting, rip-rap, or other methods;
    - Removal or reconstruction of watercourse crossings and near stream road segments; and
    - Excavation of in-stream sediment deposits.
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

The potential impacts of those activities included in this Project and the specifics of the Order are described in section H of this initial study. The draft Order and supporting documentation are attached to this initial study.

Environmental Setting and Regulatory Background

The Elk River watershed is a 33,700 acre (52.7 mi^2) watershed located in coastal northern California, draining into Humboldt Bay just south of the city of Eureka, in Humboldt County (Figure 1). Elk River has relatively steep forested headwater slopes and flows across a primarily grassland coastal plain into the central portion of Humboldt Bay, across from the bay inlet. The watershed is made up of six Calwater (version 2.2) planning watersheds: Martin Slough, Lower Elk River, Lower North Fork Elk River, Upper North Fork Elk River, Lower South Fork Elk River, and Upper South Fork Elk River. The Mediterranean climate of the Elk River watershed is characterized by mild, wet winters and a prolonged summer dry season. Mean annual precipitation ranges from 39 inches at Eureka, located on the coast, to 60 inches in Kneeland, which is near the top of the watershed, 2,657 feet above sea level, and approximately 12 miles inland from Humboldt Bay. Roughly 90% of the annual precipitation occurs as rainfall between October and April. Elevation ranges within the watershed range from 2800 feet in the headwaters of the watershed to

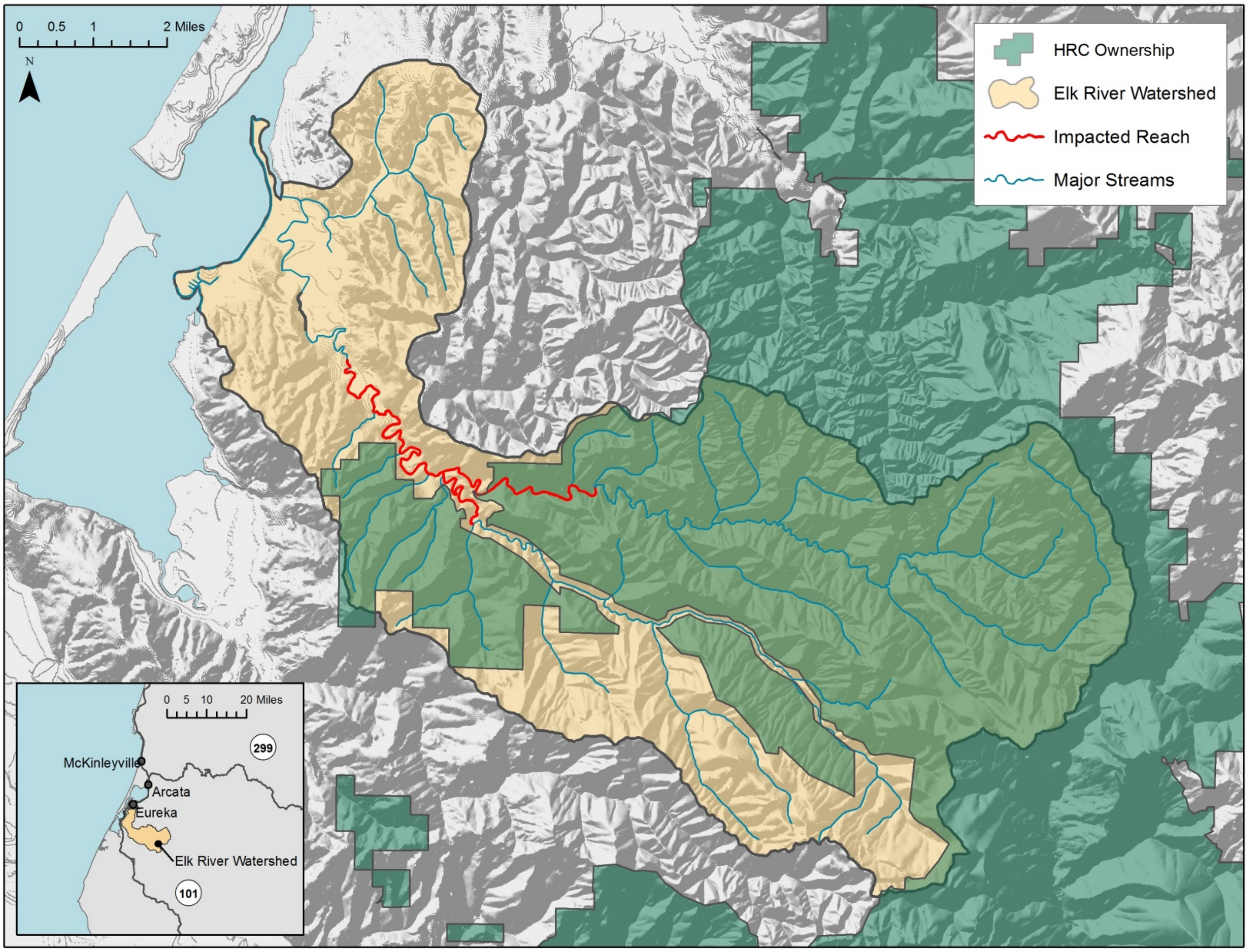

Figure 1. Elk River and Vicinity

sea level at its confluence with Humboldt Bay. Ridge-top areas can be fairly gentle with slopes typically steepening to ≥ 40% approaching watercourses.

HRC lands account for approximately 66% of the watershed: 98% of the North Fork Elk Basin, 50% of the South Fork basin, and a small section of the mainstem region near the confluence of the two major forks. This area is referred to as the Upper Elk River (UER). Other ownerships within the UER include the Bureau of Land Management (Headwaters Forest Reserve), Green Diamond Resource Company, the City of Eureka, and mixed private residential and agricultural ownerships. Approximately 85% of the land in the UER is owned by the two industrial timber management companies (HRC and Green Diamond) and is managed for growing conifer and hardwood trees for the production of saw and chip logs and other renewable forest products such as bio-fuel, split products, firewood, and burls.

In 1997, the Regional Water Board and other state agencies began to receive a flood of complaints from downstream residents of increased turbidity, channel filling, and flood frequency. In December 1997, California Department of Forestry and Fire Protection (CAL FIRE), California Department of Fish and Wildlife (DFW, then California Department of Fish and Game), California Geological Survey (CGS) and the Regional Water Board determined, based on field observations and aerial photograph data, that the Elk River Watershed was one of five Humboldt County watersheds that were significantly cumulatively impacted by sediment discharges following the large storm events in late 1996 and early 1997. Following this determination, a series of regulatory and non-regulatory actions designed to increased land use controls to reduce sediment discharges from timber harvesting activities have been implemented.

Over time, sediment transported from the upper tributaries has been deposited in low gradient downstream reaches at the confluence of the North and South Fork Elk River (hereinafter referred to as the impacted reach) and has resulted on going aggradation, encroachment of riparian vegetation onto relatively recent fine sediment deposits, and an increased incidence of overbank flooding which has impacted the residential community for the past 20 years. It is estimated that over 600,000 cubic yards (yd^3) of sediment have accumulated over the past two decades within the low gradient stream reaches of the UER. In addition to elevated sediment loads, hydromodification from channel stabilization, removal of large woody material, dredging, and channel constrictions in lower portion of the watershed such as bridges and roads have diminished the ability of the river to assimilate increased sediment loads.

In addition to the stored sediment within the impacted reach, elevated sediment production from in-stream sources within lower order watercourses further up in the watershed is being transported through the system downstream.

There is a strong association between land management practices that were used during the period between 1988 and 1997 and the impairment of beneficial uses of water in the UER. Data from field observations and interpretation of aerial photographs show that sediment production rates during this time greatly exceed long term natural background rates due to several factors, including an approximate four-fold increase in logging under then-owner, the Pacific Lumber Company (PALCO), during this time period, poorly regulated logging practices, a series of winters with above average precipitation and large storm events, and potentially of a magnitude 7.2 earthquake off Cape Mendocino in 1992.

Starting in 1997, the Regional Water Board issued Cleanup and Abatement Orders (CAO) that required the inventory, prioritization, treatment, and monitoring of existing sediment sources associated with land management activities, prevention of creation of new sediment sources, and monitoring of in-stream sediment-related indices. Treatment of controllable sediment discharge sources (CSDS) related to roads, off-road sites, and landslides throughout HRC's ownership in the UER watershed have been conducted under Cleanup and Abatement Order (CAO) Nos.

R1-2004-0028 (for the South Fork and Mainstem Elk River) and R1-2006-0055 (for the North Fork Elk River). The majority of road related sites have been treated as of the end of 2015. Treatment of all road related sites is scheduled to be completed by the end of 2017. Over 12,300 acres have been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trails, were identified. By 2011, 80% of the top 100 sites with the greatest potential for environmental impact were treated. In 2012, HRC submitted a new master treatment plan to schedule treatment of the remaining sediment sources in the watershed. As of 2014, corrective action had been implemented at approximately half of these sites. The Order requires HRC to continue to treat sites that annually based on priority and proximity to timber operations and other sediment control work .

In 2006 the Regional Water Board adopted Order No. R1-2006-0039, Elk River Watershed-Wide Waste Discharge Requirements (2006 WDR). Among other requirements, the 2006 WDR includes receiving water limitations on peak flow increases and sediment discharge from harvest-related landslides; and rate of harvest (ROH) limitations based on two scientific models.

In October 2008, HRC acquired ownership of PALCO's timberland holdings throughout Humboldt County, including the approximately 22,000acres in the UER. Since acquiring the property, HRC has implemented a significantly different silvicultural management strategy throughout their ownership that predominantly utilizes partial harvesting methods, such as selection silviculture. Partial harvesting results in post-harvest conditions that are less susceptible to mass wasting and increased erosional processes as compared to clearcut harvesting.

On September 22, 2015, pursuant to Water Code section 13260(a), HRC submitted a report of waste discharges (ROWD) for its timber harvesting and related management activities. The ROWD includes HRC's proposed long term timber management strategy, including proposed measures designed to prevent or minimize water quality impacts from activities associated with its forest management.

On May 12, 2016, the Regional Water Board adopted an amendment to the *Basin Plan* to include the *Action Plan for Upper Elk River Sediment Total Maximum Daily Load* (TMDL Action Plan). The TMDL Action Plan draws from the *Upper Elk River: Technical Analysis for Sediment* (Technical Report) (Tetra Tech, October 2015), which is a comprehensive assessment of sediment conditions in the Upper Elk River Watershed. The Technical Report is a synthesis of all Regional Water Board documents, reports from stakeholders in Upper Elk River, and additional analyses conducted by Tetra Tech. It provides the technical basis for the TMDL Action Plan.

F. PURPOSE AND NEED

The 2006 WDRs are not tailored to the management practices of HRC, and do not comprehensively address HRC's obligations for cleanups and TMDL implementation. The Order needs to reflect current conditions, and all parties agree that a more comprehensive and readable permit is desirable. In addition, it is agreed that remaining requirements for erosion control from the two CAOs should be incorporated for a more efficient management of related monitoring and reporting.

The purpose of the revised Order is to provide a water quality regulatory structure for HRC to prevent and/or address discharges of waste and other controllable water quality factors associated with timber harvest activities in the UER. The WDR is informed by the total maximum daily load (TMDL) sediment source analysis for the UER and overwhelming evidence pointing to the lack of assimilative capacity in the impacted reach.[1] The WDR provides for implementation of strict best management practices (BMP) prepared with the collaboration and cooperation of HRC, some that vary according to the sediment loading risk of subwatersheds. The WDR provides a five year interim program where HRC will refrain from timber harvest activity in high risk subwatersheds to allow time for stewardship efforts to move forward and improve conditions in the impacted reach.

The Order prescribes general and specific requirements that HRC conduct timber harvesting and associated management activities to reduce the potential for sediment and temperature impacts, including best management practices intended to implement applicable water quality standards from the Water Quality Control Plan for the North Coast Region (Basin Plan) (NCRWQCB, 2011 available at: http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/). The proposed Order is attached to this Initial Study.

G. CONSISTENCY WITH PLANS AND POLICIES

Timber Harvesting Under the California Forest Practice Rules

CAL FIRE is the state agency responsible for overseeing timber harvesting activities through implementation of the Forest Practice Rules (FPRs)(Cal. Code Regs., tit. 14, §895 *et seq.*[2]). Under the Z'Berg-Nejedly Forest Practice Act, non-federal landowners proposing to harvest timber are required to have an approved timber harvest plan (THP) prior to commencing timber harvesting.

The FPRs include rules for protection of the beneficial uses of water, including rules for enhanced protection in watersheds with listed anadromous salmonids. The FPRs provide measures designed to prevent sediment discharges (see FPR §§914, 934 [harvesting practices and erosion control]; §923, 943 [prescriptions for construction, reconstruction, use, maintenance, and decommissioning of road sand landings]; §916.4, 936.4 [requiring evaluation of sites that could adversely impact beneficial uses of water and treatment of such sites when feasible].) FPR section 916.9 requires that every timber operation in watersheds with listed anadromous

[1] The term "impacted reach" applies the North Fork Elk River below Browns Gulch, the South Fork Elk River below Tom Gulch, and the mainstem of Elk River from the confluence of the North and South Forks downstream to Bertas Road.

[2] Citations to the Forest Practice Rules contained in Title 14 of the California Code of Regulations will be indicated by "FPR" followed by the relevant § number.

salmonids shall be planned and conducted to comply with the terms of a Total Maximum Daily Load (TMDL) if one has been established for the receiving waters within the plan area. The FPRs also provide measures to limit reductions in riparian shade to protect water temperature.

Additionally, CAL FIRE is the CEQA Lead Agency for timber harvesting operations in California. The Secretary of Resources has certified that regulation of timber harvesting operations by CAL FIRE is exempt from CEQA's requirements to prepare an Environmental Impact Report (EIR) or Negative Declaration. A THP that is approved by CAL FIRE is considered the functional equivalent of an EIR under CEQA. The Regional Water Board, the California Department of Fish and Wildlife (DFW), the California Geologic Survey, and other agencies are responsible agencies charged with the multidisciplinary review of THPs for compliance with CEQA. All timber harvesting activities in the UER watershed will first be certified by CAL FIRE and considered to have completed the CEQA Functional Equivalent process. Regional Water Board staff participate in the THP review process, which provides a mechanism to ensure compliance with the Order and a supplemental CEQA review for individual THPs. Applicable FPRs and other mitigations identified in the THP review process are included as enforceable provisions of the Order.

Endangered Species Act and Habitat Conservation Plan

All of HRC's ownership in the UER watershed is covered by a multi-species state and federal Habitat Conservation Plan (HCP), which was approved in 1999 by the California Department of Fish and Game (now CDFW), the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFW). The state and federal Incidental Take Permits (ITP) issued for aquatic species including Chinook salmon, Coho salmon, cutthroat trout, steelhead trout, southern torrent salamander, tailed-frog, red-legged frog, foothill-yellow legged frog, and the northwestern pond turtle are most relevant to protection of the Beneficial Uses of UER. The management measures for water quality protection of the HCP were the subject of the federal Environmental Impact Statement and state Environmental Impact Report which led to the issuance of the ITP in conformance with the federal Endangered Species Act.

In 2005, as per the HCP requirements, PALCO conducted a watershed analysis of the Elk River and Salmon Creek watersheds. Watershed-specific prescriptions were developed for these watersheds that included riparian and landslide protections. The watershed analysis was revisited in 2014, and additional updates to the specific prescriptions were made. The revised sections of the HCP addressing Hillslope and Riparian Management Zone Prescriptions and Control of Sediment from Roads and Other Sources are included as enforceable provisions of the Order.

Master Agreement of Timber Operations

The CDFW has jurisdiction over the conservation, protection, restoration, enhancement, and management of fish, wildlife, native plants, and habitat necessary for sustainable populations of those species under state law, including Fish and Game Code , section1600 *et seq*. In August of 2006, HRC submitted a notification to CDFW for a long-term master harvesting operation lake and stream bed alteration agreement (MATO) pursuant to Fish and Game Code section1602 and 1605(g) for road work activities associated with the HCP. The MATO was issued in May 2011, and subsequently updated in June 2015. Section 10 of the MATO provides a detailed list of conditions necessary for protection of fish and wildlife resources from impacts of covered activities subject to the agreement.

Land Use Zoning

Current land uses in the UER are largely determined by local zoning regulations which have zoned 82% of the area as timber production zone. Most of the UER (75%) is privately managed for industrial timber harvest, with the exception of the federally managed Headwaters Forest Reserve (located in the South Fork Elk River subbasin) and a small portion dedicated to private residential and agricultural uses in the lower South Fork Elk River valley.

H. SPECIFICS OF PROPOSED PROJECT AND GENERAL ENVIRONMENTAL CONCERNS

This section describes the potential impacts of timber harvesting and related management activities and the measures incorporated into the Order to mitigate those impacts.

General Effects of Timber Harvesting

The UER has been utilized primarily for timber harvesting since the 1850s. A wide range of environmental effects at varying spatial and temporal scales can result from timber harvesting. In addition, the impacts can vary greatly depending on factors such as pre-harvest stand condition and harvesting practices used. For example, clearcutting an old growth stand can have significantly different results than thinning a suppressed stand second growth stand. Removal of trees diminishes the structure of a forest stand for a period of time. However, a forest is a dynamic environment, which even under natural conditions, changes constantly as trees grow, mature, and die and are replaced by new trees. A portion of the trees in a forest can be harvested and the remaining stand may retain much of the inherent qualities of a mature forest that support a watershed's physical and ecological integrity. This is not the case with intensive harvesting practices such as clearcutting, which transforms a forest stand into essentially non-forest conditions for a period of time until trees grow back. When an old-growth forest is clearcut, as occurred in UER beginning in the mid-1800s and continuing episodically through the end of 1900s, its inherent ecological integrity and unique characteristics may be lost for centuries. The majority of the timber in the UER is now in a condition of varying stages of second growth conifers and hardwood, with the exception of approximately 5,000 acres of intact old growth forest remaining in the Headwaters Forest Reserve in the Little South Fork Elk River. Impacts resulting from timber harvesting are not limited solely to those caused by tree removal, but also those caused by ground disturbance and changes to watershed hydrology associated activities such as road construction and use and transporting trees to roads and landings. Water quality impacts from this history of timber management activities are mostly associated with increased sedimentation resulting in:

a. Impaired domestic and agricultural water quality;
b. impaired spawning habitat; and
c. increased rate and depth of flooding due to channel in-filling by sediment.

These impacts result from a complex interaction between inherent watershed characteristics, such as geology and geomorphology, external natural processes such as climate and timing of stochastic events (i.e. large storms, earthquakes, fires) and type of management practices and extent and rate of watershed area disturbed. Increased sediment production is the result of greater incidence of landsliding, surface and gully erosion, and increases in channel erosion due to higher runoff rates. Much of the increased sediment production is associated with roads, skid trails, and landings, with the highest potential for sediment discharge occurring at road watercourse crossings.

HRC practices uneven-aged silvicultural techniques, such as selection and variable retention systems that result in generally continuous forest cover and a mix of age classes. Harvest management design criteria (referred to as prescriptions) are designed to capture mortality, improve the health of timber stands, and restore native species compositions more similar to what exited prior to the onset of widespread harvesting in the watershed. As the extent of mortality and inferior trees within a stand decreases from successive entries, the harvest orientations turn more towards spacing and concentration of growth on the best phenotypes of the desired species. Unless dictated by inordinate mortality, HRC's selection harvest entries into the watershed are planned to occur on 10-20 year intervals within an individual stand. Regeneration objectives are achieved through a combination of natural and artificial regeneration. HRC's silvicultural policy is based on the following:

- Operate without traditional clear-cutting;
- Harvests will retain elements of the original stand such as snags, green trees; stand structure, and other features important for a variety of functions for biotic organisms;
- Harvest less than growth so forest stand volume increases over time;
- Uneven-aged management will be employed on well-stocked conifer stands; and
- No harvest of old growth.

The overall result of timber harvesting as described in HRC's management strategy is a "managed" forest, which is qualitatively different from an untouched old growth forest. However, the management strategy is designed to retain much of the wildlife and watershed functions of the forest and will maintain or improve those values over current conditions. While it is difficult to quantify, when the proposed rate of harvest and partial harvesting methods are considered together with the emphasis on landslide avoidance strategy, landslide hazard analysis, and land management prescriptions, the potential for watershed impacts from timber harvesting is considered to be fairly low. That said, new discharges of sediment from harvesting and associated activities can be significant due to the existing impacted and degraded water quality of the watershed.

Mitigation Measures to Prevent Sediment Discharge

Specific requirements to prevent new sediment discharge and address existing discharges fall into several categories discussed below, including forest management (including harvest rate limits), limited harvesting in areas with high risk of sediment discharge, riparian protections, roads management, landslide prevention, wet weather restrictions, inventory and treatment of existing controllable sediment sources, and watershed restoration efforts. In addition, the Order includes a monitoring and reporting program designed to evaluate the effectiveness of sediment control measures, identify where additional measures are necessary, and track in-stream water quality trends. Management measures in separate categories often overlap, and also provide benefits relevant to other categories. For example, riparian protections can preserve shade and prevent increases in water temperature as well as reducing sediment discharge and landslides.

Forest Management/Harvest Rate
Tree removal can result in reduced interception, evaporation, and evapotranspiration of rainfall by forest canopy and can therefore increase the volume of precipitation that infiltrates and remains in soils, increasing pore pressure, and altering stream hydrographs by increasing the magnitude and shortening the duration of peak flows in watercourses. Increased pore pressures can increase the likelihood and magnitude of slope failures. Changes in hydrographs can result in channel scour and increases in bank failures. Tree roots enhance the strength of shallow soils, increasing the soil's ability to resist failure. When trees are harvested their roots gradually decay, reducing the soil reinforcement they provide and increasing the potential for shallow landslides. Harvesting trees can result in increased soil moisture and runoff and decreased root strength, which can contribute to landsliding and increased erosion throughout a watershed. These impacts can be reduced or prevented by limiting canopy removal through silvicultural prescriptions and/or harvest rate limits.

The rate of harvest in a watershed is an important management variable. Various studies cite specific thresholds for the rate of harvest, above which, cumulative impacts become more likely to occur and have linked specific processes to watershed impacts, such as increased peak flows from road and canopy removal (Lisle et al. 2000, Lewis et al. 2001), landslide related sediment discharge (Reid, 1998), road density (Cedarholm et al. 1981, Gucinski et al. 2001, Trombulak et a, 2000), or equivalent clearcut area[3] (USDA Forest Service, 1974). Watershed-wide

[3] Equivalent clearcut area (ECA) is a widely used methodology developed by the United States Forest Service (USFS) to account for the relative impacts of different types of silvicultural treatment. It assigns a weighting factor of one to clearcutting and a value less than one for partial harvesting silvicultural treatments. The weighting factor for a silvicultural treatment is multiplied by total area

average annual harvest rates required under the Order equate to less than 1.5% equivalent clearcut acres. These rates are lower than required under the 2006 WWDRs, which allowed annual harvest rates of 1.9% in the North Fork and 1.8% and upwards in the South Fork. Based on the transition to uneven-aged management under HRC's ownership, the proposed average annual harvest rate throughout the UER is less than 1.5% equivalent clearcut acres, the harvest rate above which Klein et. al (2012) found elevated chronic turbidity levels. In order to ensure that proposed harvest rates do not contribute to ongoing cumulative impacts on water quality, the Order establishes a threshold of concern of 2% equivalent clearcut acres per year in any subwatershed averaged over any 10 year period. Where an individual, or multiple, THP(s) would result in an average annual harvest rate in any subwatershed above 2% equivalent clearcut acres over any 10 year period, the Executive Officer or Regional Water Board may decline to enroll the THP(s), or portions of the THP, or may condition enrollment on HRC implementing additional mitigation and monitoring requirements.

Riparian Zone Management
Under natural conditions, the riparian areas in the UER created complexity in stream channels, both in the steep upper watershed as well as in depositional reaches. A riparian zone helps maintain healthy stream ecosystems and supports beneficial uses by:

- Stabilizing banks through provision of roots cohesion on banks and floodplains;
- Filtering sediment from upslope sources;
- Filtering chemicals and nutrients from upslope sources;
- Supplying large wood to the channel, which maintains channel form and improves in-stream habitat complexity;
- Helping to maintain channel form, in-stream habitat, and an appropriate sediment regime through the restriction of sediment inputs or metering of sediment through the system;
- Moderating downstream floods peaks through the temporary upstream storage of water;
- Helping maintain cool water temperatures through provisions of shade and creation of a cool and humid microclimate over the stream; and
- Providing both plant and animal food resources for the aquatic ecosystem in the form of, for example, leaves, branches, and terrestrial insects.

Alteration of physical processes in riparian zones have led to reduced complexity, including reduction in the trees available within riparian areas for recruitment to streams, increased surface erosion and landsliding, and destabilization of stream channels. Subsurface erosion of soil pipes is prevalent in the UER, particularly in swales above small headwater channels. Preferential flow through soil pipes results in internal erosion of the pipe, which may produce gullies by tunnel collapse.

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treated under each silviculture to arrive at a normalized disturbance calculation. Therefore, 100 acres of selection harvest, which is typically assigned a ECA factor of 0.5, would be counted as 50 equivalent clearcut acres.

Considerations of the interactions between sediment processes, water temperature, and riparian trees are essential for evaluating and avoiding these management related impacts to streams. Management of riparian zone must be designed to preserve and restore the function of riparian vegetation and hillslope processes, including retention of adequate riparian zone trees and avoiding use of roads and heavy equipment on vulnerable hillslopes and swales.

The Order relies in part on water quality protection derived from the Elk River/Salmon Creek Watershed Analysis Revisited (ERSC WA), prepared by HRC in June 2014 pursuant to the provisions of their HCP. The ERSC WA establishes forest management prescriptions pertaining to slope stability and riparian protection established in consultation with state and federal resource agencies. The Order includes as enforceable provisions those prescriptions designed to prevent or minimize sediment delivery to Class I, Class II, and Class III watercourses, with additional water quality protections in high risk areas. These are summarized below:

Protection measures for Class I RMZs include:

- RMZs for Class I watercourses extend to 150 feet on either side of the channel;
- No harvesting within 50 feet of Class I watercourses;
- Retain the 18 largest conifer trees per acre (measured along 435 feet of watercourse length and within 100 feet of the watercourse and lake transition line);
- Between 50 feet and 150 feet of Class I watercourses, retain a minimum of 50 percent conifer canopy;

Protections measures for Class II RMZs in high risk areas include:

- RMZs for Class II watercourses extend up to 200 feet on either side of the channel;
- No harvesting within 30 feet of Class II watercourses;
- Between 30 feet and 200 feet of Class II watercourses, or to the hydrologic divide, retain a minimum of 60% post-harvest conifer canopy coverage.

Specific requirements for Class III protection measures in high risk areas include:

- RMZs for Class III watercourses extend up to 100 feet on either side of the channel, or to the hydrologic divide;
- No harvesting within 20 feet of Class III watercourses;
- Between 20 feet and 100 feet of Class II watercourses, retain a minimum of 70% post-harvest conifer canopy coverage.

Additionally, only single tree selection will be utilized in RMZs. No small group openings will take place. No ground based equipment, with the exception of at existing roads and permitted new road construction, is allowed within 150 feet of a Class I watercourses, 100 feet of Class II watercourses, and 50 feet of a Class III watercourse or to the closest hydrologic divide.

Erosion control practices in RMZs will implement the highest feasible erosion control methods including surfacing all segments of road and skid trails within riparian areas with pavement, rock, slash, mulch, straw, or other adequate materials. Practices that trap and filter all road and skid trail surface drainage within riparian areas to prevent the discharge of sediment to watercourses will also be used. Tractor crossings in un-channeled swales are to be avoided, and trees along the centerlines of swales and in areas of subsurface flow paths will be retained.

Control of Sediment from Roads
The Elk River sediment source analysis as well as other sediment TMDLs adopted for watersheds throughout the North Coast Region have identified logging roads as one of the most significant sources of anthropogenic sediment discharge. Logging roads can alter hillslope hydrologic processes and increase sediment discharge from surface and gully erosion and landslides. Roads can contribute to landsliding by undermining and over steepening slopes and placing poorly compacted fill material on steep slopes. Roads also intercept and concentrate shallow groundwater and surface runoff, which can cause gully erosion and saturate vulnerable slopes, increasing the potential for failure. Road crossings of watercourses are subject to the force of high stream flows and failure usually results in direct delivery to streams. Road crossings of watercourses are one of the most common controllable sediment sources. Management practices to reduce the potential for road related sediment discharge have become standard in timberlands throughout the North Coast. Inventory and treatment of existing controllable sediment sources from roads is addressed under a separate heading below.

A programmatic approach to road construction, reconstruction, maintenance, decommissioning and regular inspections is essential to controlling sediment discharge from roads. A widely used reference document for planning, designing, constructing, reconstructing, maintaining, and decommissioning roads on forestlands in the North Coast is the Handbook of Forest and Ranch Roads (Weaver and Hagans, 1994). The Handbook contains a comprehensive suite of measures for forestland roads that Regional Water Board consider adequate and necessary to control sediment discharge from roads. Roads that have implemented all feasible site specific sediment control measures as described in the Handbook are referred to as "stormproofed."

Stormproofed roads incorporate the design features as summarized below into construction of new roads or reconstruction of existing roads:

- Hydrologically disconnecting road segments from watercourses and minimizing concentration of surface runoff by installing drainage structures at sufficient intervals to disperse runoff so as to avoid gully formation and minimize erosion of the road surface and inside ditches;
- Identifying and treating potential road failures (mostly fill slope failures) that fail and deliver sediment to streams;
- Designing watercourse crossings to minimize the potential for crossing failure and diversion of streams and sizing adequately to accommodate estimated 100-year flood flows (including wood and sediment);

- Inspecting and maintaining roads annually; and
- Avoiding or limiting wet weather road use to well rocked, paved, or chip sealed surfaces.

Sediment control measures for roads from the HCP largely rely on implementation of standards identified in Weaver and Hagans Handbook. Implementation of these road prescriptions are established as specific requirements of the Order. These requirements include:

- Implementing management practices and specifications to prevent and minimize sediment discharge from active roads;
- Upgrading of all roads by October 15, 2018, to meet the storm-proofed standard;
- Treating road-related controllable sediment discharge sources currently identified in the inventory by October 15, 2018;
- Maintaining and updating the inventory of controllable sediment discharge sources from roads;
- Inspecting all roads within their Elk River ownership at least annually between May 1 and October 15;
- Inspecting storm-proofed roads as soon as conditions permit following any storm event that generates 3 inches or more of precipitation in a 24-hour period, as measured at the Elk River rain gauge; and
- Notifying the Regional Water Board within one year of identifying new sediment discharge sources from roads; documenting and implementing measures to prevent or minimize sediment discharge at any new controllable sediment discharge sources identified during road inspections.

Landslide Prevention

Due to the weak geologic bedrock underlying much of the watershed, relatively high rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout much of the UER are naturally vulnerable to landsliding. Natural rates of landslide related sediment production vary based on the occurrence of landscape disturbance such as large storms, fires, earthquakes or other infrequent natural events. Timber harvesting and associated ground disturbance can result in increased rates of shallow landslides on vulnerable slopes due to decreases in root strength, increased soil moisture, altering hillslope hydrologic process, and oversteepening or loading slopes by cut and fill road construction.

Tree roots can enhance the strength of shallow soils, increasing the soil's ability to resist failure. When trees are harvested, their roots gradually decay, reducing the reinforcement they provide and increasing the potential for shallow landslides. The loss of root strength gradually increases over a period of several years, with the critical period of maximum loss occurring approximately 5 to 15 years after harvesting. Loss of root strength varies with species and intensity of harvest. Interception, evaporation, and evapotranspiration of rainfall by forest canopy can reduce the volume of precipitation that infiltrates and remains in soils. Harvesting trees can therefore result in increased soil moisture and runoff, which can contribute to landsliding and increased erosion. Construction of roads, skid trails, and landings can also increase landsliding. Excavations on vulnerable areas to construct roads and skid trails can undermine steep slopes. In addition, fill material placed on steep slopes on the outboard edge of roads can fail. Such failures can trigger larger failures on slopes below, often displacing large volumes of debris which can be transported considerable distances down slope.

The sediment source analysis found that landslide-related sediment production increased over two-fold above natural rates during the period between 1955 and 2001, with the highest rates (almost 5 times natural landslide rates) observed during the 1988 to 1997 time period. Open-slope landslides and road-related landslides were the dominant sediment sources during this period. Landslide-related sediment production has declined in the UER during subsequent time periods, notwithstanding large storm events that occurred in 2003 and 2006. Declines in landsliding rates are thought to be partially the result of the HCP mass wasting avoidance strategy, which limits or precludes operations on areas identified as high landslide hazard as well as the ERSC WA prescriptions for landslide prevention.

HRC's approach for evaluating landslide hazards relative to proposed land use activities includes ERSC WA Prescriptions. As part of THP planning, a review of pertinent technical data are conducted to denote potential high risk slopes, including landslide inventories, regional geomorphic maps, stereoscopic aerial photographs, and a shallow landslide potential map developed using the SHALSTAB landslide model. The Order requires the implementation of the following prescriptions as part of HRC's hillslope management mass wasting strategy:

- Utilize a hillslope management checklist to identify areas that are particularly vulnerable to mass wasting;
- No harvesting or road construction or reconstruction on Class I inner gorges; and
- No harvesting or road construction or reconstruction on the following areas without characterization and development of measures to protect water quality prescribed by a PG:
    - Class II or III inner gorges
    - headwall swales;
    - other areas with very high mass wasting hazard (including slopes greater than 60%; and
    - earthworks (skid trails, landings, road prisms, or other earthen structures) exhibiting characteristics identified in the hillslope management checklist.

In addition to the hillslope management mass wasting strategy described above, HRC implements a comprehensive approach to preventing increases in landslide related sediment discharge that includes characterization of landslide hazards, designing projects to minimize impacts to slope stability based on site specific hazards, and ongoing monitoring of landslide activity to better understand landslide patterns and modify management practices based on observed activity. The California Geological Survey Note 45 provides guidelines for Engineering Geologic Reports for Timber Harvesting Plans, which must be prepared by California

Professional Geologist (PG) who is familiar with watershed characteristics. The Order establishes requirements for characterization of geologic hazards by a PG and development of site specific mitigations. Characterization of landslide hazard should at a minimum consider the following information:

- Existing hazard maps derived from slope stability models;
- Available maps and reports;
- Aerial photographs;
- Field investigation and mapping; and
- Applicable studies and technical models.

During development of individual THPs, a PG evaluates potential effects on slope stability and surface soil erosion, and landslide related sediment discharge from the proposed management activity, identifies problem areas, and describes specific mitigation measures needed to minimize potential effects for identified areas of concern. The site-specific mitigations are based on the potential hazard process (likelihood of landslide initiation or acceleration in sediment mobilization or water flow, and the potential risk to water quality). Where appropriate, mitigations include, but are not necessarily limited to the following:

- Limit canopy removal in areas with elevated landslide hazard;
- Limit activities upslope of existing landslide and on vulnerable portions of deep seated landslides;
- Avoid road or skid trail construction on steep or vulnerable slopes; and
- Stabilization of existing landslides where applicable by methods such as planting, manipulate drainage, buttressing, and other feasible engineering techniques.

The Order establishes enforceable provisions to prevent increases in sediment discharge associated with HRC's timber harvest activities. The provisions entail an overall strategy that includes HRCs hillslope management mass wasting strategy from the ERSC WA, as well as additional measures included in their ROWD and those deemed necessary by Regional Water Board to prevent management related landsliding. These are summarized below as follows:

- Harvest rates throughout HRC's ownership in the UER that are less than those allowed under the limits set by the landslide reduction model under the current WDRs;
- Use of partial harvesting methods that retain a significant component of post-harvest root strength;
- Limited harvesting in high risk subwatersheds;
- Riparian protection zones, which include no harvesting within 50 feet of Class I watercourses, 30 feet of Class II watercourses, and 20 feet of Class III watercourses in high risk areas; ground-based equipment limitations within specified areas of Class I, II, and III watercourses; and significant tree retention up to 150, 200, and 100 feet of Class I, II and III watercourses respectively;
- Review by licensed geologist of all proposed activities, including harvesting and construction or reconstruction of roads and watercourse crossings; and
- Implementation of HRCs ERSC WA hillslope management prescriptions.

Wet Weather Restrictions
Conducting timber operations during wet weather increases the potential for sediment production and discharge from roads, landing, and skid trails. Use of trucks and heavy equipment during saturated soil conditions can compact soil, create ruts which effect road drainage, and increase production of fine sediment. Typically the most effective way to prevent impacts from operations during saturated soil conditions is to avoid operations during the period of the year when rain is likely to occur. This allows for timely implementation of seasonal erosion control, completion and stabilization of construction and reconstruction of roads, landings, skid trails and watercourse crossings. In the North Coast, over 90% of average annual precipitation falls between October 15th and May 1st.

In order to minimize the impacts of conducting timber operations during wet weather, the Order applies the following seasonal restrictions:

- Road construction or reconstruction may not take place between September 15 and May 1 except in response to failure of a road segment or watercourse crossing that is resulting in ongoing or imminent sediment discharge.

- Between October 1 and May 1, timber falling and cable yarding are permitted. Ground-based yarding and site preparation are prohibited.

- Additional wet weather operations consistent with HRC's ROWD and HCP wet weather prescriptions.

In addition, the following FPR restrictions on conducting timber operations during saturated soil conditions[4] apply:

914.7– "Tractor yarding or the use of tractors for constructing logging roads, landings, watercourse crossings, layouts, firebreaks or other tractor roads shall be done only during dry, rainless periods and shall not be conducted on saturated soil conditions that may produce significant sediment discharge."

915.1 – "Heavy equipment shall not be used for site preparation under saturated soil conditions that may produce significant sediment discharge; or when it cannot operate under its own power due to wet conditions."

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[4] **Saturated Soil Conditions** means that soil and/or surface material pore spaces are filled with water to such an extent that runoff is likely to occur. Indicators of saturated soil conditions may include, but are not limited to: (1) areas of ponded water, (2) pumping of fines from the soil or road surfacing material during timber operations, (3) loss of bearing strength resulting in the deflection of soil or road surfaces under a load, such as the creation of wheel ruts, (4) spinning or churning of wheels or tracks that produces a wet slurry, or (5) inadequate traction without blading wet soil or surfacing materials (FPR section 895.1).

923.4 – "Logging roads or landings shall not be constructed or reconstructed under saturated soil conditions that may produce significant sediment discharge, except that construction may occur on isolated wet spots arising from localized ground water such as springs, provided measures are taken to prevent significant sediment discharge."

Limited Harvesting in High Risk Subwatersheds
Regional Water Board staff evaluated the relative risk of sediment production and discharge in each subwatershed in the UER based on probabilistic landslide hazard, bedrock geology, and observed sediment production from 2000-2011. This evaluation was used to establish a ranking of relative risk to water quality of low, moderate, or high for each subwatershed. Similarly, section 5.4 of the ROWD identifies five subwatersheds predominantly underlain by the Hookton Formation, a geologically young sandstone/siltstone bedrock unit that is highly vulnerable to surface erosion and mass wasting. These areas closely correlate with the Regional Water Board's assessment, and include: Clapp, Tom, and Railroad Gulches, McCloud Creek, Mainstem Elk River, and the Lower South Fork Elk River. Sediment production from these subwatersheds, which are also located directly above and adjacent to the impacted reach of the South Fork Elk River, is among the highest observed throughout the UER. Further refinement of the relative risk ranking based on subwatershed sediment production, landslide hazard, and observations by field staff of areas dominated by the Hookton Formation, have resulted in identification of areas within portions of the six subwatersheds identified above that are therefore appropriately considered as high water quality risk for the purposes of the Order. The Order establishes a limited harvesting requirement, expanded riparian management zones on Class II and III watercourses, and strict limits on winter period operations in high risk areas. By refining water quality risk in specific areas, HRC can still engage in timber operations while limiting activities in the most sensitive areas to allow active measures to be taken to improve downstream beneficial uses.

Inventory and Treatment of Controllable Sediment Discharge Sources
Timber harvesting and associated road construction and use have historically left disturbed areas throughout the landscape that have the potential to discharge sediment over extended periods of time. These legacy sites may include failing or failed watercourse crossings, road failures, road surfaces, landslides, unstable watercourse banks, soil stockpiles, skid trails, landings, exposed harvest units, or any other site discharging or threatening to discharge waste or earthen materials (referred to as controllable sediment discharge sites [CSDS]).

The identification, evaluation, and treatment of CSDS are important components of a strategy to prevent or minimize ongoing sediment discharge. The Order supersedes two existing CAOs No. R1-2004-0028 and R1-2006-0055 that required inventory, prioritization and treatment of CSDS related to roads, off-road sites, and landslides throughout HRC's ownership in the UER watershed. The majority of road related sites have been treated as of the end of 2015. Treatment of all road related sites is scheduled to be completed by the end of 2017. As a result of the CAOs, over 12,300 acres has been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trail, were identified. As a result, over 12,300 acres have been surveyed since 2007 and 143 off-road CSDSs, primarily associated with skid trails, were identified. As of 2014, corrective action had been implemented at approximately half of these sites. HRC will continue to treat these sites annually according to the prioritization described in the master treatment schedule (Attachment C to Order 2016-0004), as well as concurrently with timber operations for those sites located in the vicinity of THPs.

New active or potential sediment sources are also identified through implementation of an Annual Road Inspection Program (ARIP). This program requires that all accessible roads be inspected for maintenance needs at least once annually. CSDSs identified by ARIP, storm-triggered inspections, and active THP inspections are typically scheduled and treated within one year of discovery during the drier months of the year (May – November) and will be included in annual reports pursuant to the monitoring and reporting requirements of the Order. HRC maintains an inventory to track these new CSDS when identified and subsequently treated. Additional non-scheduled routine minor maintenance (i.e. shaping of road surface, cleaning of inboard ditches and culvert inlets, maintenance of energy dissipation/downspouts, and roadside brush maintenance) also occur as needed in response to road inspection results and management directive.

CSDSs not previously identified are also addressed by preparation and submittal of Erosion Control Plans (ECPs) for individual THPs. ECPs must include an inventory of CSDS within the logging area of all THPs submitted by HRC. The inventory must include a description of each CSDS and corrective actions that can reasonably be expected to control sediment discharge from each site. Corrective action for each site must be implemented during the life of the THP. In addition, HRC must conduct three annual inspections of the THP project area including appurtenant roads and harvest units where timber operations are or have been active.

In-Stream Sediment Sources and Restoration

The sediment source analysis estimates that in-channel sources such as low order channel incision, bank erosion, and streamside landslides represent approximately 56% of the potential sediment load from the UER. In-channel sources such as these can be difficult to treat due to limited access and the potential for corrective action to result in short-term increased sediment discharge with no guarantee of long term improvements. The Order requires that HRC conduct a feasibility study to evaluate potential methods to control in-channel sources or trap or meter sediment in the UER before it can be transported to the impacted reach.

If the feasibility study identifies potential methods that may be effective in reducing in-channel sources, such methods should be tested through design and implementation of small scale pilot projects. If the pilot projects demonstrate the success of methods to reduce transport of sediment from tributaries in the UER to the impacted reach, HRC is to develop a plan to implement these methods on a wider scale throughout the UER. If the feasibility study concludes that no, or limited, effective methods for control of in-channel sources in the UER are feasible, resources that would have been used for that work should be committed to projects to improve beneficial use impairment in the impacted reach.

In-stream restoration and enhancement work consisting primarily of loading the stream with large wood placement to provide increased aquatic habitat complexity including pool development, sediment sorting, shelter and refuge has been implemented in the upper watershed since the 1990s. In addition to on-property conservation restoration and enhancement activities, HRC is also partnering with the Regional Water Board, other agencies, and NGOs to address chronic downstream health and safety concerns relative to water quality and domestic water supply, and winter storm flooding, including both financial and in-kind contributions to both the Elk River Recovery Assessment and Watershed Stewardship Program Projects.

HRC may conduct various types of restoration projects intended to improve fish habitat and control sediment delivery from in-stream and near-stream resources. Restoration activities covered under the Order would take place within the smaller, tributary watersheds to the South Fork and North Fork of Elk River, and would include projects such as:

- Large wood augmentation for the purposes of improving fish habitat and sediment routing. Methods could include falling riparian zone trees or placement of logs and stumps using heavy equipment;
- Streambank stabilization using large wood, excavation, planting, rip-rap, or other methods;
- Removal or reconstruction of watercourse crossings and near stream road segments;
- Construction of in-stream or off-channel sediment detention basins; and
- Excavation of in-stream sediment deposits.

Large wood performs important functions in stream channels: sorting sediment, scouring pools, and providing cover for fish. Individual pieces of large wood are episodically transported downstream during high, turbulent flow conditions, becoming temporarily lodged at new locations in the channel until they eventually decay or exit the watershed.
Large pieces of wood can catch other pieces, creating a log jam. As large wood moves through a stream, it changes flow dynamics, which can allow for both scouring and storage of sediment stored in the channel and on banks, resulting in pool and riffle formation, as well as improved salmonid habitat conditions.

Streambank stabilization is intended to remediate existing and prevent further in-channel failures adjacent to watercourses within the UER. Stabilization would be achieved using large wood, excavation, planting, rip-rap, or other methods. Removal or reconstruction of watercourse crossings will be done prevent and minimize erosion and hydrologic connectivity and road sediment delivery.

Removal or reconstruction of watercourse crossings and near stream road segments will reduce the hydrologic connectivity of the road system to the UER, reducing the amount of sediment that can potentially be delivered to the system and re-establishing more natural hillslope and instream hydrology.

Construction of in-stream or off-stream sediment detention basin will allow for attenuation of peak flows and sediment routing from the water column for later removal. Excavation of in-stream deposits would be done in order to prevent further downstream transport and eventual deposition of sediment within the nuisance reach.

REMEDIATION AND RESTORATION IMPACTS

This document addresses impacts from remediation and restoration described in the Order for treatment and control of CSDS and instream sediment control and restoration, including pilot projects for the instream feasibility study and HRCs voluntary restoration activities. As described above, the Order requires treatment of CSDS to reduce potential existing sediment inputs to the Elk River. By definition CSDSs have the potential to discharge sediment to waters of the state. The goal of treatment is to prevent the sediment from being mobilized and transported to waters. Implementation of corrective action on a CSDS often entails excavation of near-stream areas as well as channels and banks, installation of new drainage structures, disturbance of soil and loss of vegetation in riparian areas. These activities have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is in improve long-term site stability and decrease sediment discharge. Therefore, the result is going to be long term environmental benefit. In addition, short term impacts can be minimized by implementation of appropriate management practices as described in the section below.

In addition, other restoration activities have the potential to result in impacts to the already-impaired UER, including:

- Increased erosion and short-term sediment discharges, short-term increases in turbidity and total suspended solids levels during construction and following construction;
- The introduction of hazardous materials (e.g. oil, grease, gasoline, hydraulic fluids and solvents) to the UER from construction staging locations;
- Re-routing of in-stream flows that could result in accelerated bank and channel erosion;
- Loss of riparian area function due to channel rocking or other stabilization activities;
- Increases in water temperature due to loss of riparian trees from felling; oil, fuel, and other fluids from heavy equipment being discharged to waters of the state;
- Siltation of spawning and rearing habitat for anadromous fishes;
- Mortality of fishes due to direct injury during in-channel construction activities;
- Permanent and temporary loss of shaded riverine aquatic habitat due to removal of established riparian vegetation along the banks of the UER;
- Temporary loss of fish passage during in-stream project work; and

- Increased aggradation, frequency, and magnitude of flooding in the nuisance reach due to upstream sediment mobilization and subsequent deposition.

Some restoration projects that involve construction and other work in waters of the United States (that are not included under timber activities) may require a federal permit pursuant to section 404 of the Clean Water Act or other federal law. Section 401 of the Clean Water Act requires each applicant for a federal license or permits to provide water quality certification from the state in which the activity will occur. All water quality requirements are contained in the main body of the WDR and most remediation and restoration activities are expected to be included as part of HRC's timber management activities. Nevertheless, in the event that the Army Corps of Engineers requires a Clean Water Act section 404 permit for a given restoration project in the UER, HRC must submit a request for, and obtain, a section 401 water quality certification by submitting a Notice of Intent (NOI) to the Regional Water Board.

While short term impacts may result from implementation of restoration projects, the desired outcome of this work is in improve long-term stability, decrease sediment discharge, improve streams capacity to meter or route sediment, and improve habitat for anadromous salmonids. Therefore, the result is going to be long term environmental benefit. In addition, short term impacts can be minimized by implementation of appropriate management practices as described below.

HRC's approach for conducting restoration includes utilizing the methods, techniques, and BMPs contained in the *California Department of Fish and Game Habitat Restoration Manual*, the *Handbook for Forest, Ranch & Rural Roads*, and the *Natural Resources Conservation Service Stream Restoration Design: National Engineering Handbook*. In addition to these publications, HRC's MATO with CDFW (updated and revised in 2014) contains conditions and requirements for restoration activities. Attachment A of this Initial Study provides a comprehensive list of conditions enforceable under the MATO that are designed to prevent or minimize impacts with construction, reconstruction, or restoration work in stream, and near-stream zones.

Past restoration activities undertaken by HRC have demonstrated that proper implementation of the requirements, conditions, best management practices, and on-the-ground prescriptions contained in these documents can mitigate impacts from the listed restoration activities to less than significant. Where applicable, in-stream work, including placement of wood for enhancement of fish habitat or sediment storage, armoring of banks using unanchored wood structures, excavation of channels and stream banks to stabilize, trap, or remove excess sediment, shall be done in accordance with techniques in the California Salmonid Stream Habitat Restoration Manual (Habitat Restoration Manual). The placement and construction of such in-stream structures shall be planned and conducted to persist when subjected to large flood events.

Attachment A of this initial study include a list of Best management practices (BMPs) designed to prevent or minimize impacts, particularly sediment discharge and increased suspended sediment, associated with stream restoration and remediation. The Order requires HRC to utilize and implement Standard BMPs for Restoration Projects contained in Attachment A when implementing remediation and restoration activities, which include but are not limited:

- Temporal Limitations on restoration activities, which include seasonal, restrictions as well as restrictions based on
- Limitation on Earthmoving and construction Equipment to minimize soil and compaction;
- Erosion Control Requirements to stabilize areas disturbed during restoration work;
- Guidelines for minimizing impacts from channel excavation and stream bank stabilization;
- Limitations on work in streams and Wet Areas;
- Guidelines for temporary stream diversion and dewatering in flowing streams;
- Protection of Sensitive Species.

HRC has indicated a willingness and commitment to participate in a watershed stewardship process to address beneficial use impairments in the impacted reach. In addition, the Order allows limited timber harvesting in high risk watersheds so long as the project proposal as implemented will make a meaningful contribution to correcting beneficial use impairment in the impacted reach. Project proposals may include:

- Flood flow routing improvement (e.g. replace earthen approaches on bridge with culverts, riparian plantation thinning);
- Sediment storage reduction (e.g. slowing, trapping, removing) accumulated sediment in or delivering to the impacted reach;
- Water supply reliability (implement alternative supplies); and
- Infrastructure enhancement (E.g. roads, bridges, septics, raise houses).

Programmatic CEQA documentation has been previously developed and adopted by the Regional Water Board in its supplemental environmental documentation (SED) supporting the Temperature Policy and Policy in Support of Restoration. (Cal. Code Regs., tit. 14, § 15251, subd. (g); Cal. Code Regs., tit. 23, § 3782.; available at: (http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/temperature_amendment.shtml)). The SED analyzed and addressed potential impacts and mitigation measures of a full range of potential restoration projects that could be implemented. The SED includes a programmatic statement of overriding considerations if the State or Regional Water Board finds that a project's potentially significant, unavoidable environmental impacts could be acceptable in light of the benefits of attainment and protection of beneficial uses. Decision-makers will have the benefit of project-level review of any large-scale restoration projects. These types of large restoration projects are beyond the scope of this CEQA analysis.

INITIAL STUDY/ENVIRONMENTAL CHECKLIST

CEQA requires a Lead Agency to prepare an Initial Study to determine whether a project may have a significant effect on the environment (Cal. Code Regs., tit. 14, §15063(a)). A "significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance (Cal. Code Regs., tit. 14, §15382). If the Initial Study does not show that there is substantial evidence, in light of the whole record before the agency, that a project may have a significant effect on the environment, a Negative Declaration may be prepared. If the Initial Study identifies potentially significant effects, but identifies revisions or conditions to mitigate the effects to a point where clearly no significant effects would occur, a Mitigated Negative Declaration may be prepared (Cal. Code Regs., tit. 14, §15070).

Proposed requirements to be established in the Order would regulate timber harvesting and related management activities to protect, maintain, and restore water quality to meet Basin Plan objectives, avoid violations of prohibitions, abate or diminish nuisance conditions, and implement TMDL load allocations. The proposed Order is intended to provide additional water quality protection to timber and land management activities that are also subject to rules and restrictions of the California Forest Practice Rules and HRC's Habitat Conservation Plan. The proposed Order relies, in part, on existing prescriptive standards imposed by the FPRs and imposed through the CAL FIRE approved timber harvest plan review process. Conditions added to a THP during the approval process that are intended to protect water quality, such as riparian and hillslope protection and prevention of controllable sediment discharge from roads, are included in the Order and would become enforceable requirements.

For the purposes of this Initial Study, the Regional Water Board has evaluated the potential impacts of all land management activities, which includes timber harvesting (falling and yarding, log hauling), road construction, reconstruction, and maintenance), location of and use of skid trails and landings, and watercourse crossings, site preparation, and restoration activities.

Some of the requirements of the Order are intended to either mitigate or evaluate existing watershed impacts and have no potential for impacts. An example is the requirement that HRC maintain a landslide inventory, which consists of data gathering and interpretation for the purposes of understanding landslide distribution and evaluating and improving management practices. This is an activity that combines field investigation as well as remote sensing (review of aerial photograph) that has no reasonably foreseeable potential for causing significant adverse impacts.

The Order would not limit or change the land owner's responsibility to comply with existing requirements, authorities, or responsibilities imposed by other agencies.

Where applicable, these requirements and authorities of other agencies are described in the following checklist.

For each CEQA factor, the Regional Water Board evaluated potential environmental effects from the Order. The following checklist describes the specific and general requirements included in the Order and mitigation measures to reduce potential impacts to less than significant levels.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors marked below would be potentially affected by this project, as indicated by the checklist on the following pages.

☒	Aesthetics	☐	Agriculture and Forestry	☒	Air Quality
☒	Biological Resources	☒	Cultural Resources	☒	Geology/Soils
☒	Greenhouse Gas Emissions	☒	Hazards and Hazardous Materials	☒	Hydrology/Water Quality
☐	Land Use/Planning	☐	Mineral Resources	☐	Noise
☐	Population/Housing	☐	Public Services	☒	Recreation
☒	Transportation/Traffic	☐	Utilities/Service Systems	☒	Mandatory Findings of Significance

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial study:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date

EVALUATION OF ENVIRONMENTAL IMPACTS

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from § XVII, "Earlier Analyses," may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. (Cal. Code Regs., tit. 14, §15063(c)(3)(D)). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
I. AESTHETICS -- Would the project**:**				
a) Have a substantial adverse effect on a scenic vista?			X	
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?			X	
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?				X

a-c) The majority of the land covered in the Order has been and will be managed consistent with the timberland management of the surrounding lands, which are primarily zoned for timber production. While individual THPs or portions thereof will be in view of communities adjacent to or within view of the THP, aesthetics will be consistent with ongoing timberland management in this area.

Many travelers are interested in this industry and land management as evidenced by attendance at the logging museum and mill tours at Scotia, and the exhibits at the Humboldt Redwoods State Park Visitors Center in Weott. It is part of many travelers' expectations to see areas of on-going timber management, saw mills, log trucks and lumber trucks in northern California, just as they expect to see orchards and row crops from Interstate-5, fishing boats and freighters in our harbors, residences in suburban areas, or office buildings and industrial parks in urban areas. The juxtaposition of the preserved redwood groves within the Headwaters Forest Reserve and these timber production zones is striking and interesting and exemplifies competing land and resource uses. The view of the portions of the landscape that are planned for timber production will continue to change over time, and the implementation of this Order will not alter the view of that changing landscape in a potentially significant way.

Forests are not static; a harvested area will not remain open ground over time. Trees that have been retained, especially redwoods, will expand their crowns to utilize the available sunlight. Redwood stumps will sprout and these sprouts generally grow rapidly. Planted conifers will grow in the open areas. Open areas will quickly regain a forested appearance.

The majority of HRC's land will be harvested using uneven aged management; the canopies of harvest areas would be largely retained, and views of bare or exposed ground would be screened by the canopy. Areas that were previously clearcut will regrow and subsequent areas harvested under the current management practices will much more closely resemble an intact forest. The appropriate finding is **less than significant impact**.

d) The proposed project would not create a new source of substantial light or glare, which would adversely affect day or nighttime views; therefore, the appropriate finding is **no impact.**

II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

a-c) HRC lands in the UER are not Prime Farmland, Unique Farmland, or Farmland of Statewide Importance or otherwise zoned for agricultural use. The proposed project would not involve converting or re-zoning agricultural land to non-agricultural use. There will be no change to agricultural resources in the project area over existing conditions due to timber harvesting activities covered under the Order; therefore, the appropriate finding is **no impact.**

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?			X	
c) Result in a cumulatively			X	

considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?				
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Create objectionable odors affecting a substantial number of people?			X	

a-e) HRC's management activities covered by the Order include road work and heavy equipment use, which could generate dust, particulate matter, emissions from slash burning, and exhaust as part of logging equipment and vehicle use to transport logs, equipment, and workers to job sites, or conducting restoration activities, which could temporarily impact ambient air quality and possibly create objectionable odors.

Increases in road use, road construction, slash burning, logging equipment and vehicle use are not anticipated under the Order. A slight increase in vehicle emissions from Water Board and third-party inspections at various sites in the region could occur. Based on the temporary and geographically dispersed nature of emissions, it is reasonable to conclude that ambient air quality standards would not be violated nor would such emissions interfere with the attainment of ambient standards.

Because potential impacts to air quality are short-term and HRC is responsible for compliance with all local, state, and federal regulations, including the federal Clean Air Act and applicable state air quality standards, activities covered by the Order are not expected to have a significant impact on air quality, and therefore, the appropriate finding is **less than significant impact.**

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
IV. BIOLOGICAL RESOURCES – Would the project:				
a) Have a substantial adverse effect,		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?				
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service?		X		
c) Have a substantial adverse effect on federally protected wetlands as defined by § 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		X		
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		X		
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?		X		

a-c) The goal of the Order is to establish requirements for HRC to conduct timber harvest and related activities in compliance with applicable water quality standards and regulations. Therefore, requirements of the Order are designed to mitigate impacts to the habitat of riparian and aquatic species. These include protection and restoration of the beneficial uses of water, including those that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered. Adverse impacts to such habitat could potentially result from activities covered by the Order either directly from disruption of stream banks, channel, or riparian zone or indirectly from sediment discharges from up-stream or hillslope disturbances. The Order includes a wide range of specific requirements designed to prevent or minimize either direct or indirect adverse impacts to in-stream and riparian habitat. The primary mitigation strategy for avoidance of direct impacts to aquatic and riparian habitat is through RMZ prescriptions and limits on canopy removal as described in section H of this initial study.

The Order relies in part on implementation of the HCP and MATO for water quality improvements. These were prepared and approved by federal and state fish and wildlife agency specifically for the purpose of species protection. Further, CDFW is one of the agencies that participate in individual THP review process to add site-specific mitigation measures as appropriate.

While the Order is not explicitly designed to mitigate potential impacts to terrestrial species, approval of the Order and implementation of the required best management practices, project design features and included mitigation measureswill not significantly alter conditions currently existing in the Project area.

The potential impacts to biological resources from the proposed Project are inferred from existing available habitat and expected post-harvest habitat included within each individual project (THP). Habitat is a reasonable surrogate for projecting the future existence of wildlife and plant species. The impacts to individual species that are anticipated to result from timber harvesting operations are described in each timber harvest plan and address Biological Resources in the following manner:

Birds
Maintenance of diverse forest stand conditions is necessary to provide habitat for the varied species of birds present within the Project area. Following completion of each management activities covered by the Order, significant retention of habitat types that are essential to bird species sensitive to logging-induced habitat changes will be maintained. Essential elements of habitat such as snags, green replacement trees and suitable nesting structures are being retained throughout the logging area and will continue to be retained during future projects as required by the HCP and the FPRs. Forest openings and young forest will continue to offer important habitat to many neotropical migrant birds. In addition, these early-seral areas foster abundant prey species populations—such as wood rats—for raptors.

Because of the gradual average stand age that will be maintained within the Project area throughout the life of the project due to HRC's unevenaged silviculture practices and requirements under their HCP, no significant adverse individual or cumulative effects to bird species are anticipated.

Mammals
Maintenance of a variety of seral stages is necessary to provide habitat for the various mammal species that may occur within the area. A significant retention of habitat type acres that are essential to mammal species will be maintained and disclosed for the project area following permitted management activity. Essential terrestrial habitat attributes such as snags, green replacement trees, and down woody debris for denning sites are being retained throughout the Project area, and will continue to be retained during future projects as required by the HCP and FPRs. Because of the significant amount of mid- to late-seral habitat that will be maintained within the area throughout the life of the project due to the landowner's sustainable silviculture practices and requirements under the landowner's HCP, no significant adverse individual or cumulative effects to mammal species are anticipated.

Rare and Uncommon Plants
The maintenance of diverse forest stand conditions on the landscape over time—especially of individual stages that are regionally restricted—is an essential element to the long-term protection of rare and uncommon flora. The numbers and distribution of rare plants in the redwood region are generally dependent on the diversity of soil types, microclimates, and land use.

Section 6.12 of HRC's HCP, Conservation Plan for Sensitive Plants, specifies measures necessary to avoid significant impacts to plants. These measures include surveys for sensitive plants or potential habitat conducted by a qualified botanist. HRC shall implement feasible measures to avoid, minimize, and/or mitigate significant adverse effects to any rare or endangered plants found during any botanical surveys that are required during harvesting. Listed plant species must be flagged or delineated from herbicide usage through an avoidance strategy wherein those populations will likewise be avoided inside the same flagged or delineated areas. In addition, Technical Rule Addendum #2 from FPR section 912.9 (Cumulative Impacts Assessment Checklist) requires an evaluation of any known rare, threatened, or endangered species or sensitive species that may be directly or indirectly affected by project activities. Because of the patchy distribution of rare and uncommon flora, and the relative lack of occurrence information in the redwood region, occurrence of many rare plants can only be ascertained through careful field surveys. Much of HRC's management activities covered under the Order are subject to site-specific botanical surveys designed to locate rare and uncommon flora. All feasible protection measures developed by a qualified botanist are required to be implemented where necessary to avoid adverse impact.

Because a variety of seral stages are being maintained over time, and botanical surveys are conducted for each THP, compliance with THP, HCP, and Order conditions will protect sensitive plants and potential habitat . No significant adverse individual or cumulative effects to plant species are anticipated.

Amphibians & Reptiles
Because the sensitive amphibian and reptile species have life-history traits that require cool and clean water, avoiding direct impact to Class I and II RMZs is the primary method of protection for amphibian and reptile species. Due to the uneven aged silviculture methods used by HRC, a variety of age classes and tree species will be retained within the project area following harvesting, and will continue to be retained. Maintenance of a variety of forest stand conditions is important because of the various life-history requirements of some amphibians and reptiles. Because significant acreage in streamside areas will be avoided by HRCs harvesting, and compliance with RMZ measures, no significant adverse individual or cumulative effects to amphibians or reptiles are anticipated.

Fish
Elk River, a major tributary to Humboldt Bay, provides important freshwater habitat for anadromous salmonids and steelhead. The watershed is home to five fish species listed under the Endangered Species Act (CDFW 2014). Salmonids are identified in North Coast watersheds as the most sensitive of the native cold-water aquatic organisms. They require clear, cold, well-

oxygenated water; unimpaired migratory access to spawning grounds; clean, un-embedded gravels for spawning; and food, pools, and places to hide from predators for juvenile rearing.

Current habitat conditions throughout much of Elk River are substantially degraded by fine sediment. Stream substrate is very fine, potential spawning gravels are significantly embedded, pool depths and stream channel depths have been decreased by sediment filling (thus reducing salmonid ability to rear, avoid predators, and migrate during low-flow periods), and high suspended sediment concentrations and durations affect feeding and rearing behavior. However, there are still remaining reaches providing habitat and salmonid redd surveys conducted by HRC have shown steady increases since 2006.

The purpose of the Order is to ensure HRC's timber harvest and related activities are conducted in a manner that protects and restores beneficial uses of water in Elk River, including those associated with habitat for anadromous salmonids. Requirements of the Order that will likely result in decreased sediment production and ultimately in improved salmonid habitat include:

- Harvest limits, including Silviculture and rates, designed to minimize increases in peak flow and sediment production;
- Identification of areas with high risk of sediment production and special requirements to limit harvesting activities in these areas;
- Enhanced riparian zone buffers in high risk areas, including no harvesting adjacent to all watercourses, equipment exclusion zones, and tree retention standards;
- Measures to control sediment discharge from roads;
- Measures to control sediment discharge from off-road sites;
- Landslide prevention measures;
- Feasibility study for control of in-stream sediment sources.

As discussed in the section H, *Remediation and Restoration impacts*, implementation of corrective action on a CSDS and restoration projects often entail excavation of near-stream areas as well as channels and banks, installation of new drainage structures, disturbance of soil and loss of vegetation in riparian areas. These activities have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is to improve long-term site stability and decrease sediment discharge. Therefore, the result is long term environmental benefits and an improvement compared to current conditions. In addition, short term impacts can be minimized by implementation of appropriate management practices as summarized in section H and described fully in Attachment A. The Order requires HRC to utilize and implement the mitigations for construction impacts associated with remediation and restoration work contained in Attachment A.

Wetlands
Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin, December 1979). For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

HRC's timber operation in the Elk River must be conducted in compliance with their HCP, California Forest Practice Rules, and their CDFW MATO. All of these include provisions for avoidance and protection of wetland areas.

The HCP includes the following definition of those areas that may meet the definition of, or may contain, wetlands.

Channel migration zone (CMZ)—The boundary generally corresponds to the modern floodplain, but may also include river terraces that are subject to significant bank erosion. The area adjacent to watercourses constructed by the river in the present climate and inundated during periods of high flow. The floodplain is delineated by either the flood-prone area (twice bankfull depth) or the 100-year floodplain, whichever is greater.

Class I Waters—Fish are always or seasonally present onsite. Class I waters include habitat to sustain fish migration, spawning, and rearing. They also include domestic water supplies, such as springs, onsite or within 100 feet downstream from the project operations area.

Class II Waters—Non-fish bearing waters. Aquatic habitat is present for non-fish aquatic species, including in watercourses, streams, seeps, springs, lakes, ponds, and wetlands.

The HCP establishes riparian management zones for the above defined areas, which include no harvesting of tree and equipment exclusion, except for roads and permitted equipment crossings.

HRC forestry staff has received wetland and watercourse identification training. These trainings are internal but include guidance documents and presentations from CDFW, USFWS, NOAA, and CalFire During development of THPs, identification of watercourses and wetlands is conducted by forestry staff. Features are mapped and stored in a GIS database. Protection measures are applied based on watershed prescriptions and included in the permit for the proposed activity such as a THP or watercourse crossing. Generally, forestry staff locates the feature and if necessary wildlife, hydrology, fisheries, or botany staff provide input on the type and extent of the feature and any beneficial uses to native plants and animals that may be present. In questionable or marginal wet areas HRC botany staff trained in Army Corps of Engineers (ACOE) wetland determination/delineation establishes plots within the feature to provide guidance on classification and potential protections. While ACOE does not take jurisdiction over these features the technical documentation serves to reinforce classification of the site. All areas regarded as wetlands by ACOE definitions are afforded Class II protection measures during permitted projects. Wet areas that do not meet ACOE standards may still be considered for protection if aquatic habitat or a predominance of wetland vegetation is present. ACOE determinations follow guidance provided in *US Army Corps of Engineers (ACOE). 1987. Corps of Engineers Wetland Delineation Manual. Wetlands Research Program Technical Report Y-87-1* and *US Army Corps of Engineers (ACOE). Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region. Revised. 4-9-2007*.

Because the nature of permitted activities do not entail development or other permanent alteration of the landscape, no permanent impacts to wetlands are likely to occur as a result of activities covered under the Order, with the following exception. Newly constructed road crossings on watercourses frequently are constructed as culverted crossing structures. These structures entail placing fill material in a stream channel to as the base of a road prism.

The project will not have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status in local or regional plans, policies, or regulations, or by the CDFW, NMFS, or USFW. Such an impact will not occur because project activities are designed to protect and restore stream habitat, to provide a long-term benefit to both anadromous salmonids and other fish and wildlife. As a result, mitigation measures will ensure that any potentially significant impacts are avoided or mitigated to below a level of significance. Therefore, the appropriate finding is **less than significant with mitigation incorporation**.

d) Habitat for anadromous salmonids is impaired due to excess sediment. Spawning gravels have been covered by fine sediment, pools which provide cover have been filled, and increased turbidity due to elevated suspended sediment impairs their ability to feed. All of these factors inhibit the ability of anadromous salmonids to utilize Elk River for spawning, rearing, and migration. The purpose of the project, in conjunction with other aspects of the Regional Water Board's efforts related to the Elk River TMDL, is to reduce sediment and improve habitat for anadromous salmonids. Restoration efforts conducted pursuant to the Order have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is to improve long-term site stability and decrease sediment discharge. Therefore, the result is long term environmental benefits. In addition, short term impacts can be minimized by implementation of appropriate management practices as summarized in the initial study and described fully in Attachment A to the Order. The Order requires HRC to utilize and implement the mitigations for construction impacts associated with remediation and restoration work contained in Attachment A. After implementation of these measures, the project will not substantially interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Therefore, the appropriate finding is **less than significant with mitigation incorporation**.

e) HRC is responsible for complying with applicable local, state or federal laws and regulations. HRC lands are not within the jurisdiction of local policies and ordinances that address biological resources or tree preservation. Therefore, the Order does not conflict with local regulation protecting biological resources, such as a tree preservation policy or ordinance. Therefore, the appropriate finding is **no impact.**

f) HRC's timberlands in the UER are covered by a State and federally approved HCP and the Order requires that their management activities are conducted pursuant to the requirements of the HCP. Therefore, the appropriate finding is **less than significant with mitigation.**

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
V. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in '15064.5?		X		
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to '15064.5?		X		
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		X		
d) Disturb any human remains, including those interred outside of formal cemeteries?		X		

a-d) Cultural resources are non-renewable resources. The most significant direct adverse effects to cultural resources are expected to potentially result from logging, road construction and borrow pit extraction, or excavation conducted as part of a restoration project. FPR section 929 provides directions to foresters preparing THPs to ensure that the significant archaeological and historical sites within the site survey area are adequately identified and protected. Development of THPs require that a professional archaeologist or a person with archaeological training conduct a field survey for archaeological and historical sites within the proposed plan area and a confidential archaeological addendum (CAA) is required by and enforced by CAL FIRE pursuant to the THP approval process. The CAA is designed to ensure that the significant archaeological and historical sites within the THP are adequately identified and protected.

However, restoration work may at times be conducted outside of areas covered under THPs. By definition, such projects will be conducted in areas that have been disturbed by past management activities. Therefore, it is unlikely that restoration activities would cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to section 15064.5, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains, including those interred outside of formal cemeteries. This includes "tribal cultural resources as defined in Public Resources Code section 21074." Most of the work is anticipated to occur in areas already disrupted and the likelihood of encountering historical archaeological and paleontological resources is low. In the event that restoration occurs in previously undisturbed areas, the project must include a cultural resources investigation and paleontological survey prior to any substantial disturbance as detailed in Attachment A to the Order.

The cultural resources investigation will include, at a minimum, a records search for previously identified cultural resources and previously conducted cultural resources investigations of the project parcel and vicinity. This record search should include, at a minimum, contacting the appropriate information center of the California Historical Resources Information System. In coordination with the information center or a qualified archaeologist, a determination regarding whether previously identified cultural resources will be affected by the proposed activity must be made and if previously conducted investigations were performed. The purpose of this investigation would be to identify resources before they are affected and avoid the impact. In the event that the ground disturbances uncover previously undiscovered or documented resources, California law protects Native American burials, skeletal remains, and associated grave goods regardless of the antiquity and provides for the sensitive treatment and disposition of those remains (Health & Safety Code, section 7050.5; Public Resource Code, section 5097.9 et seq). Thus, the potential to cause a substantial adverse change in the significance of a historical , cultural, or archaeological resource and the potential to disturb any human remains, including those interred outside of formal cemeteries is **less than significant with mitigation incorporated**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?			X	
b) Result in substantial soil erosion or the loss of topsoil?		X		
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
landslide, lateral spreading, subsidence, liquefaction or collapse?				
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X

a)

i-iii) Elk River is located in a seismically active area with the potential for strong ground motion associated with movement on several nearby faults, including the San Andreas, the Cascadia subduction zone, and other active faults. The trace of the Freshwater Fault, a Quaternary active faults, crosses the northeastern portion of the watershed trending northwest-southeast.

While any personnel and structures in the region are exposed to ground shaking from these faults, HRCs management activities conducted under the Order will not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, or seismic-related ground failure, including liquefaction. Because the project does not involve these factors, the appropriate finding is **no impact**.

iv) The UER watershed is located in a tectonically active region and is underlain by the geologically recent and erodible Hookton Formation and Wildcat Group rocks, and sheared Yager terrane and Central Belt Franciscan rocks. Due to the weak underlying bedrock, relatively rapid rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout much of the UER are naturally vulnerable to landsliding.

Natural rates of landslides vary based on the occurrence of landscape disturbance such as large storms, fires, earthquakes, or other infrequent natural events. Timber harvesting and associated ground disturbance can result in increased rates of shallow landslides on vulnerable slopes due to decreases in root strength, increased soil moisture, altered hillslope hydrologic processes, and over-steepened or over-loading of slopes by cut and fill road construction.

HRC's approach for evaluating landslide hazards relative to proposed land use activities includes the ERSC WA prescriptions. Requirements to prevent increased landslide rates due to timber harvesting and associated activities are specified in sections I(D) of the Order and described on pages 13 through 15 of the initial study. As part of THP planning a review of pertinent technical data is conducted to denote potential high risk slopes, including landslide inventories, regional geomorphic maps, stereoscopic aerial photographs, and a shallow landslide potential map developed using the SHALSTAB landslide model. The Order requires HRC to implement the following prescriptions as part of its hillslope management mass wasting strategy:

- A hillslope management checklist to identify areas that are particularly vulnerable to mass wasting;
- No harvesting or road construction or reconstruction on Class I inner gorges;
- No harvesting or road construction or reconstruction on the following areas without characterization and development of measures to protect water quality prescribed by a PG;
    - Class II or III inner gorges,
    - Headwall swales,
    - Other areas with very high mass wasting hazard (including slopes greater than 60%, and
    - Earthworks (skid trails, landings, road prisms, or other earthen structures) exhibiting characteristics identified in the hillslope management checklist.

In addition to the hillslope management mass wasting strategy described above, a comprehensive approach to preventing increases in landslide related sediment discharge resulting from timber harvesting and associated activities includes characterization of landslide hazard, designing projects to minimize impacts to slope stability based on site specific hazards, and ongoing monitoring of landslide activity to better understand landslide patterns and modify management practices based on observed activity. The California Geological Survey Note 50 provides guidelines for Engineering Geologic Reports for Timber Harvesting Plans, which must be prepared by California Professional Geologist (PG) who is familiar with watershed characteristics. Section I(D) of the Order establishes requirements for characterization of geologic hazards by a PG during preparation of individual

THP and development of site specific mitigations. Characterization of landslide hazard should at a minimum consider the following information:

- Existing hazard maps derived from slope stability models;
- Available maps and reports;
- Aerial photographs;
- Field investigation and mapping; and
- Applicable studies and technical models.

The report must be provided to Regional Water Board staff and other review team agencies during the initial review of each THPs, and must include an evaluation of potential effects on slope stability and surface soil erosion, and landslide related sediment discharge from the proposed management activity, identify problem areas, and describe specific mitigation measures needed to minimize potential effects for identified areas of concern. The mitigations should be based on the potential hazard process (likelihood of landslide initiation or acceleration in sediment mobilization or water flow, and the potential risk to water quality). Where appropriate, mitigations shall include, but are not necessarily limited to the following:

- Limiting canopy removal in areas with elevated landslide hazard;
- Limiting activities upslope of existing landslide and on vulnerable portions of deep seated landslides;
- Avoidance of road or skid trail construction on steep or vulnerable slopes:
- Stabilization of existing landslides where applicable by methods such as planting, manipulating road drainage, buttressing, and other feasible engineering techniques.

The Order establishes enforceable provisions to prevent increases in sediment discharge from landslides associated with HRC's timber harvest activities. The provisions entail an overall strategy that includes HRCs hillslope management mass wasting strategy from the ERSC WA, as well as additional measures deemed necessary by Regional Water Board to prevent management related landsliding. These are summarized below as follows:

- Harvest rates throughout HRC's ownership in the UER that are less than those allowed under the limits set by the landslide reduction model under the current WDRs;
- Use of partial harvesting methods that retain a significant component of post-harvest root strength;
- Limited harvesting in high risk areas;
- Riparian protection zones, including enhanced protections measures in high risk areas, which include no harvesting within 50 feet of Class I watercourses, 30 feet of Class II watercourses, 20 feet of Class III watercourses and significant tree retention up to 150, 200, and 100 feet of Class I, II and III watercourses respectively;
- Review by licensed geologist of all proposed activities, including harvesting and construction or reconstruction of roads and watercourse crossings; and

- Implementation of HRCs ERSC WA hillslope management prescriptions.

All of the mitigation measures described above and required to be implemented by HRC, are intended to prevent or minimize the potential increased management related landslides.

Proper implementation of the above conditions will minimize the potential impacts of the Order to expose people or structure to potential adverse effects to **less than significant with mitigation incorporation**.

b-c) Timber harvesting and related management activities have the potential to create large scale ground disturbance. Due to the weak underlying bedrock, relatively rapid rates of tectonic uplift, and high annual precipitation rates, hillslopes throughout much of the UER are naturally vulnerable to erosion as a result of this disturbance. There are limited area along the boundary of HRC's property where potentially unstable slopes could fail, resulting in the potential for displaced material being transported onto adjacent properties. However, that potential impact is significantly minimized by implementation of landslide prevention strategies required by the Order.

HRC predominantly utilizes partial harvesting methods such as uneven-aged single-tree and small group selection, which result in post-harvest conditions that are less susceptible to mass wasting and increased erosional processes as compared to clearcut harvesting by way of retaining a measureable part of the existing vegetation allowing for raindrop interception, evapotranspiration, and tempering of peak flows that would otherwise result from clearcutting or even-aged harvesting prescriptions. One of the primary goals of the Order is to establish requirements for HRC to implement those management practices that prevent or minimize sediment discharges from erosion. These are found in sections I(A) – I(G) of the Order and include the following mitigation measures:

- HRC shall utilize uneven-aged single-tree and small group selection silviculture as defined in California Code of Regulations, tit. 14, section 913.1 within their timberlands in the Elk River watershed. HRC shall not utilize clearcut harvesting. Variable retention may be used in some instances as an alternative silviculture to address certain stand conditions, such as high levels of whitewood or hardwood species, animal damage or general poor form and vigor due to past logging history.
- HRC shall not utilize the group selection harvest method as defined in California Code of Regulations, tit. 14, section 913.2 within areas defined as Riparian Reserves.

- HRC shall not harvest more than 1.5% per year, averaged over five year periods, throughout its total land holdings in the UER watershed. This percentage will be measured in clearcut equivalent acres.[5]
- Harvesting in high risk watersheds is limited to address the impaired beneficial uses in the lower Elk River.
- Avoid timber harvesting practices that are likely to trigger new landslides or exacerbate existing landslides, as follows:
    - No harvest within 50 feet of fish bearing streams (Class I) or 30 feet of streams that support aquatic habitat for non-fish species (Class II) and limited harvest on steep streamside slopes up to 300 feet from watercourses,
    - Retention of 150 square feet of basal area per in headwall swales (steep convergent slopes above the headwaters of stream channel)
    - Use of a shallow landslide model (e.g. SHALSTAB) to identify relative landslide hazard and restrict or limit harvesting on high hazard areas,
    - A Professional Geologist must evaluate the potential for sediment discharge from proposed timber harvest and road construction on vulnerable ground,
    - plant conifers to stabilize potentially active landslide deposits,
    - Maintain and update a landslide inventory from field review and periodic new aerial photographs to evaluate the effectiveness of management practices and modify them as appropriate, track landslide related sediment discharge, and identify restoration opportunities.
- Conduct an inventory to identify, prioritize, and treat existing sediment sources from past land use impacts
- Maintain roads to prevent or minimize road related sediment discharge as follows:
    - Contour roads to minimize concentration of surface runoff,
    - Construct watercourse road crossings to minimize potential for watercourse failure or stream diversions,
    - minimize the length of road surface draining directly to watercourses and stabilize the surface of segments;
    - remove potentially unstable fill material to the extent feasible;
    - inspect and maintain roads annually;
    - restrict wet weather road use.
- HRC must prepare erosion control plans to identify and treat existing controllable sediment discharge sources in the vicinity of timber harvesting areas.

HRC's management activities as part of the Project will be located on geologic units or soils that are unstable, or that could potentially become unstable as a result of the project, and potentially result in on- or off-site landslide.

[5] Selection and Group Selection silviculture acres are converted to CCE acres by multiplying them by 0.5.

However, due to the Order conditions, and mitigation measures outlined above that combine characterization of landslide hazard, avoidance of the most vulnerable slope classes, and low intensity harvest, the potential for the Project to result in increased soil erosion, loss of topsoil, or landslides is less than significant. There is no reasonably foreseeable potential for the Project to result in lateral spreading, subsidence, liquefaction or collapse. Mitigation measures required under the Order are designed to prevent or minimize erosion, loss of topsoil, and therefore, the appropriate finding is **less than significant with mitigation incorporation.**

d) HRC's activities covered under the Order would not authorize projects such as building construction that are subject to the Uniform Building Code. Because the project does not involve this element, the appropriate finding is **no impact**.

e) HRC's activities covered under the Order would not involve septic tanks or alternative wastewater disposal systems. Because the project does not involve these elements, the appropriate finding is **no impact**.

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
VII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?		X		
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?				X

a) Forest activities can result in emissions through harvesting, wildfire, pest mortality and other natural and anthropogenic events. However, forestry is a net sink for carbon, the primary greenhouse gas. Plants absorb CO_2 from the air, and use the carbon as a building block of plant tissue through the process of photosynthesis. An acre of mature redwood can store between 600-700 ton/ac of CO_2, which is the highest of any forest type on Earth. Though redwood forests can store the largest amounts of greenhouse gases (GHGs) per acre of any forest type, the expanse of this forest type is not significant on a global level.

The proposed project will result directly and indirectly in carbon sequestration and CO_2 emissions. Carbon sequestration is achieved through silviculture including planting and active management of forest stands insuring the growing of trees that remove CO_2 from the atmosphere and store carbon in tree fiber. When a tree is harvested, most of the carbon-filled tree fibers become lumber that is sequestered in buildings while non-harvested trees, along with newly planted trees, continue to grow, often at increased growth rates due to the benefit of selective harvesting. To the extent these wood building products replace the demand for new concrete or steel building components; they reduce substantial CO_2 emissions that are associated with the manufacture of cement and steel. Some of the tree fibers such as branches and tops are left in the forest where they are sometimes burned to reduce fire hazard. However, the vast majority of this material is left to decay and will emit CO_2 overtime; but, it also supplements the forest soils and forest duff layer which serves as a substrate for more tree growth. In addition, redwood is a dominant species on HRC's timberlands in the UER and redwood slash decays more slowly than slash from hardwood and whitewood species. Further, when CO_2 is released by decaying slash, it is offset by rapid regeneration of tree stands (including stump sprouts from redwood and some hardwood species) and other vegetation that sequesters carbon. Some of this carbon-filled tree fiber, such as bark, shavings, and chips are used in other engineered building products or as fuel used to generate electricity. When this wood fiber is burned to generate electricity the stored carbon is released into the atmosphere, but it is being done in a controlled setting, while filling society's demand for renewable energy sources. Another factor to consider is that when wood biomass is used to generate electricity it directly reduces the amount of fossil fuels required which are non-renewable energy sources and generate CO_2 in more substantial quantities. Additionally, if this wood fiber were left to decompose naturally its stored carbon emissions would still nonetheless occur.

Forestlands are, in general, a carbon sink where CO_2 is captured and fixed by the process of photosynthesis, which removes carbon from the atmosphere and sequesters carbon in wood fiber. (OFRI 2006, USEPA, 2005). In California, forests in the North Coast, Cascade Northeast, and North Sierra regions were estimated to produce a net benefit of 7.2 million metric tons of CO_2 equivalents removed from the atmosphere each year. (California Energy Commission, 2004). Growing forests sequester and store more carbon over time until growth stagnates as trees reach a mature age. Older trees sequester carbon through new growth at a declining rate, but they remain pools of stored carbon until they decay through decline, death, or consumptive use.

The proposed project is one of numerous past, present, and future timber harvest projects on HRC ownership that combine to produce substantial net carbon sequestration benefits over time. HRC's timberlands are sustainably managed in accordance with the Order, its HCP, the FPRs, and Forest Stewardship Council (FSC) certification protocols which will help ensure sustained yield and strict environmental protection for wildlife and water quality. Timber harvests are scheduled across the ownership in management blocks, where timber stands are entered on intervals of every 20 years. Not all of HRC's timberland is dedicated to intensive forest management. Large areas of the ownership remain un-harvested or lightly harvested to provide various fish, wildlife, and ecosystem benefits. Under HRC's HCP for northern spotted owls and marbled murrelets, large areas of the property remain un-harvested for decades to provide long tern habitat for these and other species that required mid to late succession forest stands. In addition to these areas, the Order requires extensive riparian management zones (RMZ's) which extend like a web across the property. In the UER watershed, these RMZ consist of no or limited harvesting within 150 feet of Class I watercourses, 200 feet of Class II watercourses, and up to 100 feet of Class III watercourses. There are also numerous geologic features in the UER watershed, which will experience little or no timber harvesting. These wildlife, RMZ and geologic areas will be managed to develop into late succession forest stands, which will provide critical habitat for wildlife, protecting water quality and is a diversification of HRC's portfolio for carbon sequestration.

Following each THP, HRC manages slash to reduce fire risk and enhance forest soils that will host the next rotation of forest growth. Where necessary to facilitate site occupancy of desired tree species, Group-selection, Variable Retention or Rehabilitation areas are replanted and regenerated with healthy seedlings that combine with advanced regeneration and stump sprouts from harvested redwoods that immediately begin to fix carbon through photosynthesis. Because the seedlings require a substantial investment by HRC, there is a strong financial incentive to efficiently and effectively re-establish growing forests and timber production on harvested property. For the same reason, there is a strong incentive to protect growing tree stands from mortality that adds to forest fuels and to aggressively prevent and suppress wildfires before they can become catastrophic. HRC's management strategy as permitted by the Order will have the cumulative benefit of reducing the risk of catastrophic fire and related adverse impacts to GHG and carbon sequestration.

The project will also result in minimal impacts to the carbon stored in the duff layer and the soil. Because the harvesting conducted by HRC minimizes duff and soil disturbance, and HRC does very limited broadcast burning, primarily due to practicing un-evenaged management, the carbon stored in the duff layer is essentially intact following harvesting. HRC also has a policy to retain downed woody material for wildlife benefits, which also helps maintain soil productivity and is potentially a significant sink of carbon. Redwood/Douglas-fir forests that include sprouting species such as redwood and tanoak are likely to have less fluctuation in soil carbon given that the root systems of these species continue to survive following harvest.

HRC's management activities covered under the Order will likely result in sequestration of more greenhouse gas emissions than they will generate, either directly or indirectly, and therefore, the appropriate finding is **less than significant impact with the incorporated mitigation measures**.

b) The California Global Warming Solutions Act of 2006 (AB 32) is California's legislative effort aimed at reducing GHG emissions. Pursuant to AB 32, California Air Resources Board (CARB) must develop an implementation program and adopt control measures to achieve the maximum technologically feasible and cost-effective GHG reductions. AB 32 requires CARB to prepare a Scoping Plan to achieve reductions in GHG emissions in California. On June 26, 2008 CARB staff presented the initial draft of the AB 32 Scoping Plan for Board review. The AB 32 Scoping Plan contains the key strategies California will use to reduce the GHG emissions that are thought to cause climate change. With respect to forestry practice, the Scoping Plan provides:

The 2020 target for California's forest lands is to achieve 5 million metric tons of CO_2 equivalents ($MMTCO_2E$) reduction through sustainable management practices, including reducing the risk of catastrophic wildfire, and the avoidance or mitigation of land-use changes that reduce carbon storage. California's Board of Forestry and Fire Protection has the regulatory authority to implement the Forest Practice Act to provide for sustainable management practices and, at a minimum, to maintain current carbon sequestration levels. The federal government must do the same for lands under its jurisdiction in California. California forests are now a net carbon sink. The 2020 target would provide a mechanism to help ensure that this carbon stock is not diminished over time. The 5 MMTCO2E emission reduction target is set equal to the current estimate of the net emission reduction from California forests. As technical data improve, the target can be recalibrated to reflect new information. The project's forestry activities are consistent with these objectives.

The proposed project will not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases Therefore, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?		X		
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		X		
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
project area?				
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

a-b) HRC forest management activities can involve the transport and use of materials that would qualify as hazardous pursuant to the California Health and Safety Code section 25501(o). These materials include gasoline and diesel to fuel equipment, hydraulic fluid associated with equipment operations and machinery, and herbicides. The presence and use of gasoline, diesel, and hydraulic fluid would be limited to the amounts needed to operate heavy equipment and motorized equipment associated with management activities. The Order requires HRC to comply with all water quality related HCP prescriptions and conditions included in an approved THP and any additional mitigation measures identified and required pursuant to CAL FIRE's CEQA-equivalent process, and within the FPRs. This includes implementing the following prescriptions from the HCP that all company employees and hired contractors must adhere to when using gasoline, diesel, hydraulic fluid and herbicides on HRC property:

- Refueling of equipment and vehicles will be done outside of RMZs and Water crossings. Adding, draining, or depositing lubricants, coolants, or hydraulic fluids will not be done in RMZs and Water crossings and all such fluids shall be properly disposed (HCP 6.3.3.4(5)).
- As outlined in HRC Water Drafting Plan, trucks shall be checked daily for oil and fluid leaks. A catchment pan shall be placed under the truck at any place the truck may potentially leak oil. If a leak is identified and cannot be contained no water drafting may occur.
- HRC also has a Hazardous Material Clean-up Plan, which requires all operators and contractors to be trained in spill clean-up and containment procedures before they can work on HRC property. In addition, it is required for all operators and contractors to have a fuel spill clean-up kit at each work site before work can commence. If a spill does occur, the

plan requires the operator to clean-up the site immediately. In the event that this cannot be achieved, the operator is required to contact their supervisor and proceed with spill containment efforts. At this point, the supervisor would assess the situation and contact the necessary personnel to aid in clean-up efforts. Another plan requirement is that the Regional Water Quality Control Board must be notified of the spill if it has delivered, or has the potential to deliver into waters of the state.

- Necessary permits must be obtained by the county before the application of any herbicide.
- Application of herbicides must be at the direction of a certified applicator, and is trained in proper chemical use and application.
- All chemical application must be in compliance with the OSHA regulations, as discussed in HCP section 3.4.1.4.

The proposed Project would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, or a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. Therefore, the appropriate finding is **less than significant with mitigation incorporation**.

c) The proposed project would not result in the emission or handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. Therefore, the appropriate finding is **no impact**.

d) The proposed project is not located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5. Therefore, the appropriate finding is **no impact**.

e-f) The proposed project would not result in a change over current conditions related to activities near an airport or airstrip that would result in a safety hazard. Therefore, the appropriate finding is **no impact**.

g) The proposed project would not interfere with an emergency evacuation or response plan; therefore, the appropriate finding is **no impact**.

h) The proposed project would not expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands. The appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
IX. HYDROLOGY AND WATER QUALITY -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?		X		
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?		X		
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?		X		
f) Otherwise substantially degrade water quality?		X		
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?		X		
j) Inundation by seiche, tsunami, or mudflow?				X

a) The purpose of the Order is to implement the California Water Code, State and Federal water policies and regulation, and to achieve protection of the beneficial uses of water and water quality objectives established in the Basin Plan. The Order establishes specific and general requirements to implement management practices to ensure that discharges, or potential discharges from HRC's timber harvesting and related activities in the UER watershed meet water quality standards. Potential impacts from HRC's management activities in the UER Watershed would primarily consist of sediment discharges and increased water temperature.

The existing and potential beneficial uses of waters potentially affected by the proposed Project include:

- Municipal and Domestic Supply (MUN)
- Cold Freshwater Habitat (COLD)
- Wildlife habitat (WILD)
- Rare, Threatened, or Endangered Species (RARE)
- Migration of Aquatic Organisms (MIGR)
- Spawning, Reproduction, and/or Early Development (SPWN)
- Flood Peak Attenuation/Flood Water Storage (FLD)
- Wetland Habitat (WET)

The Elk River was identified in 1998 as impaired due to excessive sedimentation/siltation and was subsequently placed on the federal Clean Water Act section 303(d) list. At least five of the identified beneficial uses are considered impaired, including MUN, AGR, COLD, and to a lesser extent both REC-1 and REC-2. The primary beneficial uses of concern are domestic and agricultural water supplies and the cold freshwater habitat. For impaired water bodies, TMDLs must be established at levels necessary to attain and maintain water quality standards. A TMDL is the sum of individual waste load allocations (WLA) for point sources and load allocations (LA) for nonpoint sources and natural background. (40 CFR 130.2 (i).) Loading capacity is the greatest amount of loading that a waterbody can receive without violating water quality standards. (40 CFR 130.2(f).)
The TMDL sediment source analysis presented in the Technical Report included an evaluation of the historical, management, and physical factors associated with timber management in the UER watershed that have influenced sedimentation throughout the watershed. (Tetra Tech (2015) report.) In the UER watershed, all the land use-related sediment delivered to the stream channel is attributed to nonpoint source pollution and natural background. Due to the lack of assimilative capacity in the receiving water reach, the nonpoint source load allocation is defined as zero. A LA must be applied in the statutory context of the implementation mechanism, here Water Code section 13263. When water quality is already degraded, it may take time to achieve water quality objectives and immediate compliance may not be possible, even with complete cessation of a discharging activity. (See generally Nonpoint Source Policy at 13 available at:.)

The following waste discharge prohibitions from the Water Quality Control Plan for the North Coast Region (Basin Plan) pertain to timber harvest activities, including logging, road construction, and associated activities in the North Coast Region:

1. The discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

2. The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

Applicable water quality objectives include the following:

Sediment
The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Turbidity
Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

Temperature
The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses.

At no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature.

At no time or place shall the temperature of WARM intrastate waters be increased more than 5°F above natural receiving water temperature.

Following a century of logging, and in particular, following the post-world war II era of intensive tractor logging, water quality conditions in Elk River have been sediment impaired. Further impairment has occurred as a result of excessive and inadequately-regulated logging activities, and large storm events. The capacity of the UER for sediment is limited by the ongoing aggradation in the impacted reach and resulting nuisance conditions and compromised beneficial uses. To abate nuisance conditions, meet water quality objectives, and support beneficial uses, implementing Order conditions and mitigation measures to remediate sediment, and restore the channel by limiting new discharges of sediment are necessary. (See also Cumulative Impacts discussion below.)

For discharges associated with continued timber operations, combined measures required under the Order, as itemized below, are protective of water quality within the UER watershed: the transition from evenaged to unevenaged management under HRC's ownership; harvest rate limits throughout the UER and for each subwatershed that limit canopy reduction and anticipated peak flow changes; enhanced riparian protection; geologic review of all harvest activities; management practices designed to prevent or minimize sediment discharge; limiting timber harvest activities in high risk subwatersheds; ongoing oversight of HRC's management activities through participation in the THP review process; and implementation of the monitoring and reporting program. In addition to addressing existing, ongoing discharges, the Order attempts to address water quality impacts that have already occurred through the instream sediment feasibility study and voluntary restoration.

The Order authorizes discharges from certain cleanup and restoration activities as well as from ongoing timber harvesting and associated activities. Cleanup and restoration activities may result in small short term sediment discharges associated with placement of large wood into streams or excavation to stabilize or remove fill material stored in channels and adjacent riparian zones. The potential impacts of minor short term discharges provide benefits of long term sediment control derived by such projects. Compliance with the terms of the Order should result in continued improvement in water quality in the UER and impacted reach

The Order includes requirements and measures designed to improve water quality over the short term by meeting the established TMDL allocation, and achieving water quality objectives in a meaningful timeframe. Accordingly, the appropriate finding is **less than significant with mitigation incorporation.**

b) HRC's management activities covered under the Order will not deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. The appropriate finding is **no impact.**

c-d) HRC's management activities authorized under the Order will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. A substantial portion of the adverse impacts that occurred in the watershed since the mid-twentieth century as a result of logging and related activities was caused by increased erosion resulting from alteration of drainage patterns via hydrologically connected roads. Hydrologic connectivity increases the potential for the road segment to deliver road-derived runoff and sediment to a watercourse. When a road is hydrologically connected to a watercourse, it effectively increases the drainage area of the watercourse, producing hydrologic changes that can alter the magnitude and frequency of runoff delivery to the watercourse. Section 923.2(a)(5) of the FPR requires that all logging roads and landings be hydrologically disconnected from watercourses and lakes to the extent feasible in order to minimize sediment delivery from road runoff to watercourses and to reduce the potential for hydrologic changes that can alter the magnitude and frequency of runoff delivery to watercourses. The goal of hydrologic disconnection is to minimize sediment delivery and hydrologic change derived from road runoff being routed to a watercourse. Hydrologic disconnection is achieved by creating a road surface and drainage configuration that directs water to discharge from the road in a location where it is unlikely to directly flow into a watercourse.

In addition to the requirements of the FPRs, many of HRC's practices are designed specifically to prevent or minimize the potential to alter existing drainage patterns. Such practices are described in detail in section 6.3.3 of their HCP, *Control of Sediment from Roads and Other Sources* and are summarized as follows:

- Water crossings and associated fills and approaches shall be constructed or maintained to prevent diversion of flow down the road and to minimize erosion should the drainage structure become obstructed.
- The length of each hydrologically connected road segment is minimized, to the extent feasible,
- Drainage facilities and structures shall be installed at intervals along the road frequent enough to disperse road surface runoff so as to avoid gully formation and minimize erosion of the road surface, erosion of inside ditches and other drainage facilities, and erosion at the outfalls of drainage facilities and structures,
- Water captured by the road shall be diverted onto stable portions of the forest floor to dissipate energy and facilitate percolation to avoid creating channelized flow or erosion of mineral soil that discharges to waters of the State,
- Upon removal, temporary crossings shall be excavated to form a channel that is as close as feasible to the natural channel grade and orientation, and that is wider than the natural channel to minimize bank and channel erosion. Excavated side slopes shall be laid back to a 2:1 (50%) or natural slope.

The Order requires that HRC complies with all water quality related HCP prescriptions, including those above, and conditions included in an approved THP, and any additional mitigation measures identified and required pursuant to CAL FIRE's CEQA-equivalent process. In addition, and as discussed in more detail below, the Order includes additional requirements designed to eliminate or minimize additional sediment contributions that might exacerbate the flooding conditions in the downstream reach. The above-summarized mitigation measures required by the Order will ensure that HRC's management activities will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

e) HRC's management activities have the potential to alter hydrologic processes in the watershed, including increasing runoff rates. However, the entire project area is in a forested setting and no storm water drainage systems are present. The only pollutant that could potentially be conveyed by runoff from HRC's activities in concentrations high enough to be considered potentially significant is sediment. Mobilization and entrainment of sediment by flowing water are functions of the velocity, which is a function of discharge, slope and channel configuration. Due to increases in flow velocity and erosion potential, concentration of runoff in forested setting such as the UER can be considered to also result in runoff being polluted by sediment. Increased runoff and erosion are among the most common and widespread impacts of timber harvesting in watersheds throughout the North Coast, including in the UER watershed. As discussed in detail in this initial study, increased runoff rates from timber harvesting and related ground disturbance can result from the following processes:

- removal of forest canopy reduces the amount of precipitation that is intercepted and evaporated or removed from shallow soil by evapotranspiration;
- compaction or removal of permeable topsoil layers by heavy equipment use and road construction, decreases the amount of precipitation that infiltrates into soil;
- interception of shallow groundwater by cutting into hillslopes to construct roads;
- concentration of runoff on road surfaces.

The Order includes requirements designed specifically to prevent or minimize impacts such as those resulting from increased runoff and erosion. Implementation of the Specific Requirements of the Order will reduce the potential for increased runoff and erosion:

- Limits on the harvesting intensity and areal extent of timber harvesting;
- Methods to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;

- Retention and protection of riparian vegetation to preserve and restore shade, prevent increases in solar radiation, and meet the temperature objective;
- In-stream and riparian zone restoration;
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

The mitigation measures required by the Order and summarized above will ensure that HRC's management activities will not create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

f) This Initial Study provides a discussion of the potential impacts to water quality from HRC's management activities in the UER watershed as well as mitigation and management measures designed to mitigate those impacts. Management measures described in this Initial Study and implemented by Specific Requirements in Section I of the Order and Attachment A are adequate to mitigate all reasonably foreseeable impacts from excess sediment and elevated water temperature.

- Limits on the harvesting intensity and areal extent of timber harvesting;
- Methods to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;
- Retention and protection of riparian vegetation to preserve and restore shade, prevent increases in solar radiation, and meet the temperature objective;
- In-stream and riparian zone restoration;
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

In addition, as discussed in the sections on *Inventory and Treatment of Controllable Sediment Discharge Sources*, implementation of corrective action on a CSDS and restoration projects often entail substantial excavation of near-stream areas as well as channels and banks, installation of new drainage structures, disturbance of soil and loss of vegetation in riparian areas. These activities have the potential to result in some short term impacts to riparian area as well as short term increase in sediment discharge. However, the desired outcome of this work is in improve long-term site stability and decrease sediment discharge. Therefore, the net result is typically going to be long term environmental benefit. In addition, short term impacts can be minimized by implementation of appropriate management practices as summarized below and described fully in Attachment A.

No other pollutant sources or impacts to water quality are expected, and with implementation of the mitigation measures required under the Order HRC's management activities will not substantially degrade water quality. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

g - j) HRC activities covered under the Order do not authorize placing housing or structures within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map. The covered activities will not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, or inundation by seiche, tsunami, or mudflow.

There are several residents living at or below the confluence of the South Fork and North Fork Elk River within the 100-year flood plain. As discussed in previous sections of this initial study, nuisance flooding conditions exist in the impacted reach of the Elk River watershed. Discharges of sediment from past logging in the watershed have aggraded stream channels in the low gradient reaches of Elk River, significantly reducing channel capacity. Flooding of roads, fields, fences, and homes occurs at intervals that are more frequent than occurred historically. The cross-sectional area of the stream channel has been significantly reduced by deposits of fine sediment. Cross-section data indicates there are over 280,000 yd^3 of instream stored sediment in the lower North Fork, nearly 100,000 yd^3 in the lower South Fork and nearly 260,000 yd^3 in the upper mainstem. The fine sediment deposits in the impacted reach of the UER have become rooted in place by the encroachment of vegetation, further slowing winter floodwaters, causing streams to spill over their banks at elevated frequency and magnitude. One of the results of increased flood magnitude is that for a flood of a given return interval, the water surface would potentially be higher and flood waters extend out further from top of bank, therefore placing structures inside of the 100-year flood zone that were previously outside it. However, elevated flood heights already exist. The Order is designed to reduce sediment discharges and minimize increases in peak flows from canopy removal that caused increased flooding and encourage participation in efforts to remediate flooding.

- Limits on the harvesting intensity and areal extent of timber harvesting;
- Limited harvesting in high risk subwatersheds;
- Enhanced stream and riparian zone protection;
- Methods to prevent sediment discharge from road use, construction, reconstruction, decommissioning, repair and maintenance;
- Methods to prevent sediment discharge from landslides by implementation of hillslope prescriptions designed to minimize impacts to slope stability and review by Professional Geologist of all proposed harvesting and road construction or reconstruction;
- Inventory and treatment of controllable sediment discharge sources from roads, skid trails, landslides, and other sources related to timberland management;
- In-stream and riparian zone restoration;
- A monitoring and reporting program that includes watershed trend monitoring, annual work plans describing HRC's planned activities for each upcoming year, and an annual summary report of activities conducted during the previous year.

In particular, the permit requirement limiting harvesting in high risk subwatersheds can be lifted by HRC conducting a project, or projects, designed to improve flooding conditions or reduce conditions exacerbating flooding.

The activities covered by the Order are designed, through use of extensive BMPs and mitigations, to have less than significant impact to the beneficial uses of Elk River. With proper implementation, HRCs management and restoration activities should, over time, improve the conditions within the UER, thus having a positive impact. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
X. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?		X		

a) Activities covered under the Order would not divide an established community. Any land use planning associated with the Order is not urban, but rather intended for management and utilization of HRC's timberlands. Because the project does not involve these elements, the appropriate finding is **no impact**.

b) Activities covered under the Order must comply with all applicable local, state and federal regulations, which include land use plans, policies, or regulations of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance). Because of the fact that all of the activities covered under this Order will occur on private land zoned as timber production zone, and will be conducted pursuant to State and Federal regulations which are intended for the purpose of avoiding or mitigating environmental effects. There will not, therefore, be any conflict and there is **no impact**.

c) All of HRC ownership in the UER watershed is covered by a multi-species state and federal Habitat Conservation Plan approved in 1999. The state and federal Incidental Take Permits (ITP) issued for aquatic species including Chinook salmon, Coho salmon, cutthroat trout, steelhead trout, southern torrent salamander, tailed-frog, red-legged frog, foothill-yellow legged frog, and the northwestern pond turtle are most relevant to protection of the Beneficial Uses of the UER. The management measures for water quality protection of the HCP were the subject of the federal Environmental Impact Statement and state Environmental Impact Report which led to the issuance of the ITPs in conformance with the state and federal Endangered Species Acts. The adoption and implementation of the Order incorporates conditions of the HCP that address water quality impacts, and includes additional measures to ensure HRC's management activities do not conflict with the HCP. Therefore, this Project, with included management and mitigation measures will not conflict with any applicable conservation plan that may apply to HRC's activities. The appropriate finding is less than **significant with mitigation incorporated**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XI. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

a-b) The Order do not authorize mining activities or other activities that could affect mineral resources. Therefore, HRC's activities covered under the Order will not result in loss of availability of mineral resources; therefore, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?				X
c) A substantial permanent increase in				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
ambient noise levels in the project vicinity above levels existing without the project?				
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

a-f) Implementation of some HRC's activities may result in localized increases in noise levels. Such increased noise levels would likely be associated with heavy equipment operation associated with harvesting, yarding, road construction and/or restoration activities. These impacts would be temporary, associated with the use of heavy equipment and would, therefore, not considered to be a significant impact. The proposed project does not change the exposure of people to potential adverse effects involving noise due to vegetation management and other HRC's activities over current conditions. Noise levels due to HRC's activities will remain the same whether or not the Order is adopted and implemented. Activities covered under the Order do not impact noise levels. Because no change is foreseeable, the appropriate finding is **no impact**.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING --				

Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

a-c) The proposed project does not involve construction of new homes, businesses, or infrastructure. Any new road construction would not be for the purpose of urban or residential development, but would be intended to facilitate HRC activities such as timber harvest and related management activities. The project would also not displace people or existing housing. Because the proposed project does not involve these elements, the appropriate finding is **no impact**.

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XIV. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?				X

Police protection?				X
Schools?				X
Parks?				X
Other public facilities?				X

a) The proposed project does not involve new or physically altered government facilities. Because the proposed project does not involve these elements, the appropriate finding is **no impact.**

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XV. RECREATION --				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

a-b) This area is private property and is zoned as a Timber Production Zone. This land is not open to the public for recreational use. Conventional logging operations are not known to have caused significant adverse impacts to recreation resources in the area in the past therefore, none are anticipated for this THP, either singly or cumulatively.

Because the proposed project does not involve increasing the use of recreational facilities or construction of new recreational facilities, the appropriate finding is **no impact.**

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
XVI. TRANSPORTATION/TRAFFIC -- Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?			X	
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?			X	
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e) Result in inadequate emergency access?				X
f) Result in inadequate parking capacity?				X
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X

a-b) Log truck traffic has historically occurred on roads within the UER. Main-line haul routes include the use of HRC's private road system in the UER as well as Humboldt County roads in the lower portion of the UER and in the Lower

Elk River valley. Continuation of hauling operations at historical or current levels is not expected to cause a significant adverse impact to traffic on these roads. Work performed during timber operations would occur on private property and would not affect the existing traffic load of the road system. Mobilization of heavy equipment to conduct restoration activities may contribute temporary amounts of minor traffic to the road system, but such traffic volumes are not anticipated to be significant. Therefore, the appropriate finding is **less than significant impact.**

c) The proposed project does not involve air traffic. Because the proposed project does not involve this element, the appropriate finding is **no impact.**

d) The proposed project does not involve installation of hazardous design features. Because the proposed project does not involve this element, the appropriate finding is **no impact**.

e-f) The proposed project does not affect emergency access or parking capacity; therefore, the appropriate finding is **no impact**.

g) The proposed project does not involve alternative transportation. Because the proposed project does not involve this element, the appropriate finding is **no impact**.

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	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XVII. UTILITIES AND SERVICE SYSTEMS Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			X	
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the providers existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X

a-c) The proposed project does not involve the expansion or construction of wastewater or storm water treatment facilities. Such projects would not be eligible for coverage under the Order, and would have to be regulated by either a Waste Discharge Requirement or NPDES permit. Because the proposed project does not involve expansion or construction of wastewater or storm water treatment facilities, the appropriate finding is **no impact**.

d) The proposed project does not authorize the development of new water supplies or change the need for existing water supplies. Water supplies may be used to serve vegetation removal or construction activities (e.g., for dust abatement) in the project area. Such use will be short term in duration and relatively minor in scope. Water supplies would come from existing developed sources with existing water rights on HRC's lands. If short-term water drafting from streams in the vicinity of the project area is required for a project, HRC would be required to comply with all applicable current regulations. Because no change is foreseeable, the appropriate finding is **less than significant impact.**

e) HRC's activities covered under the Order would not require service by wastewater treatment facilities. Because the proposed project does not involve this element, the appropriate finding is **no impact.**

f) The proposed project would not affect solid waste generation or landfill capacities over current conditions. Because no change is foreseeable, the appropriate finding is **no impact**.

g) The proposed project will not involve solid waste and is not subject to federal, state, and local statutes and regulations related to solid waste, therefore the appropriate finding is **no impact**.

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporation**	**Less Than Significant Impact**	**No Impact**
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE --				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past		X		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
projects, the effects of other current projects, and the effects of probable future projects)?				
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		X		

a) The Order is a permit developed under the authority of the California Water Code, for the specific purpose of implementing the Basin Plan, protecting the beneficial uses of water and the water quality objectives required for that purpose, and to prevent nuisance and pollution. The Regional Water Board developed the Specific and General requirements of the Order to regulate HRC's management activities so that they can derive the economic benefits from their timberlands in the UER watershed while still protecting and restoring the environmental values related to water quality. The requirements of the Order are designed specifically to mitigate potential impacts to water quality from HRC's management activities. As discussed in more detail in the Hydrology and Water Quality section above, the UER watershed is sediment impaired, and additional discharges may further exacerbate this condition. The Order includes requirements designed to reduce impacts from HRC's management activities to a less than significant level, and show measurable progress toward improving water quality over the short term and achieving water quality objectives in a meaningful timeframe.

Requirements of the Order do not address those potential environmental impacts that are outside of the Regional Water Board's purview, and not related to water quality. As described in more detail in section G above, timber management and associated activities are regulated by other state and federal laws and policies, and HRC is responsible for complying with all applicable laws and regulations. All of HRC's activities regulated by the Order must also comply with their multi species habitat conservation plan (HCP). The majority of their activities will be conducted under a THP that has gone through the multi-agency CEQA functional equivalent review process as required by the FPRs. In addition, any activities that is likely to substantially modify a river, steam or lake must be covered under the MATO issued by CDFW to avoid, minimize, and mitigate potential impacts.

The continuation of HRC's timber harvesting and related management activities in the UER watershed with mitigation measures required by the Order and compliance with applicable state and federal regulations does not, therefore, have the potential to degrade the quality of the environment, reduce the habitat of fish or wildlife species or cause their population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or pre-history. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

b) The UER watershed is already cumulatively impaired for sediment. Water quality impacts from historic timber management activities are mostly associated with increased sedimentation resulting in impaired domestic and agricultural water quality, impaired spawning habitat, and increased rate and depth of flooding due to channel in-filling by sediment. These impacts result from a complex interaction between inherent watershed characteristics, such as geology and geomorphology, external natural processes such as climate and timing of stochastic events (i.e. large storms, earthquakes, fires) and type of management practices and extent and rate of watershed area disturbed. In spite of all of the efforts to control sediment discharge, conditions in downstream impacted reaches remain impaired and the stream channel continues to aggrade. Even with implementation of greatly improved management practices, ongoing timber harvesting and associated activities will result in some increased sediment discharge, further exacerbating the already impaired condition. When water quality is already degraded, it may take time to achieve water quality objectives and immediate compliance may not be possible, even with complete cessation of a discharging activity. The Order includes stringent waste discharge requirements designed to minimize new sediment production and to control and remediate existing sediment inputs to the extent feasible. To ensure that proposed harvest rates do not contribute to ongoing cumulative impacts on water quality, the Order establishes a threshold of concern of 2% equivalent clearcut acres per year in any subwatershed averaged over any 10 year period. Where an individual, or multiple, THP(s) would result in an average annual harvest rate in any subwatershed above 2% equivalent clearcut acres over any 10 year period, the Executive Officer or Regional Water Board may decline to enroll the THP(s), or portions of the THP, or may require additional environmental analysis, and potential inclusion of additional mitigation measures or monitoring as a condition of enrollment.

Sediment control activities such as inventory, prioritization, and treatment of controllable sediment discharge sources and development of feasible projects to trap, meter, or remove sediment in tributary streams, in combination with potential restoration actions downstream, could produce a cumulative impact in the UER watershed. The Order requires annual reporting that will provide a mechanism for watershed-wide project planning by documenting activities conducted in the previous year and activities planned for the following year. The annual work plans allow Regional Water Board staff the opportunity to evaluate and comment on restoration work planned for the year ahead and request that projects with the potential to cause short term impacts be more broadly dispersed throughout the watersheds or staggered in time. In addition, the five year summary reports provide a longer term evaluation of the effectiveness of the provisions of the Order. Water quality monitoring is to be conducted independently by HRC as well as in coordination with the watershed stewardship process to evaluate trends and ensure that projects are conducted in a manner that does not create a cumulatively considerable impact. HRC will also continue to conduct effectiveness monitoring to evaluate the impacts from restoration and sediment control projects. Post project monitoring is useful to inform project proponents and agency staff with respect to the effectiveness of methods, and improve them as warranted.

HRC's activities conducted in compliance with the Order will not adversely individually or cumulatively affect the quality or the beneficial uses of the waters of the State. The environmental protection afforded by the adoption of the Order, including the implementation of the management plan described in the ROWD and requirements of the Order, will provide sufficient controls on any potential impacts. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

c) HRC's management activities conducted pursuant to the requirements of the Order will not have effects that will cause substantial adverse effects on human beings, directly or indirectly. With the exception of vehicles traveling on public highways to access the Project area and transport equipment and timber products, HRC's management activities will take place exclusively on privately owned timberlands, which is removed from large population centers. Private individuals live, work, and travel in close proximity to areas affected by HRC's management activities. A small segment of people and communities in areas surrounding UER are likely to be directly or indirectly involved in HRC's activities and therefore derive an economic benefit from them. Timber harvesting and related activities, both those covered under the Order such as road construction and reconstruction, as well as activities not covered, such as processing logs at a mill, is important components of the local economy. Therefore, timber harvesting in the UER watershed will result in a small but significant economic benefit to nearby communities.

Property owners, mainly residential, living downstream from HRC's timberlands have been significantly harmed by impacts from excess sediment deposition, the vast bulk of which was produced by past logging activities. The impacts include damage to property by increased flooding magnitude and frequency, financial impacts due to decreased property values and increased flood insurance rates, loss or impairment of domestic water supplies, and threats to public safety by restricted access into or out of neighborhoods due to increased flooding of roadways. Due to the current impaired condition and lack of assimilative capacity in the impacted reach, the nonpoint source load allocation is defined as zero. As such, the Order establishes stringent requirements for control of sediment from ongoing timber harvesting. In addition to sediment control, all feasible measures to stabilize or remove sediment already are being evaluated; both pursuant to the feasibility study required under the Order and as part of the watershed stewardship program. Significant public and private resources are currently committed, or anticipated to be committed, to restoration and remediation efforts to improve water quality conditions and relieve effected residents. It is the expectation that HRC will continue to participate in these restoration and remediation efforts. Restoration and remediation efforts in the UER as well as the impacted reach combined with the additional layer of environmental protection provided by the Order is expected to ensure that adverse impacts to the water resources of local communities from HRC's activities improve over time.

The Regional Water Board determines that the project will not have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly with the implementation of management and mitigation measures required by this Order. Therefore, the appropriate finding is **less than significant with mitigation incorporation.**

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Attachment No. 5: Tetra Tech, Inc., "Upper Elk River: Technical Analysis for Sediment" (Oct. 21, 2015)

Upper Elk River: Technical Analysis for Sediment

Prepared by:

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Prepared for:

Environmental Protection Agency, Region 9

North Coast Regional Water Quality Control Board

October 21, 2015

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Table of Contents

Tables

Figures

List of Abbreviations

303(d) list	*Clean Water Act Section 303(d) List of Impaired Waterbodies*
ac	acres
AHCP	Aquatic Habitat Conservation Plan
Basin Plan	*Water Quality Control Plan for the North Coast Region*
BLM	Bureau of Land Management
BMP	Best management practice
CalFire	California Department of Forestry and Fire Protection (formerly CDF)
CAO	Cleanup and Abatement Order
CDFG	California Department of Fish and Game (now California Department of Fish and Wildlife)
CDFW	California Department of Fish and Wildlife (formerly California Department of Fish and Game)
cfs	cubic feet per second
CGS	California Geologic Survey
CSDS	Controllable sediment discharge sources
CWA	Clean Water Act
DEM	Digital Elevation Model
DSLED	Deep-seated landslide and earthflow detection model
DWR	Department of Water Resources
EPA	United States Environmental Protection Agency
FPR	Forest Practice Rules
ft^2	Square feet
GDRC	Green Diamond Resources Company
GIS	Geographic Information System
HCP	Habitat Conservation Plan
HRC	Humboldt Redwood Company
ISRP	Independent Scientific Review Panel
kg/m^3	Kilograms per cubic meter
LA	Load allocations
LiDAR	Light Detection and Ranging
LWD	Large woody debris
m^3/yr	Cubic meters per year
mg/L	Milligrams per liter
mi	miles
mi^2	square mile

mm	millimeters
MOS	Margin of safety
MRP	Monitoring and Reporting Program
mT/yr	Metric tons per year
NHE	Northern Hydrologic Engineering
NOAA	National Oceanic and Atmospheric Agency
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NPS Policy	*Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (2004)
Palco	Pacific Lumber Company, Scotia Pacific Corporation, and Salmon Creek Corporation (collectively referred to as Palco)
Peer Review Draft	*Staff Report to Support the Technical Sediment Total Maximum Daily Load for the Upper Elk River* (2013)
Porter Cologne	Porter-Cologne Water Quality Control Act
Preliminary Review Draft	Preliminary Review Draft Sediment Source Analysis
PWA	Pacific Watershed Associates
RCAA	Redwood Community Action Agency
Regional Water Board	North Coast Regional Water Quality Control Board
ROWD	Report of Waste Discharge
SSC	Suspended sediment concentration
State Water Board	State Water Resources Control Board
SYP	Sustain Yield Plan
THP	Timber Harvest Plan
TMDL	Total Maximum Daily Load
USGS	United States Geologic Survey
WDR	Waste Discharge Requirements
WLA	Wasteload allocations
WQI	Water Quality Indices
WQO	Water quality objective
WQS	Water quality standards
WY	Water year
yd^3	Cubic yards
$yd^3/mi^2/yr$	Cubic yards per square mile per year
yd^3/yr	Cubic yards per year

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Chapter 1 – Introduction

The Elk River watershed is identified on the Clean Water Act (CWA) Section 303(d) List of Impaired Waterbodies (303(d) list) as impaired for sediment[1]. The North Coast Regional Water Quality Control Board (Regional Water Board) has been working with watershed partners over the past two decades to investigate this impairment, resulting in an extensive suite of data and information. The Regional Water Board contracted with Tetra Tech, Inc. (through the United States Environmental Protection Agency [EPA] Region 9) to perform an independent review of the work completed to date. This document presents Tetra Tech's synthesis of the technical analyses and documentation.

Specifically, the *Upper Elk River Technical Analysis for Sediment* presents the data, analyses, results, and conclusions derived from watershed assessment efforts, as well as a review of the historical, management, and regulatory factors in the Elk River watershed that have influenced its sediment impairment. This builds upon the framework and information that were first reported in the *Peer Review Draft Staff Report to Support the Technical Sediment [Total Maximum Daily Load] TMDL for the Upper Elk River* (Peer Review Draft [Regional Water Board 2013a]), which was distributed for scientific peer review in April 2013. Scientific peer review comments and staff's responses to comments were posted on the Regional Water Board website, following which informal public comments were received and also posted[2] (Regional Water Board 2013b). The Regional Water Board subsequently developed an Internal Draft Staff Report[3], which included elements of the Peer Review Draft (Regional Water Board 2013a), along with additional content and analyses developed in response to the scientific peer review and informal public comments. These documents, along with other relevant sources (see Chapter 1.3), were used to develop this report.

The remainder of this chapter describes the overall project history, the iterative and collaborative approach in the watershed, existing documentation, and a brief synopsis of the report components. This document provides the technical basis for a sediment TMDL and/or a Waste Discharge Requirements (WDR). Further, the technical analysis supports the conclusion that a four prong approach to returning the Elk River to a trajectory of recovery is warranted, as described in Chapter 1.2.

1.1 Project History and Context

Due to water quality and beneficial use impairments, the Regional Water Board has taken a variety of regulatory and non-regulatory actions in the Elk River watershed to protect and restore beneficial uses and abate flooding conditions. Following an intensive period of petitions, hearings, investigations, and analyses between 1997 and 2006, the Regional Water Board undertook a series of actions including the placement of Elk River on the 303(d) list, issuing Cleanup and Abatement Orders (CAOs) and Monitoring and Reporting

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[1] The Elk River watershed is listed as impaired for sediment. Much of this document applies to the entire watershed; however, the desired watershed conditions, problem statement, sediment source assessment, and loading capacity chapters focus on the Upper Elk River watershed as it is the drainage area contributing to the impacted reach.
[2] http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/elk_river/
[3] The internal draft is not publically available.

Programs (MRPs), undertaking TMDL development, and developing and adopting property-wide WDRs for industrial timberland owners. Appendix 2-C (History of Regional Water Board Regulatory and Non Regulatory Actions in the Upper Elk River Watershed) of the Peer Review Draft (Regional Water Board 2013a) provides a review of regulatory actions in the watershed.

The Regional Water Board sponsored two phases of evaluations by an Independent Scientific Review Panel (ISRP). The ISRP authored two reports (December 27, 2002 and August 12, 2003) and concluded that 1) a rate of harvest aimed at reduction of harvest-related landslides could be determined with available landslide inventories and harvest history data, and 2) flooding and water quality standard impairment would continue as long as sediment loads remained elevated. The ISRP recommended that detailed sediment process data be collected to inform future analysis. They further found that the Timber Harvest Plan (THP) process defined by the Forest Practice Rules (FPR) and the Habitat Conservation Plan/ Sustained Yield Plan (HCP/SYP) process was not sufficient to guarantee water quality protection and recovery.

1.2 An Evolving Collaborative Approach

The Regional Water Board has a duty to implement the CWA, the Porter Cologne Water Quality Control Act (Porter Cologne), the *Water Quality Control Plan for the North Coast Region (*Basin Plan; Regional Water Board 2011a), and other plans and policies of the State Water Resources Control Board (State Water Board) and Regional Water Board for the protection of water quality. The Regional Water Board has attempted to fulfill these duties through the implementation of permits, monitoring and reporting requirements, and compliance orders, as described above. These regulatory actions also have been augmented by collaborative efforts, such as the Elk River Restoration Summit held in February 2012. Conclusions drawn from the Restoration Summit led to the development of the Elk River Recovery Assessment, an effort to model the fate and transport of sediment and flows from the top of the impacted reach to the outlet of the river to Humboldt Bay under various sediment remediation and channel restoration scenarios. This exercise was viewed by the members of the Restoration Summit as critical to the design and implementation of a sediment remediation and restoration strategy suitable to augment regulatory actions, and return the watershed to a trajectory of recovery.

To build on these early collaborative efforts, an Elk River Watershed Stewardship Program (Stewardship Program) has been proposed by the Regional Water Board and is modeled after the success of a similar collaborative approach used in the Klamath Basin. As described by Regional Water Board staff, the Stewardship Program will coordinate directly with watershed residents and other stakeholders to solicit their input and transmit information on recovery program activities that are ongoing throughout the watershed. It will ultimately provide a broad umbrella within which specific working groups can form to coordinate resource management issues in a collaborative and transparent way. A framework for how the stewardship program is envisioned to work is provided in Chapter 8.

The combination of regulatory and non-regulatory activities, now under the umbrella of stewardship, is intended to address the following four components of a recovery strategy:

1. Control of new sources of sediment (current operations),
2. Control of existing sources of sediments (areas of elevated erosion risk),
3. Expansion of the assimilative capacity for sediment in the impacted reach through remediation of deposited sediment and restoration of hydrologic function, and
4. Installation of physical infrastructure to address nuisance conditions (e.g., flooding, water supplies)

These components are described in more detail in Chapter 8.

1.3 Supporting Documentation

Information and conclusions presented in this *Upper Elk River Technical Analysis for Sediment* were developed after review and synthesis of a suite of documents and reports that have been developed over a period of years. This documentation addresses a range of issues associated with sediment production, delivery and transport in the watershed. These documents include previous drafts of the TMDL, comments and their responses, and additional watershed analyses. The supporting documentation provides background information as well as data on sediment load estimates in the Elk River watershed. Table 1 describes the materials and their use for this effort.

Table 1. Supporting Documentation Used in Technical Analysis

Description of Documentation	Use in this Technical Analysis
Peer Review Draft TMDL Staff Report (Peer Review Draft) (Regional Water Board 2013a)	
Revision of the Regional Water Board 2011 preliminary TMDL analysis Regional Water Board 2011b), which focused on sediment loadings for 1955-2003. Included new loading estimates with an extended period through 2004-2011.	Provided background information, graphics, maps, and text related to the watershed setting, problem statement, and background information on the desired watershed conditions and sediment source assessment methodology.
Internal Draft Staff Report (internal, March 2015)	
Third version of the Elk River sediment TMDL documentation; an internal document drafted by the Regional Board in 2015 to serve as the basis for a revised TMDL. Includes rationale for updates to the report based on formal and informal comments and new data available after the Peer Review Draft. Reflects several key changes to the technical analyses, including inclusion of a conceptual model and revised estimate for natural sediment loading, and implementation framework.	Provided context and background for conclusions made by Regional Water Board staff. These decisions were reviewed and verified during development of this report. Also documented conceptual model.
Formal Peer Reviews; and Staff Response to Peer Review Comments 2013 (Regional Water Board 2013b)	
Comments provided by four peer reviewers. Response to comments provides detailed review of comments along with Regional Water Board staff responses and any recommended changes to the staff report.	Provided additional context and explanations regarding the issues and analyses contained in the various supporting documents that were not explicitly discussed in other documentation.

Description of Documentation	Use in this Technical Analysis
Informal Comments on the Peer Review Draft; and Staff Response to Informal Comments (internal, July 2015)	
Written comment letters by watershed stakeholders in response to the Peer Review Draft. Regional Water Board staff drafted responses to informal comments, including proposed revisions to the draft TMDL and implementation program.	Provided additional context and explanations regarding the issues and analyses contained in the various supporting documents that were not explicitly discussed in the draft TMDLs.
Humboldt Redwood Company Watershed Analysis Revisited (HRC 2014)	
Most recent revision of the Humboldt Redwood Company's (HRC) Watershed Analysis Monitoring Report as required under its Aquatic Habitat Conservation Plan (AHCP). Establishes and maintains an inventory of hillslope, riparian, and in-stream conditions, related to sediment, wood, and temperature. Documents conditions and processes related to mass wasting, surface erosion, riparian function, and stream channels.	Provided additional context and explanations regarding information used in sediment source assessment loading rates. Loading values for North Fork Elk River watershed area compared to TMDL sediment source assessment estimates.
Salmon Forever Analysis 2013 (Lewis 2013)	
Provides updated information to augment June 2010 report to Redwood Community Action Agency (RCAA). Presents analyses of trends in storm peak flows, storm event loads, storm mean suspended sediment concentration (SSC), and instantaneous SSC as well as results of stream cross-sectional surveys at multiple locations in Elk River.	Provided additional context and explanations regarding the information used in analyses contained in the sediment source assessment. Loading values at two monitoring stations compared to TMDL sediment source assessment estimates.
Elk River Hydrodynamic and Sediment Transport Modeling Pilot Project (Northern Hydrology Engineering and Stillwater 2013)	
Presents results of a predictive hydrodynamic and sediment transport model in a pilot reach of Elk River. Includes information on cross-sections, sediment composition, and other data.	Provided information to support mass balance calculation presented in the sediment source assessment.

The approach and structure presented in the Internal Draft Staff Report was used as a foundation for this document. As part of Tetra Tech's independent review, we performed quality control checks on calculations and significant editing and synthesis to produce a document suitable for public review. In addition, several key changes to the Peer Review Draft (Regional Water Board 2013a) are presented throughout this document. These include:

- A conceptual model of the ecological risks associated with natural and anthropogenic influences in the Upper Elk River watershed;
- Changes to the estimates of natural sediment loading in the sediment source assessment;
- A comparison of the estimated loads to other loading calculations;

- Mass-balance estimates for the impacted reach[4] (2003 – 2011);
- Alternative presentation of the assimilative capacity; and
- Implementation framework divided into two phases.

These changes do not constitute a new TMDL, rather they reflect a refinement to the Peer Review Draft that considers new information from the stakeholders and peer reviewers.

1.4 Document Organization

This document is composed of seven additional chapters, which are described below.

Chapter 2: Watershed Setting

The Watershed Setting chapter describes the location and general characteristics of the Elk River watershed, including climate, hydrology, land cover, soils, and geology. The chapter also discusses landslides—a potential significant source of sediment—and their relationship to watershed characteristics, such as climate, soils, geology, and vegetation.

Chapter 3: Regulatory Setting

The Regulatory Setting chapter reviews the Regional Water Board's authority and overarching environmental regulations that affect the watershed. This chapter introduces the watershed's impaired reaches and discusses WDRs for major timber operators.

Chapter 4: Desired Watershed Conditions

This chapter contains the water quality standards (WQS) applicable to the waters of the North Coast Regional Water Board, including the Elk River watershed. To evaluate improvements towards beneficial use attainment, as well as to provide potential adaptive management thresholds, this chapter also presents both instream and hillslope water quality indicators (WQI).

Chapter 5: Problem Statement

Impacts to the watershed from excess sediment are described in the problem statement chapter and include downstream flooding (a nuisance condition) and beneficial use impairments (impaired fisheries and impaired water supplies). The chapter also describes the factors and processes critical to understanding the elevated erosion risk and impaired hydrologic function as well as some of the restoration activities that have occurred in the watershed.

Chapter 6: Sediment Source Assessment

The Sediment Source Assessment chapter presents a conceptual model of sediment behavior in the Upper Elk River watershed. The chapter also presents quantitative estimates of 1) sediment loading, 2) channel filling, and 3) sediment output from the impacted reach.

Chapter 7: Sediment Loading Capacity and Load Allocations

Building on the findings presented throughout the document, the assimilative capacity and a phased approach to the loading capacity are presented in this chapter. Phase I will be

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[4] The impacted reach extends from the confluence of Browns Gulch on North Fork Elk and Tom's Gulch on South Fork Elk downstream to the mainstem Elk River to Berta Road (Figure 9).

designed by the Regional Water Board and is anticipated to include instream sediment remediation and channel restoration activities in the impacted reach, while Phase II is expected to include a recalculation of the loading capacity after Phase I is complete.

Chapter 8: Framework for Implementation, Monitoring, and Adaptive Management

The Regional Water Board has many regulatory and non-regulatory tools to implement the requirements of the Basin Plan, including CAOs, WDRs, MRPs, grant funding, and watershed stewardship. This chapter describes a framework within which to implement water quality improvements. There are multiple strategies available to address the conditions of impairment; however, the implementation framework described builds upon historic and existing implementation efforts, is based on the Regional Water Board's revised strategy derived from scientific peer review and public review comments, and is consistent with the technical findings of this analysis.

Chapter 2 – Watershed Setting

The Elk River watershed is in the coastal temperate rain forest of Humboldt County, California. Elk River is one of the largest freshwater tributaries to Humboldt Bay, which is the second largest estuary in California. Humboldt Bay is an important economic resource for the local community including its port and marinas, recreation opportunities, the numerous shellfish rearing operations as well as providing important habitat for aquatic species.

The Elk River watershed is located in the Eureka Plain Hydrologic Unit 110.00 (Regional Water Board 2011a). It originates from the relatively steep forested headwater slopes and flows across a primarily grassland coastal plain into the central portion of Humboldt Bay, across from the bay inlet.

2.1 Delineation of the Upper Elk River Watershed

In its Peer Review Draft, the Regional Water Board (2013a) defined the reach of the Elk River watershed most impacted by excess sediment delivery (e.g., experiencing elevated rates of flooding, causing nuisance conditions and health and safety concerns). This reach is described here as the impacted reach. The Regional Water Board also delineated that portion of the 58 square mile (mi^2) Elk River watershed that drains to the impacted reach. This area is referred to as the Upper Elk River watershed (Figure 1; 44 mi^2). This document uses these terms in a manner consistent with the Regional Water Board's delineation.

The drainage area to the impacted reach includes a portion of the Lower Elk River subbasin (Figure 1). While this portion of the Lower Elk River subbasin drains to the impacted reach, it is not anticipated to contribute significant sediment loads; therefore, the upper 17 subbasins were used to calculate sediment loading in Chapter 6 (note: this is also consistent with the load estimates in all of the supporting documentation).

The Upper Elk River watershed is defined as the area draining to the downstream point at Berta Road, with the exception of upper Little South Fork Elk River (Figure 1). The Regional Water Board intends to recommend the upper Little South Fork Elk River (e.g., Headwaters Forest Reserve) for delisting in the next integrated report cycle. In addition, the Regional Water Board intends that sediment impairment in the remainder of the greater Elk River watershed (e.g., Martin Slough and most of the Lower Elk River sub-basins) be addressed under other developing and expanding programs.

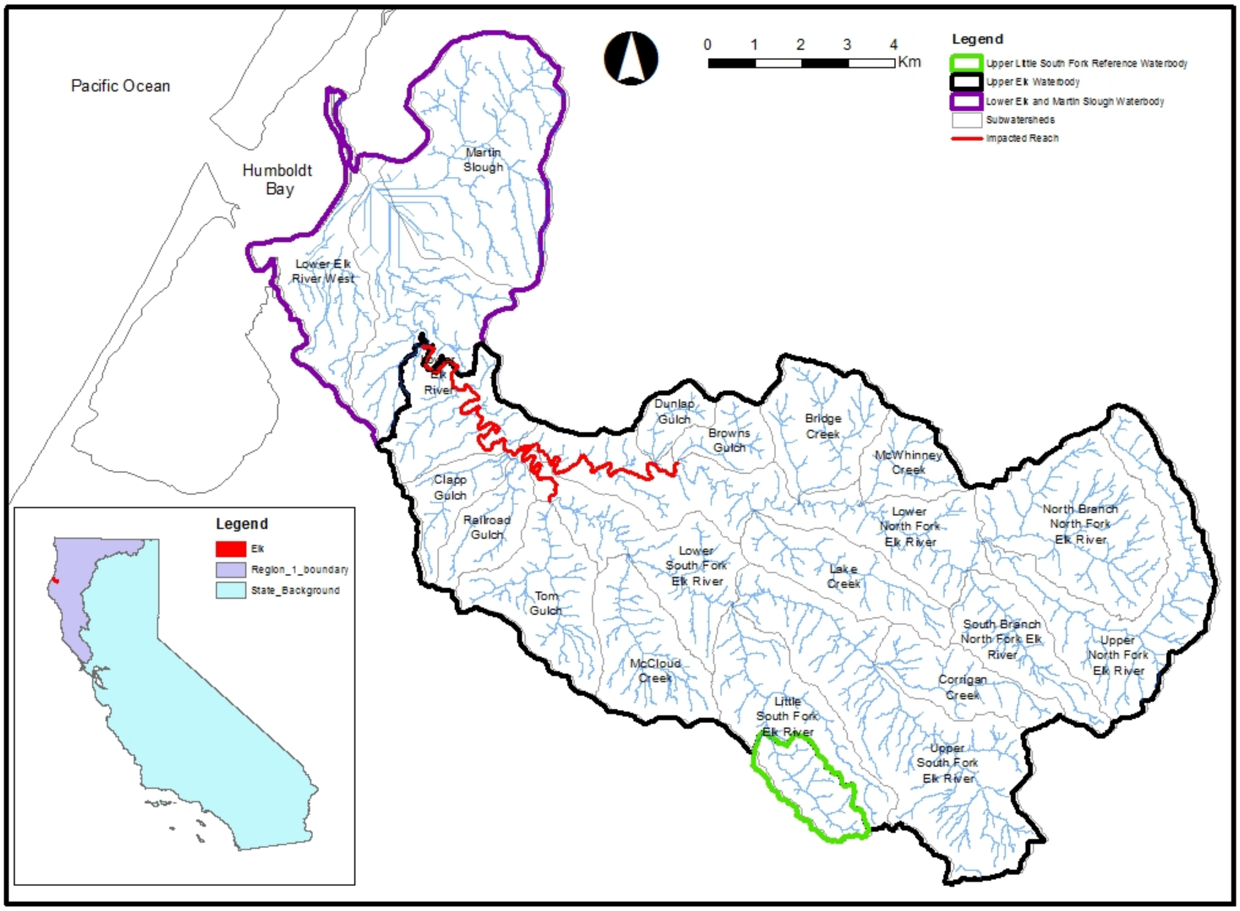

Figure 1. Delineation of the Upper Elk River watershed and impacted reach

2.2 Land Cover/Vegetation and Ownership

Five vegetation cover types, including conifer/hardwood forest, shrub, herbaceous, agricultural, and urban/bare ground, are present in the Elk River watershed (Figure 2). Urban areas are generally located near the coast, while agricultural lands include areas along the Elk River valley. Prime agricultural lands along Elk River exist mostly on the south side of the river and on the gentle slopes of the Humboldt Hill area. Cattle grazing dominates streamside land use along the lower mainstem Elk River and lower Martin Slough.

The upland areas are mostly conifer/hardwood forests with some shrub coverage. Specifically, the maritime coastal climate of the Elk River watershed supports a coniferous lowland forest community dominated by redwood (*Sequoia sempervirens*), western hemlock (*Tsuga heferophylla*), Sitka spruce (*Picea sifchensis*), grand fir (*Abies grandis*), and Douglas-fir (*Pseudotsuga menziesii*).

> Un-managed redwood forests can contribute large diameter trees and branches (large woody debris [LWD]) that are delivered to or adjacent to watercourses. LWD is an important source of instream wood, which is a critical component in the formation of the complex habitat needed to support salmonid fisheries. LWD provides cover and is also an effective mechanism in metering and sorting instream sediment. When large scale mass wasting events, such as landslides and debris flows, reach a watercourse they deliver not only large volumes of coarse and fine grained sediment; but, they also deliver important LWD to the stream system (Keller and Swanson 1979; Benda et al. 2002).

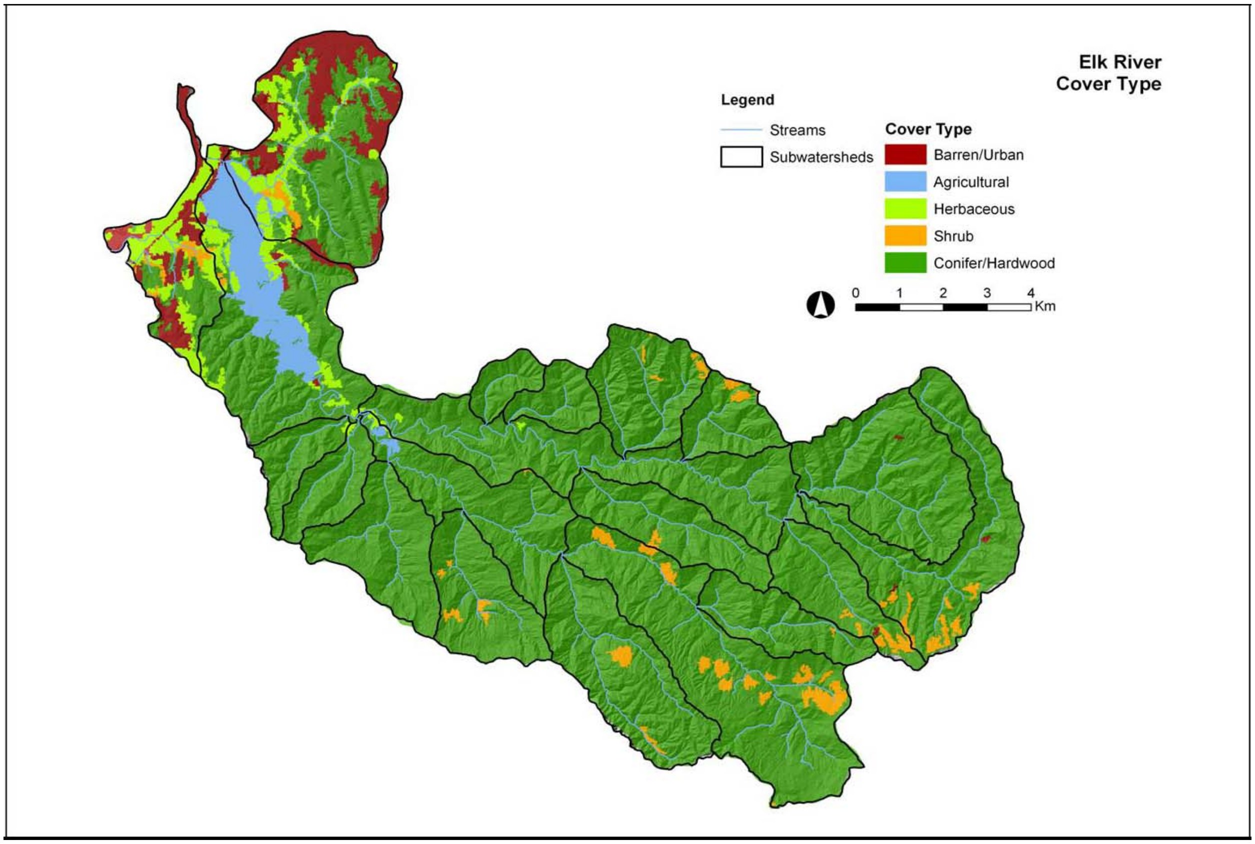

Figure 2. Land cover in the Elk River watershed (Stillwater 2007)

Figure 3 depicts land use and major land owners in the watershed and Table 2 quantifies the land use areas. HRC and Green Diamond Resource Company (GDRC) are the major private landowners in the Upper Elk River watershed. Lands owned by HRC and GDRC are primarily managed for commercial timber production (Figure 3; Table 2). HRC purchased the holdings of the former Pacific Lumber Company (Palco) in 2008 and owns the majority of land in the Upper Elk River watershed (Figure 3). GDRC land is primarily in the McCloud Creek sub-basin, draining to the South Fork Elk River. Thirteen percent of the Elk River watershed is public land, including lands owned by the Bureau of Land Management (BLM) (Figure 3; Table 2). BLM owns and operates the Headwaters Forest Reserve as an ecological refuge and for environmental education in the South Fork Elk River watershed. The lower extent of the Upper Elk River watershed includes residential (1.3 mi^2), agriculture (0.5 mi^2), or non-industrial timber lands uses (Figure 3; Table 2).

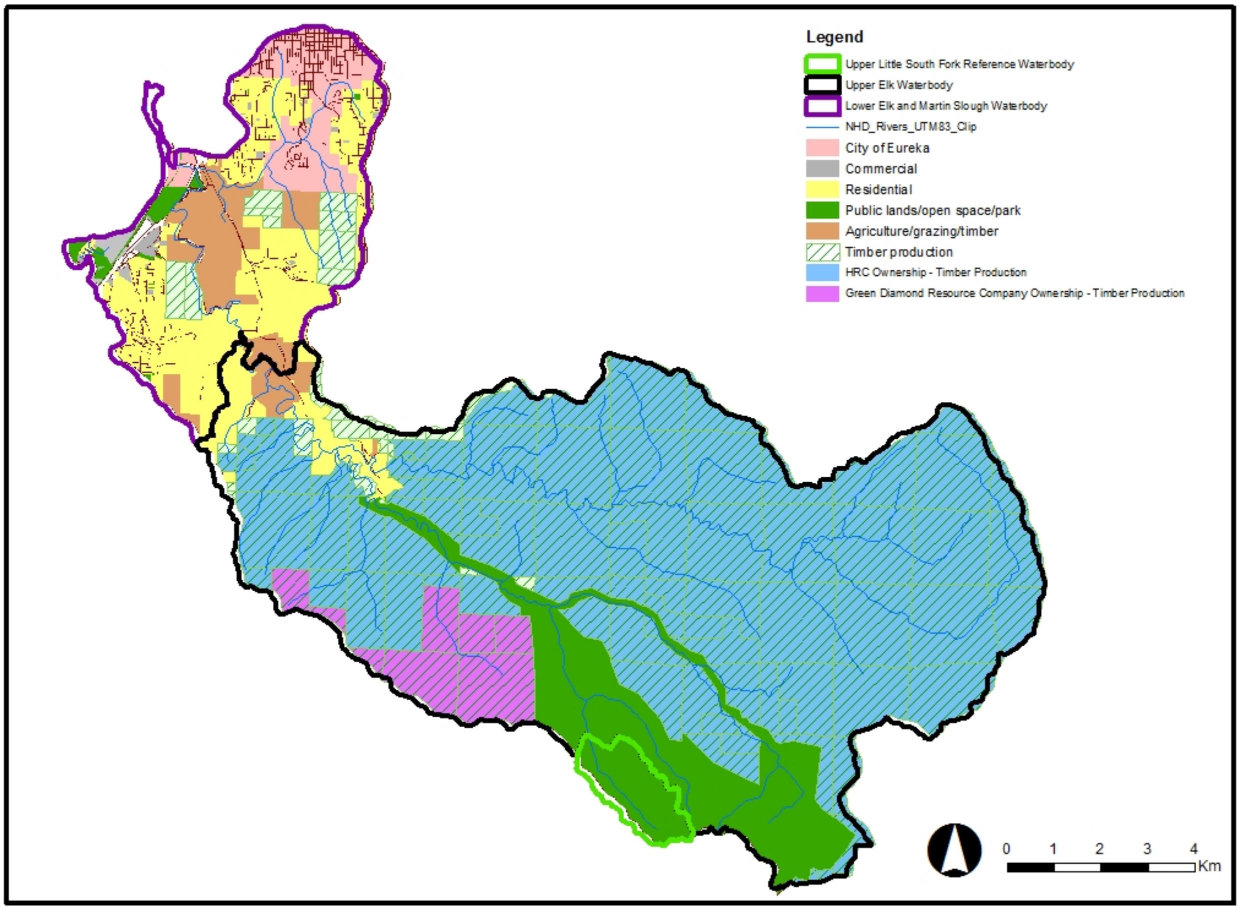

Figure 3. Land use and ownership in the Elk River watershed

Table 2. Land Use Area

Land Use Category	Elk River Watershed Area (mi^2)	Upper Elk River Watershed Area (mi^2)
Residential	6.3	1.3
City of Eureka	2.0	0.0
Timber Production	38.8	37.0
Commercial	0.3	0.0
Agriculture	2.5	0.5
Unnamed	0.1	0.0
Public	7.3	5.9
Total	**57.3**	**44.6**

In the Lower Elk River watershed, the Elk River Wildlife Sanctuary comprises 0.5 mi^2 at the mouth of the Elk River. The Wildlife Sanctuary is managed through a partnership between the California Department of Fish and Wildlife (CDFW) and the City of Eureka. Additionally, just upstream, CDFW owns and manages the 0.2 mi^2 Elk River Wildlife Area.

Ridgewood Heights is a major residential area in the Elk River watershed, characterized by both urban and rural land uses. According to the Humboldt County General Plan update, currently underway, the Martin Slough sub-basin is to be the focus of growth for the City of Eureka, potentially growing by up to 8,000 new residences. According to California Department of Fish and Game ([CDFG]; 2008) Martin Slough currently has 10 percent impervious area.

2.3 Climate and Hydrology

The Mediterranean climate of the Elk River watershed is characterized by mild, wet winters and a prolonged summer dry season. Mean surface air temperature at the coast fluctuates from 48 °F (9 °C) in January to 55 °F (13 °C) in June, with summer temperature moderated by fog. Rainfall totals are higher in the Elk River watershed than at the bay, as rainfall increases with elevation (Figure 4). Mean annual precipitation ranges from 39 inches at Eureka, located on the coast, to 60 inches in Kneeland, which is near the top of the watershed (2,657 feet above sea level) and approximately 12 miles inland from Humboldt Bay. Roughly 90 percent of the annual precipitation occurs as rainfall between October and April. Winter rainfall intensity and storm runoff are highly variable due to orographic lifting of moisture-laden, frontal air masses as they intersect the outer Coast Range.

> The extensive canopy of the redwood forest offers interception, storage, and cycling of water through evapotranspiration. Canopy intercepts the rainfall, reducing its intensity as it reaches the forest floor and decreasing the potential for accelerated soil erosion. Additionally, the interception allows rainfall to be delivered in a metered fashion over time, tempering the peak flows associated with storms. Reid and Lewis (2007) found that in second growth redwood forests, interception and evapotranspiration accounted for 20 percent of the overall rainfall, even in the largest of the measured storms.

The United States Geologic Survey (USGS), in cooperation with the California Department of Water Resources (DWR), established a stream gage station (USGS Station 11-479700) on the mainstem Elk River in 1957, just downstream of the confluence of two of Elk River's main tributaries, North Fork Elk River and South Fork Elk River (Figure 5). Railroad Gulch and Clapp Gulch, respectively, are upstream and downstream of the historic gage site. The drainage area above this gage station is 44.2 mi^2. The gage was situated where the watershed geomorphology transitions from steeper forested uplands onto the flatter coastal plain.

Monthly gage records were maintained at this USGS gage station for ten water years (WY; October through September) from 1958 to 1967 (e.g., water year 1958 starts October 1, 1957 and ends September 30, 1958). Regional Water Board staff compiled and analyzed available gage records to characterize hydrologic and hydraulic conditions during the 10-year period of record. According to the Regional Water Board's assessment, the domestic water supply beneficial use was supported and there was evidence that suggests excessive flooding did not regularly impact residents in the Upper Elk River during this period (Dudik 1998; RCAA 2003; Wrigley 2003). As such, these data offer a baseline condition on the mainstem of the Elk River, which represents a target condition. The estimated recurrence intervals of various peak flow events that are derived from these data are presented in Table 3.

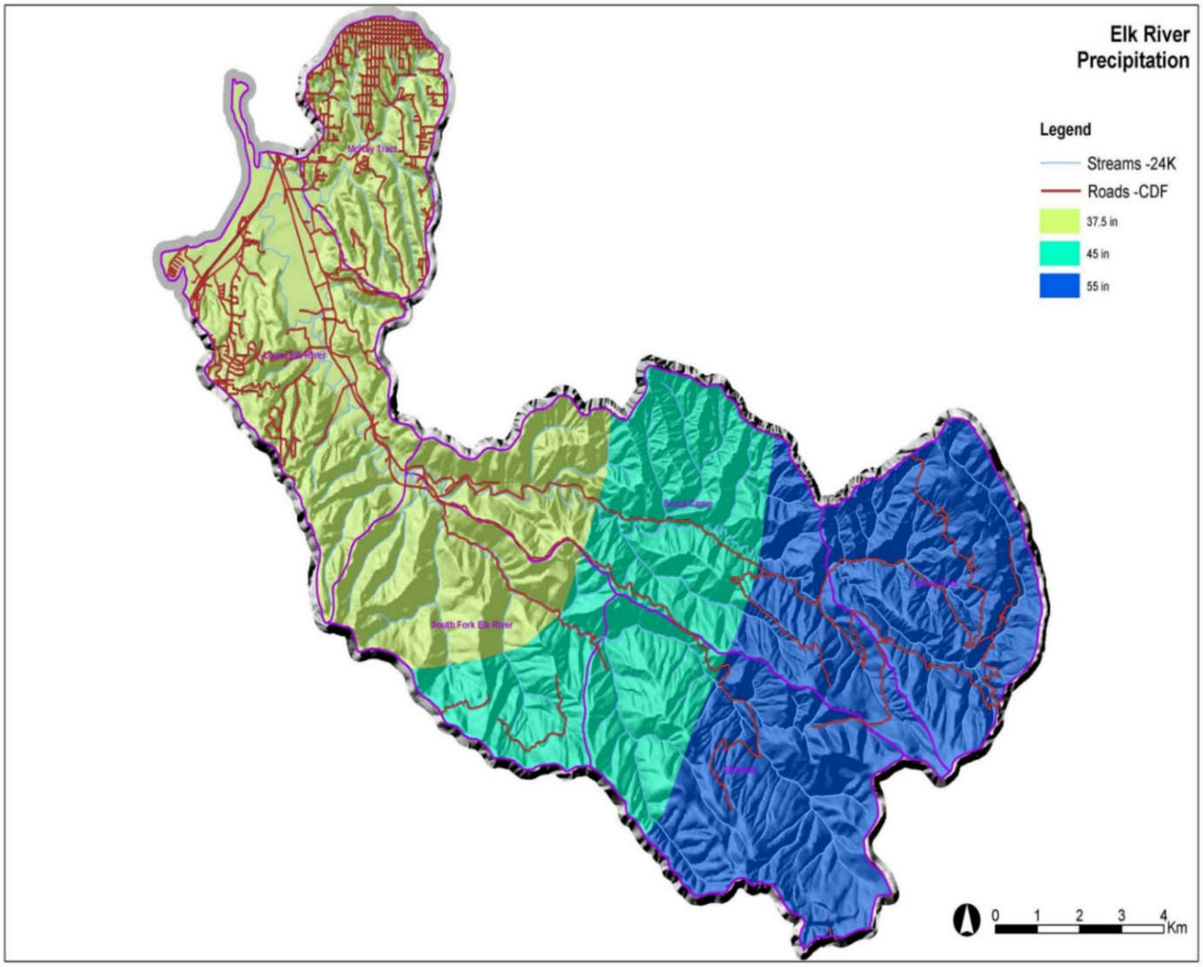

Figure 4. Annual precipitation, streams, and road network in the Elk River watershed (Stillwater 2007)

Sea level elevations have changed over time in response to climate changes and other factors. During the interglacial periods of the late Pleistocene, sea level rose and flooded the coastal portion of California numerous times, including the valley and plain of the Elk River, filling it with sediment and creating the wetland conditions associated with Martin Slough and the Lower Elk River sub-basins. During this next century, global sea levels are predicted to rise at an increasing rate due to climate change. Conservative estimates are 6 inches by 2030, 12 inches by 2050, and 36 inches by 2100 (Griggs 2012 as cited by Laird et al. 2013). Relative sea level rise rates may be greater on Humboldt Bay due to the tectonic subsidence of the land and compaction of former tidelands (Laird et al. 2013). The impacted reach passes water and sediment (see Chapter 6.2.4.4), although not efficiently enough to eliminate nuisance flooding conditions. Without restoring the hydrologic function of this reach, a back water effect could occur as a result of sea level rise, increasing the flood potential in the impacted reach.

Also associated with climate change, the future landscape condition of Elk River is likely to be influenced by increased “storminess” with the potential to trigger erosional processes that are typically episodic, including landslides. An alteration in the historic frequency and magnitude of storms has the potential to interact with natural and management-induced landscape vulnerability to increase ambient sediment loading and turbidity, as well as the frequency of floods.

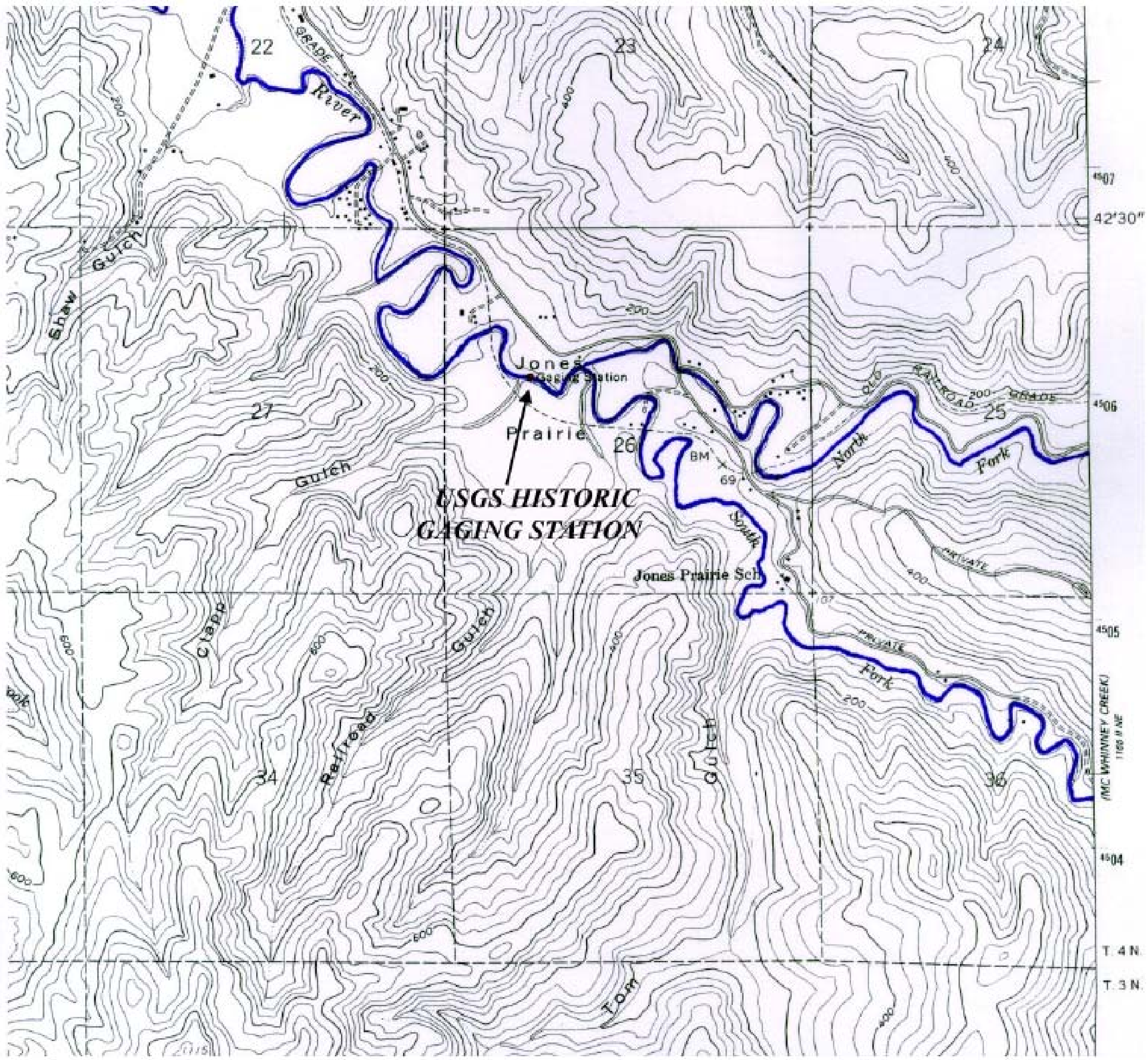

Figure 5. Location of historic USGS Gage 11-479700 (Patenaude 2004)

Table 3. Summary of Recurrence Interval at USGS Station 11-479700

Recurrence Interval (years)	Estimated Peak Flow Discharge (cfs)
1.5	2,483
2	2,713
5	3,191
10	3,456
25	3,748

2.4 Topography

The topography of the Elk River watershed shows extreme differences (Figure 6). The forested headwaters are generally steep slopes, while the grassland coastal plain is relatively flat. Hillslope gradients in the Elk River watershed have been stratified into six hillslope terrain categories based on slope gradients. Slope categories include: 0–5, 5–15, 15–35, 35–50, 50–65, and >65 percent. These categories were selected based on values that have either been mandated in regulation or have emerged as practical thresholds to aid in the identification and management of landslide hazards (Stillwater 2007).

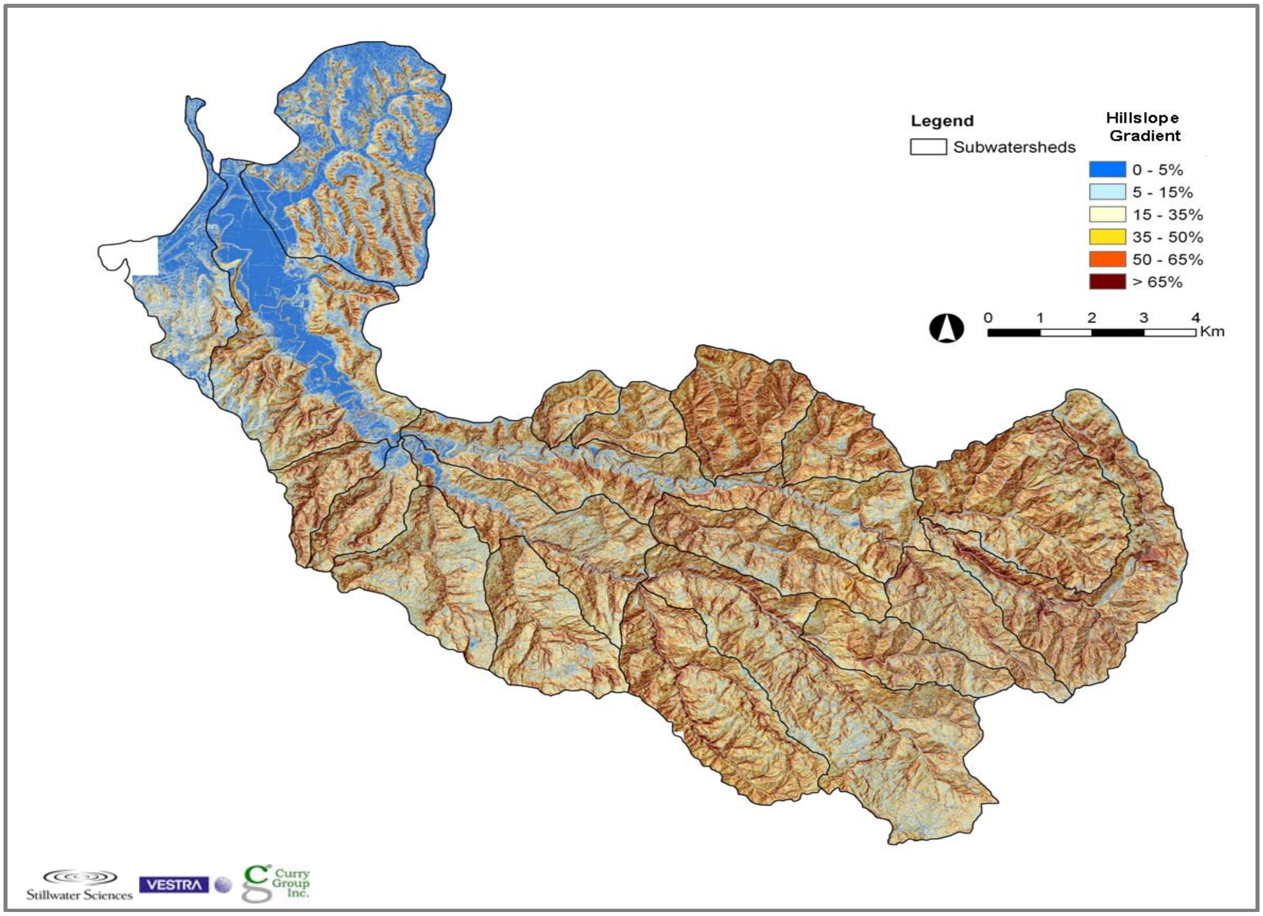

Figure 6. Slope gradients of the Elk River watershed (derived from the LiDAR-based 1-meter digital elevation model) (Stillwater 2007)

Approximately 9 percent of the watershed is in the 0-5 percent slope category, 13 percent is in the 5–15 percent slope category, 28 percent is in the 15–35 percent slope category, 20 percent is in the 35–50 percent slope category, 15 percent is in the 50–65 percent slope category, and 14 percent is in the >65 percent slope category (derived from the Light Detection and Ranging [LiDAR]-based 1-meter digital elevation model [DEM]). Figure 6 illustrates slope gradient conditions within the Elk River watershed.

2.5 Geological Setting

The Elk River watershed originates in the northwestern California Coast Range geologic province and flows northwest across the low gradient Humboldt Plain into Humboldt Bay. Elk River is unique among Humboldt Bay tributaries in that the majority of the watershed is underlain by weak Hookton and Wildcat rocks and sheared Yager rocks, allowing for rapid denudation as the drainage network incises through the formations. The long-term erosional processes in the watershed are heavily influenced by sea level and its changes due to climate, base level changes and uplift caused by tectonic movement, localized uplift due to folds and faults, and resulting channel incision in response to uplift.

The watershed is comprised primarily of geologically recent and erodible geologic formations (Figure 7). The dominant geologic unit is the Wildcat Group, which underlies nearly 60 percent of the Elk River watershed. The Wildcat Group typically consists of poorly to moderately consolidated siltstone and fine-grained silty sandstone that weather to become granular, non-cohesive, non-plastic, clayey silts and clayey sands (Marshall and Mendes 2005). The Franciscan Complex Central Belt underlies approximately 5 percent of the Elk River watershed, while the Yager terrain makes up nearly 13 percent of the watershed (Stillwater 2007). The sandstone-dominated rock units commonly form cliffs and exert local base level control where streams have cut down through younger, less resistant deposits upslope.

Ridge crests in the western part of the Elk River watershed are undifferentiated shallow-water marine and fluvial deposits (gravel, sand, and silt) of the Hookton Formation. These deposits and similar Quaternary marine and river deposits consist of poorly consolidated sand and gravel that are prone to shallow landsliding on the steep hillslopes. Combined, these deposits underlie 17 percent of the watershed and the remaining 7 percent is Quaternary alluvium, dune sand deposits. These are poorly consolidated and have relatively high infiltration rates, but are extremely erodible if vegetative cover or runoff patterns are altered.

The nature and predominance of individual geologic formations underlying a landscape is a major factor of sediment delivery to stream channels. The rocks that underlie the landscape form the source material for the in-channel substrate, including the presence or absence of spawning gravels. Historical observations indicate that both the North and South Forks of the Elk River were gravel bedded streams, with cobble present in lower South Fork Elk River (RCAA 2003). Small gravel and sand were observed in the 1960s by USGS in the mainstem Elk River (Patenaude 2004). Additionally, gravel was apparently mined from the mouth of Elk River to build streets in what is now Eureka (Winzler 2002). Current stream bed conditions are substantially degraded by fine sediment, which coats the stream bed and banks. Stream substrate is very fine, potential spawning gravels are significantly embedded, and pool depths have been decreased by sediment filling (Regional Water Board 2013a).

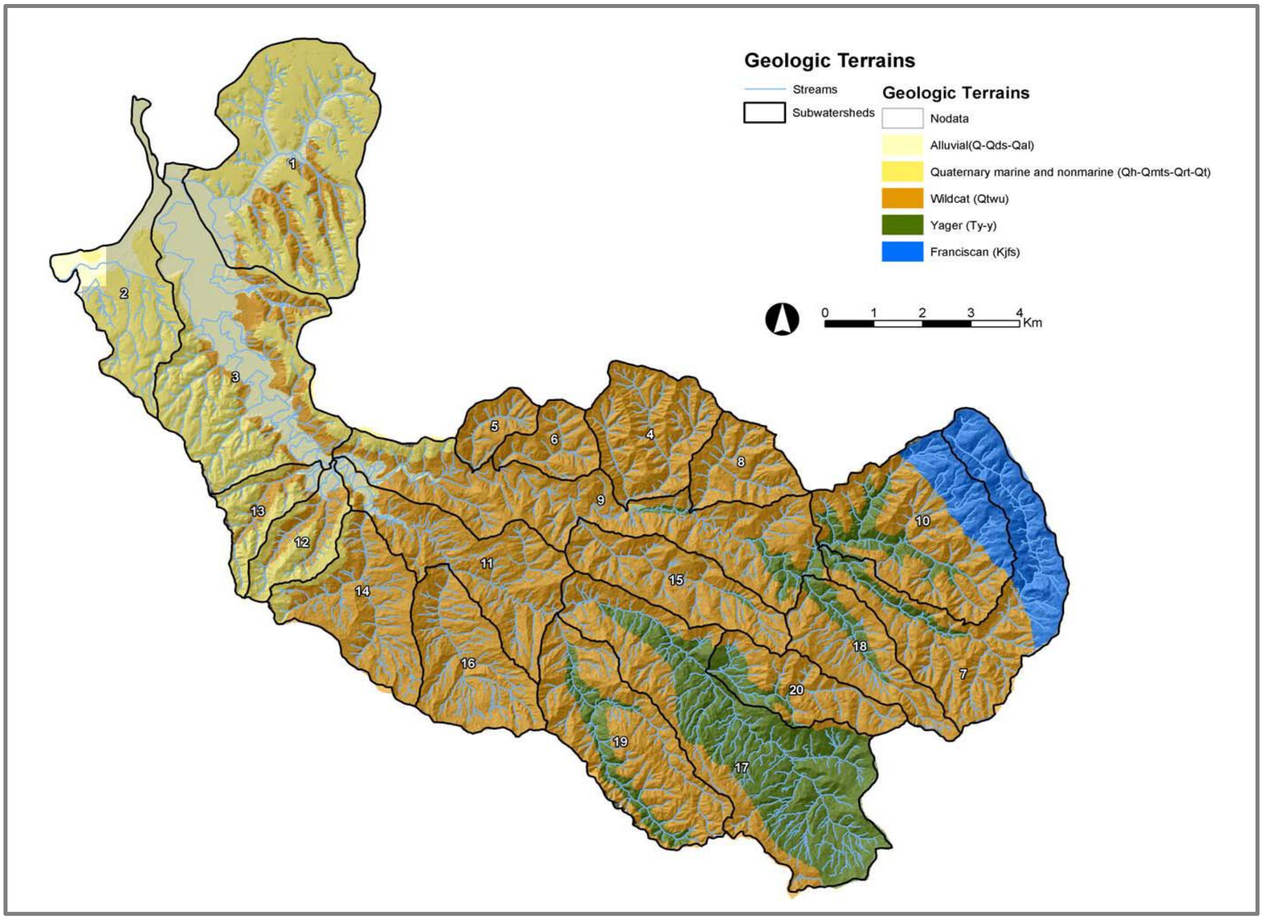

Figure 7. Geologic formations of the Elk River watershed (Stillwater 2007)

2.5.1 Soil Characteristics

The redwood forest is a source of much organic material, in the form of needle and leaf drop (duff), limbs, and tree fall. All of these sources of organic material contribute to soil formation, protect the soil from erosion, and ultimately support networks of microorganisms. These microorganisms play crucial roles in nutrient cycling, including fixing atmospheric nitrogen into the soil, enhancing the fertility of the forest and contributing to forest health. The organic rich soil supports shrubs and herbaceous understory where other site conditions allow. This understory layer in combination with duff, provides a virtual vegetative blanket over the unmanaged portions of redwood forests, thereby stabilizing the soil.

2.5.2 Tectonics

The Mendocino Triple Junction, just offshore of Cape Mendocino in northern California, is where the Pacific Plate, the North American Plate, and the Gorda Plate meet. The Gorda Plate is the southern-most portion of the Cascadia Subduction Zone and is subducting beneath the North American Plate. The Little Salmon Fault Zone is near the headwaters of Elk River. This zone is a series of northwest-trending thrust faults associated with the regional compression of the Cascadia Subduction Zone and contributes to the regional uplift of the Elk River watershed. The area is also affected by the convergence between the northwest-trending San Andreas Fault with the Cascadia Subduction Zone at the

Mendocino Triple Junction. Additionally, there are likely smaller, unmapped faults that influence localized uplift.

Subsidence of the baylands in the Elk River flood plain is occurring due to the down-warping related to tectonic activity and to compaction and diking of the lower portions of the watershed. Uplift, caused by tectonic movement, is balanced by erosion via channel incision and steep slopes. Additionally, high uplift rates result in steep slopes and shallow soil. Figure 8 presents the relationships between tectonic uplift, subsidence, and sea level rise. The net effect of this relationship is:

- Steeper slopes that affect soil stability and landslide frequency;
- High rates of channel denudation;
- Steeper stream gradients with higher energy profiles in the upper watershed;
- Lower stream gradients and elevations creating a longer depositional area and length of stream under tidal influence in the lower reaches; and
- Back water effect from sea level rise, which affects the flood potential in the impacted reach.

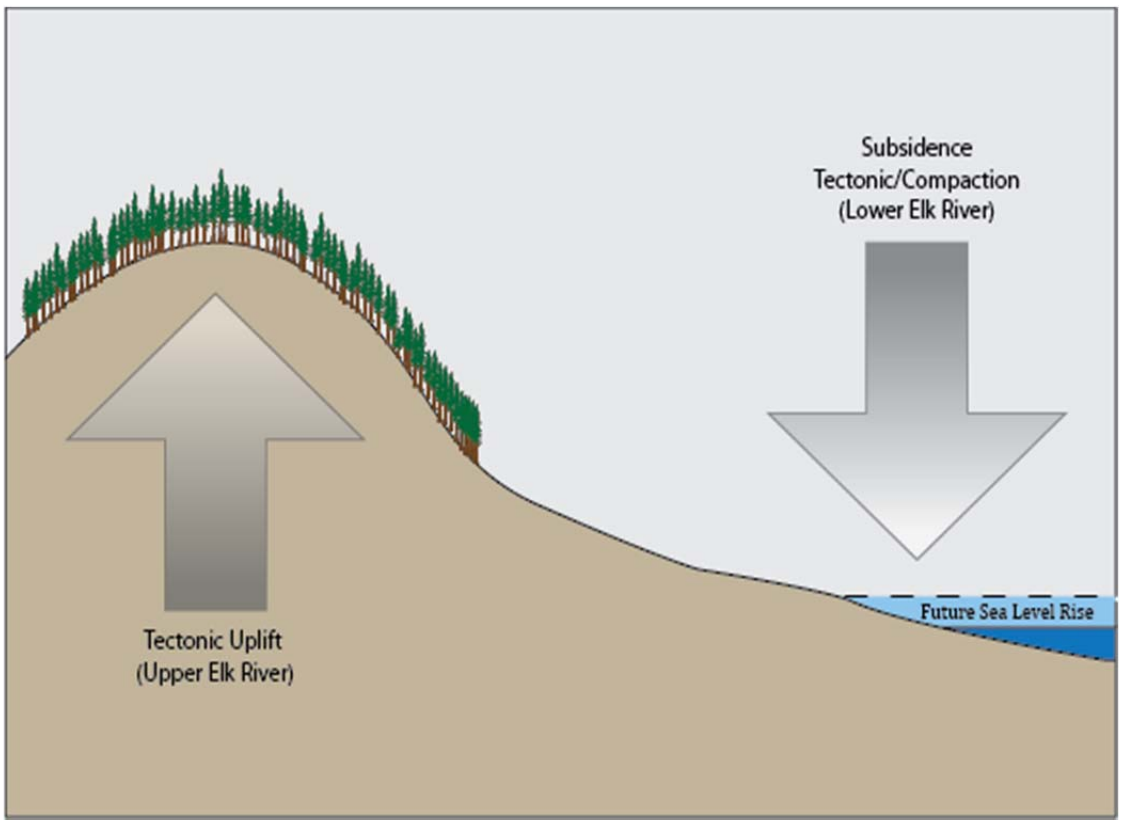

Figure 8. Relationship of tectonic uplift, subsidence, and sea level rise

Chapter 3 – Regulatory Setting

The regulatory setting influencing restoration of sediment-related beneficial uses in the Elk River watershed includes federal, state, and local regulatory requirements. The North Coast Regional Water Board is one of nine regional water boards that function as part of the California State Water Board system within the California Environmental Protection Agency. The Regional Water Board is the state agency responsible for the protection of water quality in the Elk River watershed. The Regional Water Board implements the Porter Cologne Act[5], which is the state law governing water quality protection activities as authorized by the State Legislature. The Regional Water Board, in part, is also tasked with implementing the requirements of the federal CWA.

3.1 Impaired Waters

The State Water Board, with Regional Water Board input, periodically identifies waters that are not meeting WQS. The State Water Board is required, under Section 303(d) of the federal CWA, to develop a list of those waterbodies in California where technology-based effluent limits or other legally required pollution control mechanisms are not sufficient or stringent enough to meet the WQS applicable to such waters. This list, referred to as the 303(d) list also identifies the pollutant/stressor causing the impairment, and establishes a prioritized schedule for developing a control plan to address the impairment.

Placement of a waterbody on this list generally triggers development of a pollution control plan, referred to as a TMDL. In California, the authority and responsibility to develop TMDLs rests with the nine regional water boards. The TMDL process leads to a “pollution budget” which quantifies the pollution reductions necessary to restore the health of a polluted body of water. Specifically, a TMDL is the calculation of the maximum amount of a pollutant that a waterbody can receive and still meet WQS and provide supportive conditions for the beneficial uses of water. EPA has federal oversight authority and may approve or disapprove TMDLs developed by the state. There are a number of specific components that must be included in a TMDL in order for EPA to approve it.

Consistent with recommendations by the Regional Water Board, Elk River was added to the 303(d) list in 1998. The listing was based on evidence of excessive sedimentation/siltation loads from land management activities in the upper portion of the watershed. Water quality problems cited under the listing include the following:

- Sedimentation and threat of sedimentation;
- Impaired domestic and agricultural water quality;
- Impaired spawning habitat;
- Increased rate and depth of flooding due to sediment; and
- Property damage.

[5] Water Code §§ 1300 et seq.

The Elk River, from its confluence with Humboldt Bay to its tributary headwater streams has continued to be identified as an impaired waterbody on subsequent 303(d) lists, including the latest list approved by USEPA in 2012.

3.2 Waste Discharge Requirements and Cleanup and Abatement Orders

Current management of the Elk River watershed for timber harvest is conducted under several permits issued by the Regional Water Board. These permits or other regulatory mechanisms are described below by owner. Appendix 2-C (History of Regional Water Board Regulatory and Non Regulatory Actions in the Upper Elk River Watershed) of the Peer Review Draft (Regional Water Board 2013a) provide additional information on past WDRs.

3.2.1 Humboldt Redwood Company

HRC currently operates under Order No. R1-2006-0039, an Elk River watershed-specific WDR issued by the Regional Water Board in 2006 (Regional Water Board 2006a). Treatment of road-related controllable sediment discharge sources (CSDS) have been conducted under CAO Nos. R1-2004-0028 (for the South Fork and Mainstem Elk River) and R1-2006-0055 (for the North Fork Elk River). All Orders that pertain to HRC's current activities were originally issued to Palco and amended by Order No. R1-2008-0100 to reflect HRC's ownership of the former Palco holdings. These orders were developed to compliment the HCP that covers the HRC properties (Palco 1999).

3.2.2 Green Diamond Resources Company

GDRC currently operates in the South Fork Elk River watershed under two WDRs. In 2010, GDRC was issued a WDR (Order No. R1-2010-0044) by the Regional Water Board for discharges related to road management and maintenance activities conducted ownership-wide. Subsequently, in 2012, a WDR (Order No. R1-2012) was issued for discharges related to GDRC's forest management activities ownership-wide. The 2012 forest management WDR relies on the prescriptions contained within GDRC's 2012 updates to its South Fork Elk River Management Plan. These orders were developed to compliment and make enforceable by the Regional Water Board portions of the AHCP (2007) that covers the GDRC properties.

3.2.3 Bureau of Land Management

BLM's management of the Headwaters Forest Reserve does not include commercial timber harvest activities and currently is not under any ownership-wide WDR. The primary activities conducted by BLM within the Headwaters Forest Reserve are road decommissioning and forest restoration under the Headwaters Forest Reserve Resource Management Plan.

3.2.4 TMDL Analysis and Implementation

This document confirms several important findings, which can be addressed through TMDL analyses and implementation. Specifically, existing control mechanisms are not correcting the sediment impairment and the sediment source analysis confirms that the impairment continues to persist and worsen. It is also important to consider that the CWA requires a TMDL when waters are impaired and a TMDL can be adopted as a single action if a single regulatory mechanism will attain beneficial uses. However, EPA has a new TMDL vision[6] that allows for an alternative restoration plan in lieu of a TMDL. As noted previously, this document provides the technical basis for a sediment TMDL and/or a WDR. It is a synthesis of all readily available information, which can be used to calculate a TMDL, support development of an alternative restoration plan, and/or revise the WDRs to ensure they provide reasonable assurance that the impairment will be corrected through their implementation.

3.2.5 Waste Discharge Requirements Under Development

Regional Water Board staff is currently developing revised WDRs for timberland owners in the Elk River watershed. The information and findings of the sediment analysis presented in this report are developed to inform such revisions and the development of additional permits, as necessary. The revision of WDRs is further discussed in Chapter 8.

[6] http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/programvision.cfm

Chapter 4 – Desired Watershed Conditions

This chapter includes a description of the water quality standards (WQS) applicable to the Elk River watershed (Regional Water Board 2011a). By defining instream and hillslope water quality indicators (WQIs), it also describes the desired watershed conditions that represent a functioning hydrologic and ecologic system. Collectively, these are presented as numeric targets and are appropriate for inclusion in the TMDL and WDR(s). The narrative water quality objectives (WQOs) for sediment are interpreted by deriving numeric instream WQIs and target conditions from the scientific literature and other agencies. Attainment of the instream targets is further interpreted by deriving numeric hillslope WQIs and target conditions (also obtained from scientific literature and documentation from other agencies). The goal condition described by the narrative WQOs, numeric instream targets, and numeric hillslope targets is a dynamic equilibrium (Chapter 6.1.1) in which WQS are attained, including supporting conditions for beneficial uses and abatement of flooding risks in the impacted reach[7] (Figure 9).

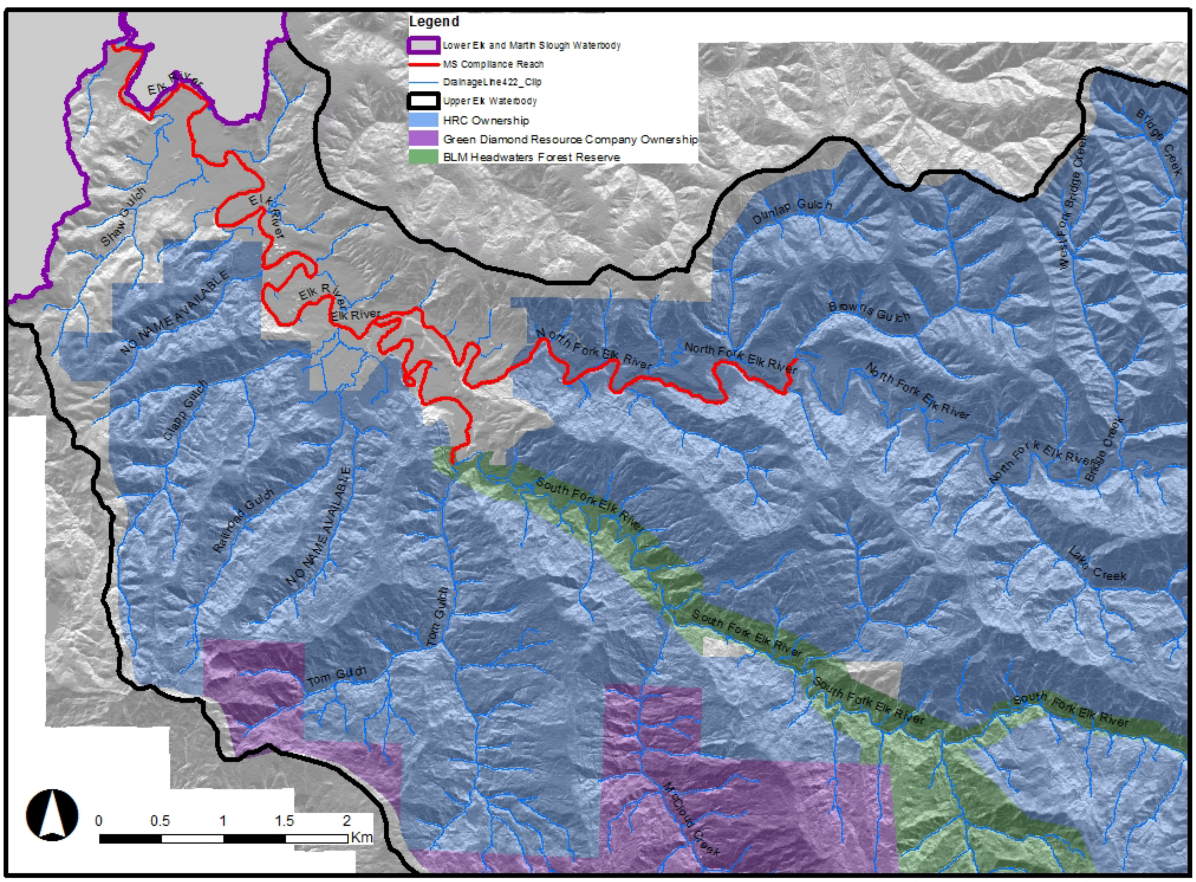

Figure 9. Upper Elk River watershed impacted reach

[7] The impacted reach extends from the confluence of Browns Gulch on North Fork Elk and Tom's Gulch on South Fork Elk downstream to the mainstem Elk River to Berta Road.

The desired watershed conditions and numeric targets are based on the current understanding of recovery potential and the conditions necessary to support beneficial uses. Under the Regional Water Board's proposed implementation strategy, these conditions and targets are expected to be continuously evaluated as part of the adaptive watershed management approach. This chapter can be considered as the initial starting point for the adaptive management process.

4.1 Water Quality Standards

WQS are adopted by the Regional Water Board to protect public health and welfare, enhance the quality of water, and serve the purposes of the federal CWA (as defined in Sections 101(a)(2), and 303(c) of the CWA). WQS, as described in the Basin Plan (Regional Water Board 2011a), consist of 1) designated beneficial uses, 2) the WQOs to protect those beneficial uses, and 3) implementation of the Federal and State policies for antidegradation. In accordance with the federal CWA, TMDLs are set at a level necessary to achieve applicable WQS. This chapter describes the state WQS for the Elk River watershed.

4.1.1 Beneficial Uses

Beneficial uses of water (beneficial uses or uses) are those uses of water that may be protected against quality degradation such as, but not limited to, domestic, municipal, agricultural supply, industrial supply, power generation, recreation, aesthetic enjoyment, navigation, preservation and enhancement of fish, wildlife and other aquatic resources or preserves.

Beneficial uses of water in the Elk River watershed include:

- **Municipal Water Supply (MUN)**
- Non-Contact Water Recreation (REC-2)
- **Agricultural Supply (AGR)**
- Commercial or Sport Fishing (COMM)
- Industrial Service Supply (IND)
- **Cold Freshwater Habitat (COLD)**
- Industrial Process Supply (PRO)
- Wildlife Habitat (WILD)
- Groundwater Recharge (GWR)
- **Rare, Threatened, or Endangered Species (RARE)**
- Freshwater Replenishment (FRSH)
- **Migration of Aquatic Organisms (MIGR)**
- Navigation (NAV)
- **Spawning, Reproduction, and/or Early Development (SPWN)**
- Hydropower Generation (POW)
- Aquaculture (AQUA)
- **Water Contact Recreation (REC-1)**
- Estuarine Habitat (EST) (applies only to estuarine portion of the watershed)
- Flood Peak Attenuation/Flood Water Storage (FLD)
- Wetland Habitat (WET)
- Water Quality Enhancement (WQE)

As noted above, there are many beneficial uses of the Elk River watershed. The beneficial uses of primary focus in this document for the Upper Elk River include: domestic drinking water (MUN) and agricultural (AGR) water supplies and salmonid habitat (including cold freshwater habitat [COLD]; rare, threatened and endangered species [RARE]; migration of aquatic organisms [MIGR]; spawning, reproduction, and/or early development [SPWN]). These are shown in bold in the list above. Water contact recreation (REC-1) is also a key beneficial use in the watershed; however, the other bolded beneficial uses represented more sensitive uses. Therefore, protection of the water supply and salmonid habitat uses are expected to adequately protect REC-1, as well.

4.1.2 Sediment-Related Water Quality Objectives

Basin Plans contain both numeric and narrative WQOs to support beneficial uses. These WQOs specify limitations on certain water quality parameters that are not to be exceeded. The sediment-related objectives pertinent to the Elk River watershed are:

- **Suspended material**: Waters shall not contain suspended material in concentrations that cause nuisance[8] or adversely affect beneficial uses.
- **Settleable material**: Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.
- **Sediment**: The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
- **Turbidity**: Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

All four of these WQOs are associated with the salmonid habitat beneficial uses of concern (COLD, MIGR, RARE, and SPWN). In addition, the turbidity, suspended sediment, and settleable material WQOs directly protect the water supply uses (MUN and AGR). WQOs are either explicitly or implicitly designed to prevent nuisance conditions.

4.1.3 Controllable Water Quality Factors

Porter Cologne and the Basin Plan also contain a provision for “controllable water quality factors” as described below:

> Controllable water quality factors shall conform to the water quality objectives contained herein. When other factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, then controllable factors shall not cause further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled.

If controllable water quality factors are affecting the support of WQS, actions must be taken to bring those factors into conformance with Basin Plan objectives such that beneficial uses of water are maintained and restored. This provision specifically supports the development of hillslope WQIs, as described below.

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[8] CWC § 13050(m) defines nuisance to mean anything which meets all of the following requirements: (1) Is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property. (2) Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal. (3) Occurs during, or as a result of, the treatment or disposal of waste.

4.1.4 Antidegradation Policies

There are two antidegradation policies that are applicable to all waters in the North Coast Region — a State policy and a federal policy. The State antidegradation policy is titled the *Statement of Policy with Respect to Maintaining High Quality Waters in California* (Resolution 68-16). The federal antidegradation policy is found at title 40, Code of Federal Regulations, Section 131.12. Both policies are incorporated in the Basin Plan for the North Coast Region (Regional Water Board 2011a). Although there are some differences in the state and federal policies, both require that whenever surface waters are of higher quality than necessary to protect the designated beneficial uses, such existing quality shall be maintained unless otherwise provided by the policies. High quality waters are defined by the highest water quality existing since 1975. The Elk River watershed is described by CDFW as a critical habitat for endangered coho, which infers a historic presence of clear, cold water, an adequate area of gravel-sized substrate for spawning, and adequate channel complexity. Nonetheless, both the geologic setting (Chapter 2) and results of the sediment source analysis (Chapter 6) suggest that since 1975 sediment-related conditions in the Upper Elk River are unlikely to have been of higher quality than necessary to protect beneficial uses.

4.1.5 State Policy for Control of Nonpoint Sources of Pollution

The 2004 State Water Board *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Policy) establishes requirements for both nonpoint source dischargers and Regional Water Board regulation of those dischargers (State Water Board 2004). The NPS Policy requires that the Regional Water Board use its administrative tools (e.g., WDR, waiver of WDRs, and prohibition) to address all nonpoint source discharges of waste and ensure compliance with all nonpoint source (NPS) pollution control requirements. In this way, the NPS Policy "provides a bridge between the NPS Program Plan and the [State Water Board] Water Quality Enforcement Policy" (State Water Board 2004).

Following is a summary of the three administrative tools required to control nonpoint sources of pollution, as reaffirmed in the 2004 State NPS Policy.

- **Waste Discharge Requirements (WDRs):** WDRs are the Regional Water Board's water quality control permits that may include effluent limitations or other requirements that are designed to implement applicable water quality control plans, including designated beneficial uses and the WQOs established to protect those uses and prevent the creation of nuisance conditions.
- **Waivers of WDRs:** The requirements for a discharger to apply for WDRs may be waived for a specific discharge or a specific category of discharge if the Regional Water Board determines that the waiver is consistent with the Basin Plan and is in the public interest. All waivers are conditional and may include specific management practices that must be implemented to be eligible for the waiver. Waivers may be terminated at any time and may not exceed five years in duration without being renewed through a public Regional Water Board adoption hearing.
- **Prohibitions:** The Regional Water Board may prohibit discharges of waste or types of waste through WDRs or through waste discharge prohibitions amended into the

Basin Plan. The prohibition may be made conditional by including specific conditions under which application or enforcement of the prohibition may be waived. Regional Water Boards may also use conditional Basin Plan prohibitions as the primary administrative tool for implementation programs. For example, in cases where a Regional Water Board desires to prohibit discharges unless certain procedural or substantive conditions are met.

4.2 Numeric Targets: Water Quality Indicators

Numeric targets are used as a means to express narrative WQOs. Specifically, numeric targets offer a means to evaluate attainment of WQOs and the beneficial uses they protect. They are a mechanism to document measureable improvement. However, it is important to note that numeric targets are not WQOs; they are not enforceable unless they are incorporated into future permitting or regulatory actions (it is anticipated that a subset of the numeric targets identified below could eventually be incorporated into permits). If targets are incorporated into permits (and therefore become enforceable), it must be understood that not all of the proposed numeric targets may be attainable within the life of a permit. Any change from pre-permit condition toward the numeric targets will be considered as making measurable progress.

Numeric targets are useful in linking hillslope and instream conditions to narrative WQOs and associated beneficial uses. The numeric targets selected are based on Instream WQIs and Hillslope WQIs. The proposed numeric targets represent a conceptual linkage between hillslope erosion and aquatic ecosystem functioning, including the physical, chemical, and biological components of the system that support achievement of WQOs and protection of beneficial uses and prevention of nuisance flooding conditions.

The Instream WQIs describe a condition under which water quality and hydrogeomorphic features in the Upper Elk River stream network are able to meet the following three instream goals:

1. Support salmonids[9] throughout their historical range;
2. Support the use of surface water for domestic drinking water and agricultural water supplies, particularly within the impacted reach; and
3. Contain historic bankfull discharges[10] within the bankfull channel, particularly within the impacted reach.

The first two instream goals above tie directly to the salmon habitat and water supply beneficial uses, respectively. The third goal is associated with prevention of nuisance flooding conditions, which is another critical problem in the watershed (Chapter 5.2.2). These goals (and, therefore, the associated beneficial uses) are linked to the specific Instream WQIs in Table 4 below.

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[9] Coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*Oncorhynchus tshawytscha*), Coastal cutthroat trout (*Oncorhynchus clarki clarki*) and Steelhead (*Oncorhynchus mykiss*) are historically present in the Elk River watershed.

[10] Bankfull discharge is the discharge at which water fills the channel completely and the water surface is level with the floodplain.

While the Instream WQIs focus on conditions within the stream channel, it is also important to manage and improve conditions on the land. The Hillslope WQIs collectively describe hillslope conditions that are expected to support attainment of beneficial uses. This is accomplished by reducing the signature left on the landscape from land use activities. The Hillslope WQIs describe conditions in which sediment delivery, hydrology, and large woody debris recruitment supports attainment of beneficial uses, as measured by trends in the Instream WQIs.

4.2.1 Instream Water Quality Indicators

Instream WQIs offer a suite of numeric targets to strive for and to gage improvements in the aquatic system. Table 4 identifies the Instream WQIs, their associated instream goal, numeric target, and the associated stream type.

Table 4. Summary of Instream Water Quality Indicators

Instream Indicator	Instream Goal[a]	Numeric Target[b]	Associated Stream Type
Bankfull Channel Capacity	FLOOD	Channel cross-sectional area sufficient to contain the historic bankfull discharges (see Regional Water Board 2013a for additional details): Upper Mainstem = 2,250 cfs Lower North Fork, = 1,172 cfs Lower South Fork = 1,015 cfs	Area of impacted reach near confluence of North and South Forks Elk River
Chronic turbidity[c]	SALMON; SUPPLY	Clearing of turbidity between storms to a level sufficient for salmonid feeding and surface water pumping for domestic and agricultural water supplies	Salmonid feeding—watershed-wide historic range of salmonids Water supplies—Impacted reach

[a] Key for Instream Goals:

SALMON: Support salmonids throughout their historical range in Elk River

SUPPLY: Support the use of surface water for domestic drinking water and agricultural water supplies

FLOOD: Contain flood flows within the channel bankfull discharge

[b] cfs = cubic feet per second.

[c] The WQO for turbidity also applies (Chapter 4.1.2). The Instream WQI target condition focuses specifically on turbidity values between storms.

Numerous sediment TMDLs throughout the region[11] adopted by the Regional Water Board and EPA include Instream WQIs generally focusing on salmonid habitat quality, including sediment composition, pool depth and frequency, and large wood. While this report does not identify WQIs for those aspects of salmonid habitat, they may be adapted from a variety of applicable studies as well as compilations of habitat indictors and values including the *Desired Salmonid Freshwater Habitat Conditions for Sediment-Related Indices* (Regional Water Board 2006b; see also Regional Water Board 2013a, 2013b for additional rationale on use of specific indicators) as well as the National Oceanic and Atmospheric Association (NOAA) National Marine Fisheries Service *Properly Functioning Conditions Matrix* as incorporated into the HCP for HRC (USFWS and Calfire 1999).

[11] See http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/ for sediment TMDLs adopted by the Regional Water Board.

Monitoring of Instream WQIs is critical to track progress toward attainment of WQOs and beneficial use protection and restoration. The stewardship process can assist with coordinated monitoring to track progress towards improved salmon habitat and water supplies and elimination of nuisance conditions. Evaluation of the proposed instream numeric targets or other salmonid habitat-related targets through special studies is encouraged and could be guided by the proposed watershed stewardship group, as appropriate. Similarly, landowners could propose alternative targets, as determined necessary, through monitoring and adaptive management.

The Peer Review Draft (Regional Water Board 2013a) provides examples of instream targets that are under consideration for further development and refinement as part of the adaptive management stewardship program in Elk River. The development of salmonid habitat-related targets specific to Elk River should include the following considerations: (1) commonly applied salmonid habitat indices have been developed primarily for Franciscan geology (produces both course and fine sediment) and Elk River is primarily comprised of Wildcat Formation (producing primarily fine sediment); (2) sediment-related habitat needs vary by life stage for different salmonid species and specific values may not be appropriate for all life stages of all salmonids; and (3) generally with WQIs, a series of environmental conditions that trend toward the target conditions is the desired condition. When evaluated comprehensively, numeric targets can demonstrate attainment of beneficial uses; however, when evaluated individually, they should be interpreted as recommendations.

4.2.2 Hillslope Water Quality Indicators

The proposed Hillslope WQIs are divided into two categories: 1) common indicators that are comparable to those adopted by the Regional Water Board in numerous sediment TMDLs or WDRs and 2) Hillslope WQIs that are specific to the Upper Elk River watershed due to its unique characteristics. A subset of these indicators may be translated to permit terms, so they become enforceable.

The Hillslope WQIs offer a suite of controllable factors that can be managed through the use of best management practices (BMPs) that can be implemented in support of beneficial use attainment (see Chapter 4.2.3 for a discussion on the application of WQIs). Table 5 depicts the Hillslope WQIs, associated instream goal, numeric target for each indicator, and the applicable area in the Upper Elk River watershed. This table includes both the common and specific indicators. The Peer Review Draft provides detail on these indicators, including applicable source categories (Regional Water Board 2013a).

It is important to recognize that these Hillslope WQIs require careful interpretation. Similar to the Instream WQIs, when evaluated comprehensively (Chapter 4.2.3), these are numeric targets that demonstrate attainment of beneficial uses; however, when evaluated individually, they should be interpreted as recommendations. They focus on the controllable sources of sediment in the watershed and their implementation is expected to support attainment of instream WQOs. The pertinent instream goals are generally associated with salmon habitat; however, meeting Hillslope WQIs is also expected to indirectly support the other instream goals through reduction in sediment loads, including fine sediments, which can reduce aggradation and turbidity (thereby improving nuisance flooding and water supply, respectively).

Table 5. Summary of Hillslope Water Quality Indicators

Indicator	Instream Goal[a]	Numeric Target	Associated Area
Common Road Indicators			
Hydrologic connectivity of roads to watercourses	SALMON SUPPLY FLOOD	100% of road segments hydrologically disconnected from watercourses	All roads
Sediment delivery due to surface erosion from roads	SALMON SUPPLY FLOOD	Decreasing road surface erosion	
Sediment delivery due to road-related landslides	SALMON SUPPLY FLOOD	Decrease in sediment delivery from new and reactivated road-related landslides	
Common Harvest-Related Indicators			
Sediment delivery due to surface erosion from harvest areas	SALMON SUPPLY FLOOD	100% of harvest areas have ground cover sufficient to prevent surface erosion	All harvest areas
Sediment delivery from open slope landslides due to harvest-related activities	SALMON SUPPLY FLOOD	Decrease in sediment delivery from new and reactivated open-slope landslides	All open slopes
Sediment delivery from deep seated landslides due to harvest-related activities	SALMON SUPPLY FLOOD	Zero increase in discharge from deep-seated landslides due to management-related activities	All deep-seated landslides
Common Management Discharge Site Indicators			
New management discharge sites	SALMON SUPPLY FLOOD	No new management discharge sites created	Across ownership
Specific Upper Elk River Watershed Indicators			
Headward incision in low order channels	SALMON SUPPLY FLOOD	Zero increase in the existing drainage network	Lower order channels
Peak flows	SALMON SUPPLY FLOOD	Less than 10% increase in peak flows in 10 years related to timber harvest	Class II/III catchments
Channels with actively eroding banks	SALMON SUPPLY FLOOD	Decreasing length of channel with actively eroding banks within sub-basins	Across ownership
Characteristics of riparian zones (i.e., 300 feet on either side of the channel) associated with Class I and II watercourses	SALMON SUPPLY FLOOD	Improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover	Class I and II watercourses
Characteristics of riparian zones (150' on either side of the channel) associated with Class III watercourses	SALMON SUPPLY FLOOD	Improvement in the quality/health of the riparian stand so as to promote 1) delivery of wood to channels, 2) slope stability, and 3) ground cover	Class III watercourses

[a]Key for Hillslope Goals:

SALMON: Support salmonids throughout their historical range in Elk River

SUPPLY: Support the use of surface water for domestic drinking water and agricultural water supplies

FLOOD: Contain flood flows within the channel bankfull discharge

4.2.3 Application of Water Quality Indicators

The WQIs identified above can be applied in multiple settings. They help to:

- Establish appropriate metrics for ongoing monitoring, whether it is effectiveness monitoring, trend monitoring, or compliance monitoring;
- Determine appropriate control measures to be included in a regulatory mechanism, including specific numeric permit provisions; and
- Establish adaptive management thresholds, appropriate for identifying temporal and spatial conditions for re-evaluation of the applied control measures.

Because NPS restoration is driven by BMPs, evaluating post-implementation monitoring data against these numeric targets can show if the BMPs are adequate to restore and maintain beneficial uses. BMPs prevent sediment from entering waterways and increase the potential that instream numeric targets will be met.

Scientific methods to describe hydrogeomorphic processes are constantly expanding and evolving and, because of this, specific methodologies are intentionally not prescribed for the Instream or Hillslope WQIs. This encourages use of the latest techniques and emerging science to characterize and monitor water quality conditions. The numeric targets can be evaluated and modified through strong science within an adaptive management framework.

Attainment of the numeric targets is intended to be evaluated using a weight-of-evidence approach, because no single WQI applies at all points in the stream system and stream channel conditions are inherently variable. In other words, when considered together, the WQIs are expected to provide good evidence of the condition of the stream and attainment of beneficial uses. It is not necessary to achieve all of the numeric targets in order to meet beneficial uses.

Chapter 5 – Problem Statement

This chapter provides a description of the impairments to the pertinent beneficial uses in the Elk River watershed. It also documents other water quality concerns, such as nuisance flooding. Watershed conditions associated with these watershed impacts are also presented. The Peer Review Draft provides additional detail regarding these topics (Regional Water Board 2013a).

5.1 Watershed Conditions

The impacted reach has been identified as impaired for sediment as a result of three related factors: 1) excess sediment has been deposited on the bed, banks, and floodplain, reducing channel conveyance; 2) sediment delivered from the upper watershed is predominated by very fine particles, which can embed gravel; and 3) deposited material is readily colonized by vegetation, which anchors the material and reduces the potential for remobilization to move sediment out of the system.

There has been a history of significant sediment deposition on the bed, banks, and floodplain of Elk River, including the impacted reach (see Chapter 6.2 for a discussion of sources). This aggradation is a function of sediment volume as well as the composition of the sediment and increased opportunity for vegetation growth, as described above. Overall, this deposition has caused diminished flow conveyance resulting in frequent, extensive flooding. The flooding poses health and safety risks to residents and constitutes a nuisance condition. In addition, the sedimentation impacts salmon habitat and water supply beneficial uses.

In 1998, the Regional Water Board found that it would be too environmentally damaging to remove the sediment deposits and preferred to pursue regulatory requirements for Palco to quantify past waste discharge volumes, treat sites with the potential to discharge, and implement measures designed to prevent new sediment discharges. It was expected that the excess stored sediment would slowly scour over time; particularly as upstream sediment sources were better controlled. This process was effective at reducing sediment loads related to management activities. However, even though sediment sources have been reduced and the watershed has been subject to many large, potentially scouring storms, data indicate that the stream channel, banks, and floodplain continue to aggrade.

Specifically, morphologic changes resulting from deposition of fine sediment is described from observations by residents and staff and corroborated with cross-sectional surveys (Regional Water Board 2013a; Lewis 2013; HRC 2014). The sediment supply in the Elk River has overwhelmed the transport capacity of the river resulting in rapid channel and floodplain aggradation. Deep pools and gravel bars have been filled in and silted over, respectively. The naturally steep stream banks and low terraced floodplains that defined the former bankfull channel have been inundated with repeated deposition of excessive amounts of very fine sand and silt-sized sediment. The broader floodplain is also routinely covered in silty deposits during overbank flooding events. An in-depth analysis and discussion of these issues can be found in the Peer Review Draft (Regional Water Board

2013a). The remainder of this chapter describes various watershed conditions that contribute to the sediment problems in the Upper Elk River watershed. The combination of the environmental setting and management activities has resulted in an increased risk of erosion in the upper reaches and sedimentation in the lower reaches.

5.1.1 Environmental Setting

As described in Chapter 2, the Elk River watershed has steep upland topography, erodible geologic formations, and a restricted, low gradient river mouth. The watershed is also tectonically active, with areas of localized uplift from folds and faults resulting in channel incision. These environmental factors all contribute to the potential for erosion in the upper watershed and subsequent deposition in the lower watershed. This erosion/sedimentation pattern is exacerbated by other factors, including landslides (natural and management-related) and anthropogenic activities. Natural conditions that contribute to erosion and landslides are described in this chapter, while the role of anthropogenic activities is discussed in Chapter 5.1.2. Among these factors are hillside slopes, geology, soils, vegetation, and precipitation:

- **Hillslide Slopes:** The area underlain by the Wildcat Group is characterized by steep and dissected topography sculpted by debris sliding, and is known for high historical erosion rates from such slope failures. Shallow landslides in the Wildcat Group are commonly associated with headwall swales, inner gorges, and hollows. These are areas where weathered soil and colluvium accumulate over the loosely consolidated parent bedrock. The relatively fine-grained nature of the bedrock produces an overall low permeability rate, which increases the risk of slopes becoming saturated with water. The low permeability coupled with the natural orientation of the bedding planes (subparallel to the hillslope) make these areas prone to landsliding (Pacific Watershed Associates [PWA] 1998).
- **Geology:** The argillite-dominated rock units of the Yager terrain are typically deeply weathered and sheared and subject to deep-seated flow failures on moderate slopes (Marshall and Mendes 2005). Deep-seated landslides and earthflows enclosing blocks of component sandstone are common in the Franciscan Complex Central Belt. These blocks commonly create steep slopes and weather to soils that have little strength and are susceptible to debris slides and debris flows (Marshall and Mendes 2005). Shallow landsliding and deep-seated bedding plane failures are common in Hookton terrain (Marshall and Mendes 2005).
- **Soils:** Subsurface erosion of soil via soil pipes appears to be prevalent in Upper Elk River watershed, at least in the Wildcat Group (PWA 2000; Buffleben 2009; Regional Water Board 2013a). Soil pipes are a connection of macropores in the subsurface soils. These macropores run parallel to the soil surface and are a conduit for subsurface runoff. Timber harvesting can modify transpiration and rainfall interception, increasing the amount of subsurface flow generated during storms; and road construction and heavy equipment use can compact soils and disrupt soil pipes (Cafferata and Reid 2013). These alterations to flow through soil pipes can lead to internal erosion of the pipe, which can thus produce daylighted gullies by tunnel collapse (Buffleben 2009; Cafferata and Reid 2013; SHN 2013). The eroded

material can clog soil pipes, causing pore water pressure buildup inside the pipes that can result in landslides, debris flows, embankment failures, or of ephemeral gullies (Fox et al. 2007).

- **Vegetation:** The presence (or the absence of) and density of vegetative cover is directly related to surface and hillslope erosional processes. Increase in both surface erosion and hillslope mass wasting events can occur following alteration of the canopy cover, specifically resulting from changes in rainfall interception, and the effects of root distribution and strength on slope stability. Redwoods have an intricate network of shallow roots that contribute to the stability of steep forested slopes by maintaining the shear strength of soil mantles. Roots add strength to the soil by anchoring through the soil mass into fractures in the bedrock and laterally to root systems of adjacent trees. Root strength contributes to increasing slope stability across zones of weakness or instability (Ziemer and Swanston [1977]; Ziemer [1981], O'Loughlin and Ziemer [1982]). Additionally, roots influence the soil pipe network via providing preferential flow paths and providing stability to protect the capping layer above soil pipes from collapse (Jones 1994).
- **Precipitation:** Storm events with rainfall intensity exceeding 3-4 inches a day are considered capable of initiating landslides (Palco 2004). A 24-hour rainfall total of 4-5 inches in the Eureka area (up to approximately 2,000 feet) has an estimated return interval of 5 years (NOAA Atlas Vol XI Northern California cited in Palco 2004). Rainfall intensities exceeding 5 inches per day are rare and have only occurred 3 times between 1941 and 1998 (water years 1950, 1959, and 1997). The 24-hour rainfall total of 6.8 inches on December 27, 2002 set many records and caused widespread landslide damage and flooding.

These natural factors are documented in the Elk River watershed (Chapter 6.1.3). They are also known to exacerbate erosion and landslides. When evaluated comprehensively, the Elk River watershed has both an increased risk of erosion in the upper watershed and the potential for sedimentation in the lower reaches. These conditions make the watershed prone to sediment impairment and the potential for impairment is further aggravated by anthropogenic or management-related activities.

5.1.2 Historical Management and Land Use Activities

Documenting historical activities and events to establish a timeline provides useful context for the complex technical analyses that are presented in this document. There has been over a century of intensive anthropogenic activity in the Elk River watershed. It is important to consider this activity while simultaneously considering the loads quantified during different time periods (Chapter 6.2). This perspective provides context to evaluate the status of dynamic equilibrium in the impacted reach (Chapter 6.1.1).

From the settling of Elk River in approximately 1850, through the present, Elk River has provided water supplies to residents. Lower Elk River served as the water supply for the growing town of Eureka from 1885–1935, until the construction of Sweasy Dam on the Mad River offered an alternative supply. During that period, Elk River was stocked with fish by CDFW.

The Upper Elk River watershed has been utilized primarily for timber harvesting since the 1850s. Ranching and residential uses have dominated the valley. Between 1850 and 1870, a road was built across Elk River. The bay jetties were constructed between 1880 and 1900. Coast survey maps identify a sand spit at the mouth of Elk River that was constantly changing and an island located approximately half a mile from its mouth. Between 1910 and the mid-1940s, the sand spit grew to the north by 6,200 feet, likely in response to both increased sediment discharges and altered bay hydraulics associated with hardening and deepening.

At various times, Humboldt Bay was deepened to facilitate shipping. By the 1850s, the watershed was becoming a hub for timber production, beginning in Elk River in earnest in the 1860s. Initially, hand harvesting of old-growth redwoods proceeded slowly, yarding[12] the logs to the river by oxen and transporting them down-river in booms or rafts during high flows. Between 1860 and 1885, a log pond operated on South Fork, which would be released during high flows sending logs downstream; high tides would facilitate their transport to the Bay. The sand spit at the mouth of Elk River impeded log transport during high tides from 1880–1900.

From 1880–1935, a mill was operated on South Fork Elk River near McCloud Gulch in the town of Falk. In 1895, a rail line was constructed to Falk, connecting upper Elk River to Humboldt Bay. The primary log transportation was via railroad through the 1930s. Eventually rail lines and mills were built up North Fork, as well. Steam donkeys (steam-powered winches) were used to yard logs until the advent of early tractors in the mid-1920s. Trucks replaced railroads for transportation in the mid-1930s.

Timber operations continued in the upper watershed. In 1986, there was a marked increase in the rate and scale of timber harvesting and road construction activities with an associated increase in sediment discharges. In 1997, increased management controls were implemented in response to several new requirements associated with water quality and endangered species protections. These requirements led to the development and implementation of more robust controls aimed at reducing the land use impacts and have continued to be refined since that time.

Anthropogenic alterations in the Elk River watershed combined with the watershed setting risk factors, have led to alterations in the balance of water and sediment fate and transport. Figure 10 highlights a number of watershed land uses, management activities, and natural events that had a notable impact up through the 1950s; however, there is no sediment source analysis for this period, or stream channel cross-sectional data by which to evaluate the impacts of sediment production from the upper watershed on the downstream reaches. Therefore, Figure 10 primarily illustrates the relative timing of potentially important factors that could have had an impact on historic watershed conditions prior to 1950.

[12] Yarding is the transport of logs from their hillslope harvest areas.

Figure 10 and Figure 11 provide background on relevant history regarding the timing and magnitude of a number of other watershed factors, which demonstrate the effects of environmental and management-related occurrences on watershed conditions from 1955–2011. Key occurrences in this period are increases in road density and clearcut equivalent acres[13], as well as a series of large storms from 1988–1997. The results of these key activities are represented in the sediment source data and loss of channel capacity (see Chapter 6). There is some indication that implementation of WDRs (including harvest rate limits) and the HCP, coupled with fewer large storms, has helped to reduce the rate of sediment production in the upper watershed from 2001-present. There is also evidence that despite reductions in sediment production, the impacted reach continues to aggrade.

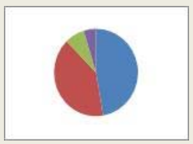
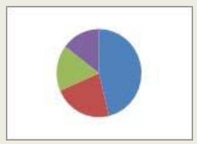
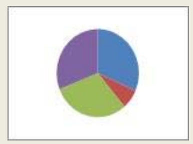
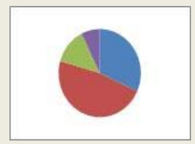
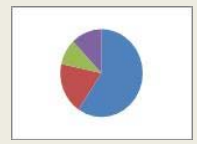
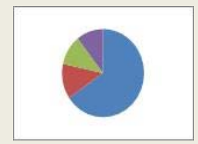
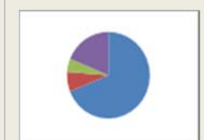
While little historical quantitative data exists prior to the 1950s, the figures below illustrate the approximate timing and relative magnitude of different events and activities that might have relevance to the progression of sediment conditions in Elk River. Within the sediment source assessment (Chapter 6), land use activities in the Upper Elk River watershed allow a comparison over various periods, from 1955–2011 as well as coincident estimates of sediment production and delivery to the stream system (Chapter 6.2).

5.1.3 Water Quality Monitoring

Over the past 15 years, various stakeholder groups have been conducting instream water quality monitoring and channel form evaluations at a number of locations. Monitoring efforts undertaken by industrial landowners, residential landowners, and others such as the fisheries and resident advocacy group, Salmon Forever, have verified the impaired nature of the beneficial uses in the watershed and provided data to support the development of a TMDL for sediment in the Upper Elk River watershed. Information on and results of monitoring can be found in the Peer Review Draft (Regional Water Board 2013a). Some of these data have also been used to develop the sediment source assessment (Chapter 6.2).

[13] The harvested acreage is normalized to clearcut equivalents based upon weighting coefficients that represent the percentage of canopy removed under the employed silvicultural method.

Figure 10. Illustrated summary of relevant history and related factors for the Elk River watershed 1800 to 2011

TMDL Analysis Period	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
Annual Clear-Cut Equivalent Harvest Rate[1] (% area harvested, acres [ac])	NF: 0.2%, 26 ac SF: 0.2%, 23 ac MS: 0.3%, 4 ac	NF: 0.6%, 81 ac SF: 0.6%, 70 ac MS: 0.9%, 13 ac	NF: 0.2%, 22 ac SF: 0.2%, 19 ac MS: 0.3%, 4 ac	NF: 3.8%, 552 ac SF: 0.5%, 130 ac MS: 2.0%, 28 ac	NF: 1.9%, 264 ac SF: 1.0%, 53 ac MS: 0	NF: 2.3%, 336 ac SF: 1.2%, 152 ac MS: 0	NF: 1.0%, 148 ac SF: 1.5%, 179 ac MS: 0.5%, 7.5 ac
Road Density (mi/mi^2)	NF: 2.2 SF: 1.7 MS: 3.3	NF: 3.3 SF: 2.6 MS: 5.0	NF: 3.8 SF: 2.9 MS: 5.6	NF: 5.9 SF: 4.5 MS: 8.7	NF: 5.9 SF: 4.5 MS: 8.8	NF: 6.3 SF: 4.8 MS: 9.4	No data available for this period.
Total sediment loading to Upper Elk River watershed (yd^3/mi^2/yr) and distribution of loading by source[2] In-channel Landslides Surface erosion Management-discharge sites	781 yd^3/mi^2/yr 	563 yd^3/mi^2/yr 	360 yd^3/mi^2/yr 	1,133 yd^3/mi^2/yr 	707 yd^3/mi^2/yr 	563 yd^3/mi^2/yr 	485 yd^3/mi^2/yr 

1 Harvest history based upon a combination of data from Peer Review draft TMDL (Regional Water Board 2013a), California Department of Forestry and Fire Protection (CalFire), ROWD (2005), Water Quality Timber Harvest staff (2014), and HRC (2014).

2 yd^3/mi^2/yr = cubic yards per square mile per year
In-channel Sources = Σ (low order channel incision, bank erosion, streamside landslides).
Landslides = Σ (road-related, open slope, deep-seated).
Surface erosion = Σ (harvest surface erosion, road surface erosion).
Management-discharge sites = Σ (management sediment discharge sites, skid trails, post treatment discharge).

Figure 11. Timeline of Upper Elk River land use activities and sediment loading for 1955 to 2011

5.2 Impacts in the Watershed

This chapter describes impacts to the watershed from excess sediment including downstream flooding and impaired recreation, fisheries, and water supplies, which are the basis for listing the Elk River watershed as impaired under Section 303(d) of the CWA. Numerous watershed effects have manifested due to the land use history of the watershed. These include increased peak flows, increased drainage network, altered sediment storage, decreased channel complexity, and altered sediment transport which are discussed in detail in Chapter 6.1. These effects have in turn resulted in increased aggradation, increased turbidity, and decreased summer stream flows. Such effects can be dramatic, such as in the impacted reach where ongoing aggradation and vegetative colonization of fine sediment deposits results in notable and long-lasting impacts such as downstream flooding, impaired recreation, impaired fisheries, and impaired water supplies. These impacts are described below, starting with the beneficial use impairments and followed by nuisance flooding concerns.

5.2.1 Beneficial Use Impairments

Numerous beneficial use impairments have been documented in the Upper Elk River watershed. These impairments include impacts to domestic and agricultural water supplies and impacts to recreational use of the river and degradation or loss of aquatic habitat.

5.2.1.1 Domestic and Agricultural Water Supplies

Residents of Upper Elk River, including those along the North Fork, South Fork, and Mainstem, have historically relied on surface water intakes in the river for domestic and agricultural water supplies. The majority of water users in Upper Elk River have relied on an instream pump intake system, usually placed in a relatively deep and stable pool. Specifically, the North Fork has 12 surface domestic supplies, the South Fork has approximately 6-7 impacted surface domestic supplies, and the mainstem has at least 8 documented impacted domestic surface or shallow well water supplies. Many of these sources are also used for localized agriculture for gardens, crops, or small livestock operations. There are also two livestock operations further down in the impacted reach.

The discharge of sediment associated with controllable land use activities has significant adverse impacts in water quality and stream morphology, including filling of pools historically used for domestic and agricultural water supplies. Discharge of sediment has been known to result in conditions that produced tastes and odors in water supplies that were offensive to the senses. Fine sediment provides a medium to promote bacteriological growths, thus reducing the effectiveness of water disinfection for domestic water supplies. Further, elevated turbidity and fine sediment discharges were found to be responsible for limited withdrawal windows between storms and increased frequency of maintenance and replacement of pumps, hot water heaters, and water treatment facilities, as well as damage to agricultural spray equipment and surface water supply intakes.

5.2.1.2 Salmon-Related Beneficial Uses

Elk River, a major tributary to Humboldt Bay, provides important freshwater habitat for anadromous salmonids and steelhead. The watershed is home to five fish species listed under the Endangered Species Act (CDFW 2014). Salmonids are identified in North Coast watersheds as the most sensitive of the native cold-water aquatic organisms. They require clear, cold, well-oxygenated water; unimpaired migratory access to spawning grounds; clean, un-embedded gravels for spawning; and food, pools, and places to hide from predators for juvenile rearing.

While there are reaches providing salmonid habitat, in general, current habitat conditions are substantially degraded by fine sediment. Stream substrate is very fine, potential spawning gravels are significantly embedded, pool depths and stream channel depths have been decreased by sediment filling (thus reducing salmonid ability to rear, avoid predators, and migrate during low-flow periods), and high suspended sediment concentrations and durations affect feeding and rearing behavior.

Newcombe and Jensen (1996) developed a *Severity of Ill Effects Index* describing the effects associated with excess suspended sediment. Data analyzed from nine Upper Elk River monitoring stations from 2003 to 2007 indicate the potential for a suite of sublethal effects ranging from 0-90 percent of the time. Sublethal effects include reduction in feeding, increased respiration, and habitat degradation. In addition, the California Department of Fish and Wildlife (CDFW; 2014) points out that pool depths continue to decline and fine sediment targets are still being exceeded 15 years after HCP implementation.

5.2.1.3 Contact and Non-Contact Recreation
As noted in Chapter 4.1.1, recreation uses are adequately protected by the attainment of water supply and salmonid habitat uses. Impacts to recreation uses are described in this section to ensure all impacts in the watershed are thoroughly documented. Contact recreational uses in the Upper Elk River are impaired, in part, due to the lack of deep pools, resulting from sediment deposits and the accumulation of small wood debris and branches and other shrubby vegetation that has encroached on the channel in response to altered geomorphology. The channel bottom is covered with a substantial layer of silt-sized material, rather than sand and gravel sized material, making wading and swimming unpleasant. The anaerobic condition of water during summer months and the presence of colonizing aquatic vegetation, such as sedges and duckweed, also impairs the use of water for contact recreational purposes.

Non-contact recreational uses, including boating and aesthetic enjoyment, is also limited due to the extent of the sediment impairment. Boating is difficult due to lack of stream depth and the accumulation of small vegetative debris, while aesthetic enjoyment is limited due to the degraded stream and riparian conditions and noxious odors arising from shallow, stagnant water and algae growths. Other non-contact recreation such as biking, hiking, and picnicking continues in BLM's Headwaters Forest Reserve.

5.2.2 Nuisance Flooding
In addition to the beneficial use impairments, nuisance flooding is another concern in the watershed. Discharges of sediment and small organic debris to watercourses have aggraded stream channels in the low gradient reaches of the Elk River, significantly reducing channel capacity. Overbank floods now occur at a frequency of four times per year on the North Fork Elk River (Regional Water Board 2005). Therefore, there is flooding of

roads, fields, fences, and homes at intervals that are much more frequent than occurred historically (Patenaude 2004). This affects property values and the livelihoods of those who live in the community. South Fork and Mainstem also flood, though their frequency of occurrence is not as quantifiable as on North Fork (Regional Water Board 2005).

The cross-sectional area of the stream channel has been significantly reduced by deposits of fine sediment. Evaluation of cross-section data indicates there are over 280,000 cubic yards (yd^3) of instream stored sediment in the lower North Fork, nearly 100,000 yd^3 in the lower South Fork, and nearly 260,000 yd^3 in the upper mainstem. The fine sediment deposits in the impacted reach of the Upper Elk River watershed have become rooted in place by the encroachment of vegetation, further slowing winter floodwaters, causing streams to spill over their banks at elevated frequency and magnitude.

Potentially serious impacts to health and safety are associated with these flood events, as residents attempt to cross floodwaters, emergency vehicles are limited from accessing homes, and power can be lost to people dependent on health-support machinery and other people for care. Additionally health impacts from contaminated floodwater entering a home include damage to walls, flooring, and furniture and the potential for growth of harmful molds in homes.

Chapter 6 – Sediment Source Assessment

This chapter describes the present level of understanding regarding sediment sources in the Upper Elk River watershed. It discusses past efforts and data available to support the analysis of sediment by source category. The sediment source assessment is intended to determine the predominant sources, locations, and causes of sediment delivery as a way of prioritizing management actions in the watershed (see Figure 12 for an illustration of these factors)**Error! Reference source not found.**.

Chapter 6.1 presents an overall conceptual model of sediment behavior in the Elk River watershed, describing how sediment sources, past and present land use activities, and other natural factors in the basin affect sediment loading and existing sediment conditions in the river. Chapter 6.1 also describes the concept of dynamic equilibrium and provides an explanation of how it fits into the overall conceptual model. Chapter 6.2 presents recent efforts to conduct a quantitative sediment source analysis to support regulatory programs, including current estimates of natural and land use-related sediment loading from the various source categories.

6.1 Factors Controlling Sediment in the Elk River Watershed

Multiple natural and anthropogenic factors influence the behavior of sediment in the Elk River basin. The purpose of this chapter is to describe linkages among those factors and illustrate how they impact sediment delivery and the watershed's responses. Primary *natural* factors include: tectonics, geology, soil characteristics, geomorphology, climate and vegetation. Primary *anthropogenic* factors include: timber harvest, yarding, road building and use, and legacy practices (e.g., pre-Forest Practice Rules) not captured in the other categories (e.g., splash dams, stream channel skidding).

6.1.1 Dynamic Equilibrium and Attainment of Water Quality Standards

A functioning natural system occurs as a result of multiple factors or processes that interact under various environmental conditions, but result in a *dynamic equilibrium*. Dynamic equilibrium can be defined as "the condition of a system in which inflow and outflow are balanced" (Eastlick 1993) and the character of the system remains unchanged[14]. Balanced inflow and outflow is associated with the movement of both water and sediment.

> A natural stable channel experiences scour and deposition; however, if over time these processes lead to degradation or aggradation, respectively, then the system is no longer in dynamic equilibrium.

The geomorphic role of rivers is to transport flows and sediment from the watershed while maintaining its dimension, pattern, and profile without aggrading or degrading significantly. A system maintaining this role would be in a state of dynamic equilibrium. The feedback mechanism between sediment input/output is central to the dynamic equilibrium of a river channel (EPA 2012). The relative balance in sediment input/output is also central to the attainment of WQS, including achieving WQOs for sediment, turbidity, suspended sediment, and settleable matter; protection of beneficial uses related to water supplies and aquatic

[14] http://water.epa.gov/scitech/datait/tools/warsss/rivstab.cfm

habitat; and prevention of nuisance conditions related to flooding, property damage, and loss of free access to and use of property.

The Elk River is aggrading (Chapter 6.2.4); therefore, it is not in dynamic equilibrium. This aggradation has resulted in beneficial use impairments and nuisance flooding and, as described in Chapter 5.2, the Elk River is not attaining WQS. Returning the river to a state of dynamic equilibrium that meets WQS is the ultimate water quality improvement goal for the Elk River.

6.1.2 Anthropogenic Factors

Chapter 5.1.2 provides a detailed description of how the Elk River watershed has been altered by anthropogenic activities over the past 150 years. These alterations have combined with other factors (discussed in Chapter 5.1.1 and below) to result in an alteration in the fate and transport of water and sediment through the watershed. Documenting relevant Elk River watershed history provides a useful context within which to interpret the complex technical analyses associated with sediment source data going back to the 1950s, which is presented in this report (Figure 10).

Though quantitative data do not exist to establish historical loading levels, a firm understanding of the Elk River's relevant history provides a line of evidence in support of the sediment transport and delivery linkages presented below. For the more recent history, Figure 11 illustrates the relative timing of watershed land use and management activities that have had a notable impact on sediment loading through present time. These are connected to the management and land use activities discussed below.

6.1.3 Conceptual Model of Watershed Processes and Ecological Risk Factors

As discussed above, the Elk River has multiple natural watershed setting risk factors that lead to high levels of sediment loading and that make the watershed unusually sensitive to impacts from management activities. A mixed history of management practices has led to increased sediment delivery to the river and degraded hydraulic conditions, which have impacted several of the beneficial uses assigned to the Elk River.

Figure 12 depicts a conceptual model of the linkages among controlling factors, categorizing them by rows. Specifically, the watershed setting (Row A) and land use activities (Row B) interact, resulting in watershed responses (Row C). The combined watershed responses result in physical watershed effects (Row D) and manifest in watershed impacts to beneficial uses and creation of nuisance conditions (Row E).

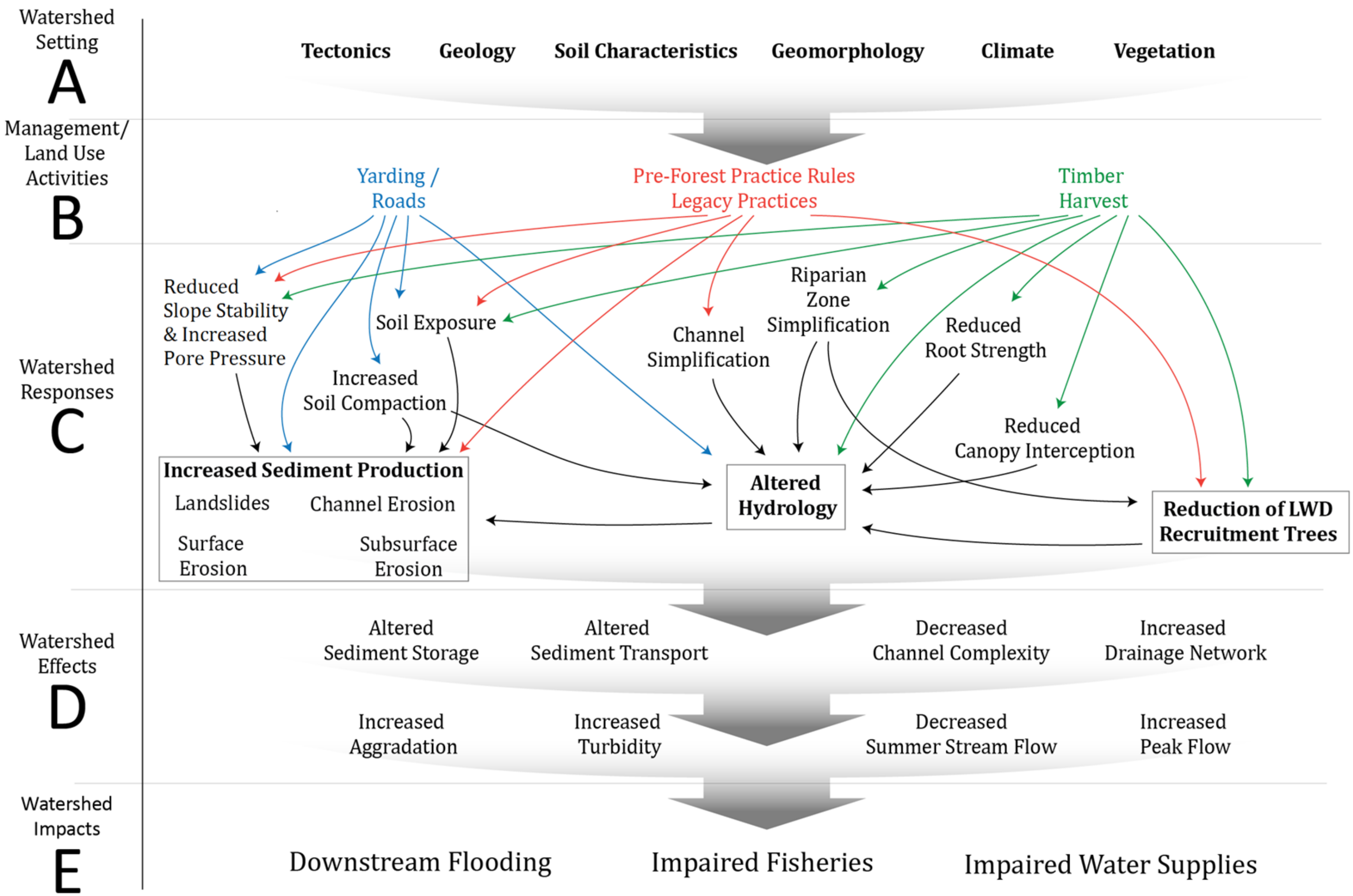


Figure 12. Elk River watershed processes and ecological risk factors conceptual model

The conceptual model of watershed processes and ecological risk factors can be used to identify important elements of a watershed recovery program, as described below:

- **Row A** and **Row B** identify ongoing sources of sediment that could be managed through BMPs to reduce sediment delivery;
- **Row C** represents vulnerabilities in the watershed where control measures could be developed;
- **Row D** identifies metrics that can be measured to track the implementation progress (i.e., decreased aggradation quantifies improvements caused by implementation activities associated with Rows A through C); and
- **Row E** represents the problem to be corrected; reductions in the extent and frequency of these problems demonstrate progress towards attaining WQS.

6.1.3.1 Watershed Setting

Row A in Figure 12 depicts the natural characteristics that determine the Elk River watershed's vulnerability to erosion (e.g., geology, soils, tectonics, etc.). The Upper Elk River watershed is a highly erodible, tectonically active producer of fine-grained sediment that under natural conditions would be reasonably well-anchored on the landscape by the complex, multi-storied tree canopy and ground cover typical of a forest ecosystem. Additional discussion is provided in Chapter 2.

6.1.3.2 Management/Land Use Activities

Row B depicts the varying types of landscape disturbance from Management/Land Use Activities. The Upper Elk River has been managed for industrial timber harvesting since the 1850s. Timber operations, as represented in this figure, are tree harvest activities conducted under the FPR, ranging from single tree selection to clearcuts and burning. Yarding in the watershed has ranged from full suspension cable to tractor yarding in and near watercourses. A significant road network has been built, including low and midslope roads with an increasing emphasis on shifting to a higher slope road system. Prior to the FPR, significant landscape alteration occurred associated with the movement and placement of soil and debris. Splash dams[15] were also used before the FPR to transport logs downstream. Additional discussion on historic activities is provided in Chapter 5.1.2.

6.1.3.3 Watershed Responses

As illustrated in **Row C** of Figure 12, the combination of natural watershed conditions and anthropogenic factors intersect to create *watershed responses*. The most notable responses are increased sediment production, altered hydrology, and reduction of LWD recruitment trees. Watershed response terms identified in the figure are defined below.

Reduced Slope Stability:

- Slope stability is the resistance of a natural or artificial slope or other inclined surface to failure by landsliding.
- Slope stability in forested settings can be reduced by:

[15] A splash dam is a temporary wooden dam used to raise the water level in streams to float logs downstream; they allowed many more logs to be moved downstream than would be possible using the natural flow of the stream.

- decreased root strength from timber harvesting;
- increased pore water pressure inside soils and in soil pipes;
- road construction on hillslopes utilizing partial bench or full bench construction; and
- sidecasting from legacy road construction activities, which oversteepens the outboard edge of the road.

Soil Exposure: Removal of overlying duff and organic material leaving bare mineral soil open to the elements. Exposed soil is more prone to runoff and surface erosion.

Increased Soil Compaction: Increased soil compaction reduces rainfall infiltration rates, increasing runoff and surface erosion. Soil compaction can occur from yarding activities and roads in managed areas.

Landslides: A general term covering a wide variety of mass movement landforms and processes involving the downslope transport, under gravitational influence, of soil and rock material en masse.

Watercourse Channel Erosion: Channel erosion in which material is removed by concentrated water flowing in well-defined watercourses and unchanneled swales.

Erosion: The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away and simultaneously moved from one place to another by natural agencies including weathering, solution, corrosion (i.e., process of mechanical erosion of the earth's surface caused when materials are transported across it by running water, waves, glaciers, wind or gravitational movement downslope, and transportation but usually excludes mass wasting.

Surface Erosion: Surface erosion is a process that refers to overland transport of eroded material via mechanical processes such as raindrop impact, surface rilling, rutting, and gullying.

Subsurface Erosion: Subsurface erosion is the process by which sediment is mobilized and transported by groundwater through large voids in the hillslopes. Preferential flow through soil pipes results in internal erosion of the pipe, which may produce gullies by tunnel collapse. The eroded material can clog soil pipes, causing pore water pressure buildup inside the pipes that can result in landslides, debris flows, embankment failures, or of ephemeral gullies (Fox et al. 2007).

Channel Simplification: Channel simplification relates to the loss of in-channel complexity because of land use activities. An example of management-related channel simplification is the removal of large woody debris from watercourses. Channel simplification can result in increased flow velocities, reduced sediment storage capacity, and degradation of aquatic habitat.

Riparian Zone Simplification: Management within watercourse riparian zones results in:

- reductions of canopy cover,
- reductions of riparian diversity, and
- changes to the composition and abundance of riparian species.

Pore Pressure: Groundwater held in gaps between in soil and rock particles exerts force known as pore pressure. Pore water pressure is vital in evaluating slope stability. When pore pressure increases, slope stability decreases relative to equilibrium (i.e., stable conditions) with anchoring forces.

Reduced Root Strength: Redwoods have an intricate network of shallow roots that contribute to the stability of steep forested slopes by maintaining the shear strength of soil mantles. Roots add strength to the soil by anchoring through the soil mass into fractures in the bedrock and laterally to root systems of adjacent trees, creating an interconnected root-web matrix. Timber harvest on forested hillslopes results in the reduction of root strength and complexity.

Reduced Canopy Interception: Rainfall is intercepted by the forest canopy, reducing the amount of raindrops that fall to the ground. Increase in timber harvest results in a reduction of canopy and an increased amount of rainfall hitting the ground.

Increased Sediment Production: Excess sediment generated by land use activities within a managed watershed increases the amount of sediment available for transport to the stream channel.

Altered Hydrology: The cumulative impact of increased soil compaction, channel simplification, reduced root strength, reduced rainfall interception, increased drainage density, and riparian zone simplification.

Reduction of LWD Recruitment Trees: Timber harvest focused in riparian areas reduces the overall chance of inputs of large woody debris into the hydrologic system.

6.1.3.4 Watershed Effects

The previous chapter highlighted watershed responses that occur from the combination of inherent erosional risk in the watershed and the history of land use activities (e.g., alterations to erosional, hydrologic, and riparian processes of wood loading). Combined with downstream channel characteristics, these responses have resulted in numerous watershed effects including increased peak flows, increased drainage network, altered sediment storage, decreased channel complexity, and altered sediment transport (see **Row D**). These effects have in turn resulted in increased aggradation, increased turbidity, and decreased summer stream flows. These watershed effects are summarized below.

Increased peak flows: Runoff associated with rainfall events results in increased stream flow. The highest stream flow rate achieved in response to a storm is referred to as peak flows. During storm events, the instantaneous stream peak flows from storm events is a function of antecedent wetness at the onset of the storm, storm intensity and duration, drainage area size and shape, and vegetative cover. Canopy removal associated with timber harvesting and alterations to hillslope drainage associated with roads and compacted areas can alter the magnitude and timing of peak flows. Data from Caspar Creek suggest that the peak flow response for single-tree selection logging may be about 60 percent of that for the equivalent canopy removal by clearcutting (Reid 2012). Additionally, a recent study found that during rainfall events, 30-40 percent more water fell on the ground (effective rainfall) in an opening than under forest cover (Dhakal and Sullivan 2014). When considering this in combination with transpiration, approximately 50 percent more water can be available in forest openings during the wet season (Lewis and Klein 2014).

Increased drainage network: Associated with increased peak flows and compaction is an increase in drainage network. In the Upper Elk River watershed, especially in the Wildcat formation, the combination of tractor and road crossings and hydrologic modification associated with canopy removal in unchanneled swales and their contributing area influenced the collapse of soil pipes, the formation of sink holes, and the headward incision[16] of low order channels, resulting in an estimated three-fold increase in drainage density.

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[16] Scour of low-order channels includes vertical incision and headward migration of the stream channel. Headward migration increases both the channel length and density of the stream network, which increases the drainage network.

Altered sediment storage: Sediment quantity and storage is a function of sediment inputs, sediment transport, and hydraulic controls. When sediment enters the fluvial system from in-channel sediment, surface erosion, or landslides, it is either moved downstream as bedload or carried as suspended load. In the Upper Elk River watershed, the primary sediment component is the suspended load. Conceptually, as sediment is transported downstream, hydraulic controls alter the flow velocity, allowing sediment to drop out of suspension to be stored temporarily until velocities and the resulting shear stresses are large enough again to re-suspend the material. The temporary storage of sediment in the tributary system in this manner prevents the kind of massive sediment deposition as was seen in the impacted reach in the late 1990s (Chapter 6.2.3). Under previous conditions of dynamic equilibrium, the relationship of flow to sediment quantity would be moderated by hydraulic controls such as LWD, changes in gradient, side channels, and floodplains. Sediment would only be mobilized when stream flows were big enough and would be deposited for temporary storage when velocities were reduced. The ability of tributary streams in the watershed to store sediment and meter it slowly over time has been interrupted by many intersecting factors including: an increase in the amount of sediment entering the fluvial system, a decrease in LWD, an increase in the amount of rainfall that enters the fluvial system as surface flow, and an increase in the surface drainage network and associated reduction in subsurface infiltration.

Decreased channel complexity: Channel complexity plays an important role in the fate and transport of sediment through the fluvial system. Channel complexity is highly influenced by the inputs and outputs to and from the stream and has an influence on sediment storage. Riparian areas deliver wood to streams; redwoods take a long time to decay and thus can accumulate and create complexity over time. Complexity in low order streams allows for sorting of coarser sediment, providing important habitat elements for amphibians and aquatic insects that provide food to vertebrates. In steep headwater streams, landslides can be important processes by which wood is delivered to streams. Riparian harvesting reduces these inputs. In the event of a landslide, the absence or reduction in trees that would have stabilized the body and toe of the landslide result in greater volume of sediment delivery. Results from streamside landslide surveys in Upper Elk River and Freshwater Creek clearly identifies increasing delivery volume per slide and increasing frequency of slides associated with decreasing stand age (PWA 2006). These effects, especially when coupled with past practices of yarding logs down and near low order channels, have led to significant alterations in the complexity of channels resulting in greater sediment transport efficiency, reduced sediment storage and metering, higher forces on the banks, and greater bank instability.

Increased aggradation: During the 1988-1997 period, land use activities in Upper Elk River made the landscape extremely vulnerable to intense rainfall events, resulting in increased discharges of excess sediment from timberlands in the upper watershed. The high flows of the mid-1990s transported fine sediment and deposited it in the bed, on the banks, and across

> Sediment transport is a function of the inherent mobility of the sediment (e.g., grain size) and the transport capacity of the fluvial system. The transport capacity itself is a function of hydrology, gradient, and channel geometry. Therefore, multiple factors influence this process.
>
> The Upper Elk River watershed is dominated by young, fine-grained, erodible geology. When the ground is well covered with duff and vegetation and the soils are reasonably well-anchored by tree roots, both water and eroded fine sediment can be captured and retained on the land prior to entering the fluvial system.
>
> The transport of sediment that does enter the fluvial system is subject to hydraulic controls, such as channel roughness, channel complexity (including LWD), side channels and a functioning floodplain, and stream gradient (among other controls). Such a landscape can be said to be in dynamic equilibrium when the inputs match the outputs over time.

the floodplain, effectively reducing the channel's stream flow capacity and raising water surface elevations. As a result, frequent floods inundated properties adjacent to Elk River. This altered morphology and reduced sediment transport capacity within the impacted reach, coupled with ongoing sediment loading, has led to continued aggradation as indicated by the mass balance in the impacted reach (Chapter 6.2.4.4;) and cross-sectional surveys (Regional Water Board 2013a, 2013b; Lewis 2013; HRC 2014 although it is important to note that quantitative channel survey data were not available during the 1988-1997 time period).

Altered sediment transport: In the case of Upper Elk River, with reduced channel complexity, increased drainage network, and increased peak flows, there has been increased sediment transport from the steep watercourses near the headwaters. At the same time, in the depositional reaches, increased aggradation and encroaching vegetation has led to reduced channel conveyance capacity and increased lateral flooding, thus reducing flow velocities and sediment transport capacity. This results in deposition of sediment in the impacted reach. This is also supported by the pilot Hydrodynamic and Sediment Transport modeling study, which found that over a 2.5 mile reach near the confluence of the North and South forks, the model predicted net sediment deposition on the bed, banks, and floodplain, with greater deposition within riparian forest than pasture areas (NHE and Stillwater 2013).

Increased turbidity: Turbidity is a measure of water clarity and is often used as a surrogate for suspended sediment concentration. As the magnitude and timing of sediment transport is altered, so is the turbidity. The impacts of watershed disturbances include higher peak turbidities during storms, as well as higher turbidities between storms. Turbidity exposure level and duration can impact fish health (Newcomb and MacDonald 1991; Newcomb and Jenson 1996). Low turbidity conditions between storm events can allow important windows of opportunities for fish feeding. Similarly, water supplies can be supported during these between storm times. In the Upper Elk River watershed, turbidity from three sub-basins were compared. This analysis found that the turbidity values from the two managed sub-basins were much greater than 20 percent higher than measurements in the reference sub-basin, indicating exceedance of the turbidity WQO (Regional Water Board 2013b).

Decreased summer stream flows: In surface water-dominated mountainous streams similar to the Elk River, flows decline over the course of the dry summer and fall season. Studies have indicated that timber harvesting can initially increase summer stream flows due to reduced transpiration (Moore and Wondzell 2005; Chamberlin et al. 1991), but decrease below their original levels as harvested areas regrow (Hicks et al. 1991; Perry 2007). Caspar Creek research also found that in the initial 7 years following selection harvest, summer flows increase (Keppeler 1986; Keppeler and Zeimer 1990; Keppeler 1998) and then decline over the next 20 years, compared to expected pre harvest conditions (Reid and Lewis 2011; Reid 2012).

6.1.3.5Watershed Impacts

As shown in **Row E** of Figure 12, the responses and effects of altered sediment loading has resulted in watershed impacts that include downstream flooding, impaired fisheries, and impaired water supplies. The beneficial use impacts are the basis for listing the Elk River watershed as impaired under Section 303(d) of the CWA. A substantial portion of these impacts can be restored or mitigated and a working landscape can be sustained while maintaining equilibrium conditions to support beneficial uses. A framework to restore conditions and to ensure sustainable land use practices is described within the implementation discussion below (Chapter 8).

6.2 Quantitative Source Analysis

There is an enormous inventory of sediment source and delivery data for the Upper Elk River watershed available from sediment data collection and mapping efforts from a variety of professionals associated with agencies, timber companies, private consultants, and research institutions. These include the following:

- Humboldt Redwood Company
- Pacific Lumber Company
- Green Diamond Resource Company
- Bureau of Land Management
- Pacific Watershed Associates
- Stillwater Sciences
- North Coast Regional Water Board
- Redwood Sciences Laboratory
- California Geologic Survey (CGS)
- Salmon Forever
- Humboldt State University
- Northern Hydrology and Engineering

The volume and variety of data relevant to this watershed are not often available, particularly for management-related sediment delivery, in source analyses for other sediment TMDLs in the North Coast Region. Following is a brief overview of the sediment source analysis work conducted for the Upper Elk River watershed from which the existing source loading estimates have evolved.

6.2.1 History of Upper Elk River Sediment Source Analyses

The Regional Water Board produced a *Preliminary Review Draft Sediment Source Analysis* (Preliminary Review Draft) in 2011. This report was the first effort to estimate sediment loading, in support of a sediment TMDL for the Upper Elk River watershed and relied upon data collected during the 1955-2003 period. Primary sources of data for this report included, Palco watershed analysis (2004), North Fork Elk Sediment Source Inventory (PWA 1998), surveys of natural and managed drainage networks (Regional Water Board 2011b), a BLM inventory, a GDRC inventory, and CAO inventories of management discharge sites. In total, at least 18 data sets were used and they are detailed on page 8 of that document (Regional Water Board 2011b).

The preliminary analysis was revised in 2013 in the Peer Review Draft (Regional Water Board 2013a) in which data analyzed were extended through the period 2004-2011. The analysis included new data related to bank erosion and streamside landslides obtained from HRC Watershed Analysis surveys (HRC 2012a, 2012b), as well as new analyses of road surface erosion. Inclusion of the additional data resulted in updated openslope landslide, road surface erosion, and deposition estimates in the impacted reach relative to the 2011 Preliminary Review Draft.

More recently, Regional Water Board staff evaluated data from HRC's *2014 Watershed Analysis* report (HRC 2014), which included stream survey data for the period 2001-2010 for 26 miles of streams in the Upper Elk River watershed. These data were incorporated into the existing source analysis to update estimates for bank erosion and streamside landslides.

In March of 2015, Regional Water Board staff completed an *Internal Draft Staff Report*, which reflected revisions to the prior sediment source analyses. This analysis included the same total loading estimates from the 2013 results, with changes to the association of streamside landslide estimates to account for the influence of deep seated landslides. This resulted in non-uniform estimates of natural loading temporally and spatially in the watershed. A comparison was also made of the loading rates derived from the sediment source analyses with suspended sediment load data and the sub-basins were ranked according to the magnitude of loading estimates.

The source analysis should not be viewed as static as it can be updated and refined over time to include additional monitoring and research. The rest of this chapter presents the methodology and the most recent estimates of sediment loading for the Upper Elk River watershed. These estimates are based on the most recent data and scientific understanding of natural and land-use related sources.

6.2.2 Sediment Load Estimation Approaches

The following chapters quantify natural and management- or land use-related sediment production and delivery processes in the Upper Elk River watershed based on information available from 1955 to 2011. They include estimates of sediment production from landslides, surface erosion, and channel erosion. Subsurface erosion is noted as a uniquely important, but presently unquantifiable, source of sediment in the watershed and is described narratively.

Sediment conditions in the watershed are greatly influenced by altered hydrology and the reduction of LWD, as well. The routing of the delivered sediment through the fluvial system is not analyzed as part of the source analysis, except to say that increases in peak flows and reduction in LWD have influenced the way in which sediment is routed through the fluvial system, and sediment routing should be an important subject of further sub-basin scale surveys.

The Elk River watershed is stratified into twenty sub-basins for analytical purposes (Stillwater 2007). This analysis focuses on the Upper Elk River watershed, which includes the upper seventeen sub-basins. The primary impairments to beneficial uses and nuisance conditions are found within the impacted reach, located within the Lower Elk River, Lower South Fork Elk River, and Lower North Fork Elk River sub-basins (see Chapter 2.1 for a discussion of the delineated watershed). Figure 13 depicts the sub-basins. Sediment loads are quantified by time period for the upper 17 sub-basins and an overall area-weighted load estimate is provided for this drainage area.

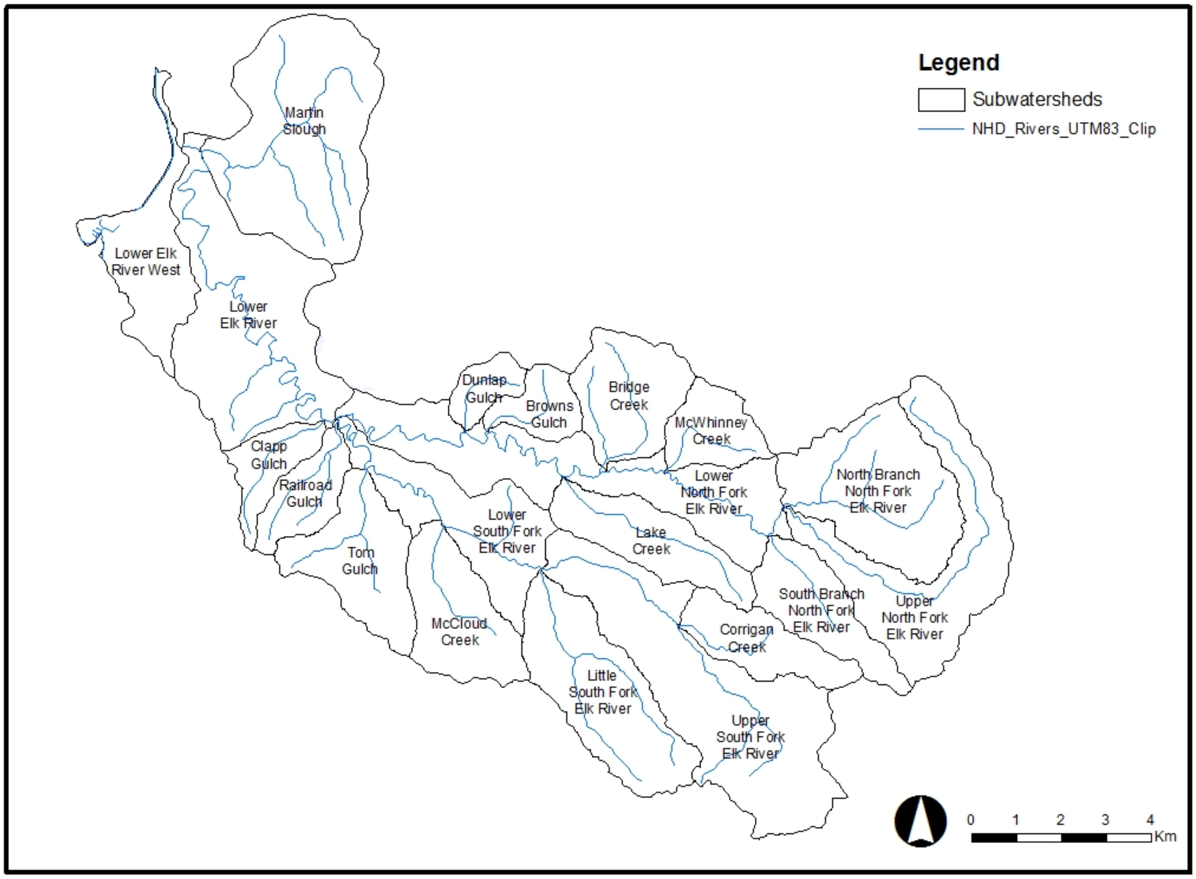

Figure 13. Subbasins in the Elk River watershed

The sediment source inventory is divided by sediment source categories, initiation (i.e., natural or land use-related), and time period (1955-1966, 1967-1975, 1975-1987, 1988-1997, 1998-2000, 2001-2003, and 2004-2011; these ranges correspond with the availability of sequential aerial photos). Table 6 describes the data and approaches used in estimating sediment loading by source category. Specifically, a variety of analytical approaches were used to estimate natural and land use-related sediment loads, including aerial photographs, field surveys, geographic information system (GIS) mapping and modeling, land use history, erosion monitoring, use of study sub-basins[17], and application of erosion models. The text below defines the source category and briefly describes the approach used to quantify sources categories, while the Peer Review Draft (Regional Water Board 2013a) provides a detailed description of available sediment data and how they were used to develop the loading estimates presented below (notable exceptions are identified below).

[17] Study sub-basins include characterization of reference conditions in Little South Fork Elk River within the Headwaters Forest Reserve and land use influenced conditions in Corrigan Creek, South Branch North Fork Elk River, and nearby Freshwater Creek.

Table 6. Data and Approach Used in Estimating Sediment Loading by Source Category

Sediment Source Category		Data Source(s) and Approach
Natural	Natural Bank Erosion	Field surveys of 1.9 miles of channel in reference sub-basin; natural drainage density estimate
Natural	Natural Streamside Landslides	Field surveys of 2.6 miles of channel in reference sub-basin; natural drainage density estimate
Natural	Shallow Hillslope Landslides	Palco/HRC Reported landslide delivery volumes from Upper Elk River areas not harvested in prior 15 years
Natural	Deep-Seated Landslides	CGS mapped active features (Marshall and Mendes 2005); Palco Elk River Watershed Analysis movement rates (Palco 2004)
Natural	Deep Seated Influences on Bank Erosion and Streamside Landslides	Sub-basin specific bank erosion and streamside landslide surveys Percent drainage network in sub-basin intersecting CGS mapped deep seated landslide (all activity levels) Percent sub-basin with surface roughness associated with deep seated landslides
Land Use	In-Channel: Low Order Channel Incision	Volume of land use-induced channel incision based on measured channel dimensions and field-based estimates of impacted and natural drainage density; assumed 75% occurred in 1950's and 5% in each subsequent decade
Land Use	In-Channel: Management-Related Bank Erosion	PWA Field surveys of 3.9 miles of channel in study sub-basins; impacted drainage density estimate; subtracted natural loading
Land Use	In-Channel: Management-Related Streamside Landslides	HRC field surveys of 26 miles of channel in Elk River and PWA field surveys of 6.5 miles of channel in impacted sub-basins of Freshwater Creek; applied to natural drainage density and subtracted natural loading. Estimate assumes void features in upper extent of impacted network are accounted for in bank erosion estimates.
Land Use	Road-Related Landslides	Sub-basin specific landslide inventory data from Palco Watershed Analysis (2004) and 2005 ROWD
Land Use	Open Slope Shallow Landslides	Sub-basin specific landslide inventory data from Palco Watershed Analysis (2004) and 2005 ROWD; non-road-related slides, includes some skid-related slides
Land Use	Land Use-Related Sediment Discharge Sites	Sub-basin specific site inventories from Palco Watershed Analysis (2004), HRC CAO reports, GDRC WDR reports, BLM reports
Land Use	Post-Treatment Sediment Discharge Sites	Compiled monitoring results from BLM, HRC, and GDRC from sites treated in Elk River
Land Use	Skid Trails	Compiled findings from Elk River skid trail-related inventories on BLM and Palco/HRC lands to estimate loading from skid sites not otherwise included in land use discharge site inventories
Land Use	Road Surface Erosion	Estimated sub-basin road densities in different road surface and condition categories based on Palco and HRC Watershed Analysis (2004) and 2005 ROWD; unit loading based upon 2005 ROWD
Land Use	Harvest Surface Erosion	Estimated harvest history in clear-cut equivalents based upon CalFire, Palco Watershed Analysis (2004), and 2005 ROWD; unit loading based upon Palco Watershed Analysis (2004)

6.2.2.1Natural Sediment Loading Categories

In the Upper Elk River sediment source analysis, natural sediment sources identified and quantified include:

- bank erosion,
- streamside landslides,
- shallow hillslope slides,
- deep-seated landslides, and
- streamside landslides and bank erosion associated with deep seated landslides.

Natural Bank Erosion and Streamside Landslides

Bank erosion includes lateral incision into stream banks. This category captures sediment production associated with soil creep, a natural process by soil and/or rock debris slowly moves downslope under the influence of gravity. Under equilibrium conditions, sediment supplied to stream banks via soil creep is equal to the bank erosion rate (Reid and Dunne 2003). Soil creep is often estimated in sediment budgets where bank erosion estimates are unavailable; however, as part of the sediment analysis, bank erosion and streamside landslides surveys in the Upper Elk River were conducted. These data were used to provide a more accurate estimate than using literature values of soil creep rates developed in other sediment source analyses.

Streamside landsides are mass wasting landslide features that originate from streamside slopes and are too small to detect on aerial photographs. While the erosional processes are different, the distinction made in the field between bank erosion and streamside landslides is generally based on the size of the resulting void. Bank erosion voids are recognized as smaller than those left by streamside landslides. Long-term estimates of natural bank erosion (9 $yd^3/mi^2/yr$) and streamside landsliding (26 $yd^3/mi^2/yr$) are applied to each of the analysis time periods from 1955-2011.

Shallow Hillslope Landslides

Shallow hillslope landslides (shallow landslides) are landslide features that are typically visible on aerial photographs given their size (greater than 400 square feet [ft^2]). Small landslides with delivery to the fluvial system are accounted for in the small streamside landslide category. Aerial photo inventories include identification of landslide attributes; generally, these inventories have identified if the area was harvested in the 15 to 20 years prior to landslide initiation. If not, it is often assumed that timber harvesting was not a contributing factor. The source analysis estimate of natural landsliding is derived from an inventory of landslides in areas not harvested in the past 15 years, resulting in a long-term sediment delivery rate estimate of 30 $yd^3/mi^2/yr$. Though episodic, this long-term rate was applied uniformly to the Upper Elk River sub-basins.

Deep Seated Landslides

Large storm events can activate debris slides and rotational/translational landslides associated with pre-existing deep-seated landslide features. Deep-seated landslides and their corresponding level of activity are typically identified based on interpretation of topographic signatures and patterns of drainage development in maps and aerial photographs supplemented by field observations. These approaches, however, require substantial effort, are limited by vegetation that obscures relevant features, and require professional judgment based on experience with the local geology and topography; resulting in hazard mapping that is subjective. There can be further uncertainties in the types, boundaries, and activity level of existing deep-seated landslide mapping, especially when mapping was conducted prior to the high resolution topography provided by LiDAR (Sanborn 2005), resulting in uncertainties in the types, boundaries, and activity level of existing deep-seated landslide mapping.

CGS mapped deep seated landslides as part of *Geologic and Geomorphic Features Related to Landsliding in Elk River* (Marshall and Mendes 2005). The CGS map does not identify activity levels or any information from which to determine sediment delivery rates from different mapped features. The Palco (2004) Watershed Analysis included an effort in which Hart Crowser estimated landslide activity levels on mapped features based upon Keaton and Degraff methodology. These activity levels were the best available information on deep seated landslides. For the sediment source analysis, Regional Water Board staff relied upon the Palco (2004) inventory for estimates of the deep seated landslide delivery from "active" features and associated those features with natural loading.

The sediment delivery associated with these features results in an estimated natural deep-seated landslide sediment delivery of 17.2 $yd^3/mi^2/yr$ in the Upper South Fork Elk River and 5.9 $yd^3/mi^2/yr$ in Toms Gulch. The overall deep seated landslide sediment delivery used for the loading calculations was then determined using an area-weighted average loading (resulting in 2.9 $yd^3/mi^2/yr$). The sediment source analysis accounts for sediment delivery from features classified as anything but "active" in other source categories.

Deep Seated Influences on Bank Erosion and Streamside Landslides

The Peer Review Draft (Regional Water Board 2013a) did not tailor the sediment loading estimates of natural bank erosion and streamside landslides based upon concentration of deep seated landslide features and landforms within individual sub-basins. It was concluded that the Peer Review Draft (Regional Water Board 2013a) may not have adequately accounted for the influence of deep features on these in-channel sources (e.g., bank erosion and streamside landslides). Therefore, in response to informal public comments (CalFire 2014; MacDonald 2014), the estimates of natural sediment loading have been adjusted to account for the influence of deep seated landslides on the rate of stream bank erosion. HRC (2014) found that streamside landsliding and bank erosion occurred independent of recent management associations.

The revised estimates were developed based on the proportion of deep seated landforms in the individual sub-basins as identified using the deep seated landslide and earthflow detection model (DSLED) that evaluate surface roughness from the LiDAR and identify features associated with the body of deep seated landslides. The DSLED Rough algorithm modeled surface roughness values ranging from 0.6-0.7, which are generally associated with deep seated landslide features whose activity levels are defined as "historic" or "dormant young" (Stillwater 2007). The revised estimates also were developed using the portion of the existing managed drainage network[18] in each sub-basin that intersects with any CGS-mapped deep seated features. These are the areas where the toes of deep seated features most likely influence bank erosion and streamside landslides.

Two estimates of the proportion of streamside landsliding associated with deep seated features were determined and then averaged for each subbasin. This loading was removed

[18] The drainage network evaluated was from the channel initiation study (a drainage area of 0.52 hectares) and modeled on the Light Detection and Ranging (LiDAR) DEM.

from the prior management-related estimates and attributed to natural estimates (see table note below). As a result, natural loading varies by period and sub-basin.

Table 7 shows the results for each time period in each sub-basin. The values in the bottom-most table were incorporated into the overall watershed loading estimates (see the table note for additional description on the calculations).

6.2.2.2Management/Land-Use-Related Sediment Loading

This chapter describes the land use influences on sediment production and delivery. Timber harvest is the primary past, current, and probable future land use in the watershed and is therefore the focus of the land use-related sediment source analysis. The sediment source categories affected by land use activities in Upper Elk River watershed that are identified and quantified include:

- In channel sources (low order channel incision, bank erosion, and streamside landslides),
- Road-related landslides,
- Open-slope shallow landslides,
- Land use-related sediment discharge sites,
- Post-treatment discharge sites,
- Skid trails,
- Road surface erosion, and
- Harvest (in unit) surface erosion.

In-channel Sources

The combination of headward channel incision, bank erosion, and streamside landslide features are related and collectively referred to as in-channel sources. Scour of low-order channels includes vertical incision and headward migration of the stream channel. Headward migration increases both the channel length and density of the stream network (thereby increasing the drainage network). Bank erosion and streamside landslide processes are described under natural sources. Generally speaking, channel incision accounts for the initial delivery from expansion of the drainage network length and depth (i.e., gullies) and bank erosion and streamside landslides are erosional processes within the drainage network.

These three categories are identified separately in Table 6, but are grouped into low order channel incision and management-related bank erosion and streamside landslide categories in the loading summaries below. Channel incision estimates were based on measured channel dimensions and field estimates of impacted and natural drainage density (Table 6). Three different survey efforts informed the rates of bank erosion and streamside landsliding in Upper Elk River; the studies corroborated each other very well (Palco 2004; PWA 2006; HRC 2014). The most recent effort was the most extensive (26 miles of stream in Upper Elk River) and was part of the HRC Watershed Analysis Revisit (HRC 2014). These findings were used to estimate loadings associated with land use-related bank erosion and streamside landslides.

Table 7. Summary of Information on Refined Estimates of Natural Streamside Landslide and Bank Erosion Rates Influenced by Deep-Seated Features (all units unless specified are yd^3/mi^2/yr)

Sub-basin		Area (mi^2)	% area in DSLED Rough 0.6-0.7	Additional natural bank erosion and streamside Landslides based on association with % area in DSLED Rough 0.6-0.7							% channel length intersecting CGS mapped landslide	Additional natural bank erosion and streamside Landslides based on association with % channel length intersecting CGS mapped deep seated landslide						
				1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011		1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	Bridge Creek	2.20	5%	12	10	4	15	16	16	16	30%	82	62	24	96	105	105	102
5	Dunlap Gulch	0.66	13%	36	27	11	42	46	46	8	21%	56	43	17	66	72	72	12
6	Browns Gulch	0.89	21%	56	43	17	66	72	72	52	21%	56	43	17	66	72	73	52
7	Upper North Fork Elk River	4.36	22%	56	42	14	66	73	73	11	7%	18	13	5	21	23	23	3
8	McWhinney Creek	1.27	11%	30	23	9	35	38	39	38	8%	22	17	7	26	28	28	28
9	Lower North Fork Elk River	5.02	15%	42	32	13	50	54	54	31	45%	123	93	37	144	158	158	90
10	North Branch North Fork Elk River	4.02	12%	32	24	8	37	41	41	18	57%	149	111	38	175	192	193	83
11	Lower South Fork Elk River	2.90	15%	41	31	12	48	53	53	11	35%	95	72	28	111	122	122	26
12	Railroad Gulch	1.20	22%	61	46	18	72	78	79	64	57%	155	118	46	182	200	200	163
13	Clapp Gulch	1.00	22%	60	46	18	71	78	78	69	68%	184	140	55	216	237	238	210
14	Tom Gulch	2.51	7%	20	15	6	23	25	25	57	52%	141	107	42	166	181	182	410
15	Lake Creek	2.12	11%	31	24	9	37	40	40	33	64%	173	132	52	204	223	224	181
16	McCloud Creek	2.36	25%	67	51	20	79	86	86	55	42%	114	86	34	134	146	147	94
17	Upper South Fork Elk River	6.45	25%	67	51	20	79	86	87	55	56%	153	116	46	179	196	197	126
18	South Branch North Fork Elk River	1.93	23%	63	48	19	74	81	81	65	68%	185	141	55	218	238	239	190
19	Little South Fork Elk River	3.59	20%	53	41	16	63	69	69	44	46%	126	96	38	148	162	163	104
20	Corrigan Creek	1.66	19%	52	39	15	61	67	67	43	72%	195	148	58	229	251	252	161
Total Upper Elk River		**44.13**	**17%**	**47**	**36**	**14**	**55**	**61**	**61**	**37**	**45%**	**121**	**92**	**36**	**142**	**156**	**156**	**114**

Sub-basin		Area (mi^2)	Revised additional natural bank erosion and streamside Landslides based average of associations with DSLED Rough and CGS mapping						
			1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	Bridge Creek	2.20	47	36	14	55	61	61	59
5	Dunlap Gulch	0.66	46	35	14	54	59	59	10
6	Browns Gulch	0.89	56	43	17	66	72	72	52
7	Upper North Fork Elk River	4.36	37	28	10	43	48	48	7
8	McWhinney Creek	1.27	26	20	8	30	33	33	33
9	Lower North Fork Elk River	5.02	82	63	25	97	106	106	61
10	North Branch North Fork Elk River	4.02	90	67	23	106	117	117	50
11	Lower South Fork Elk River	2.90	68	51	20	79	87	87	18
12	Railroad Gulch	1.20	108	82	32	127	139	139	113
13	Clapp Gulch	1.00	122	93	37	144	158	158	139
14	Tom Gulch	2.51	80	61	24	94	103	103	234
15	Lake Creek	2.12	102	78	31	120	132	132	107
16	McCloud Creek	2.36	90	69	27	106	116	116	74
17	Upper South Fork Elk River	6.45	110	84	33	129	141	142	90
18	South Branch North Fork Elk River	1.93	124	94	37	146	160	160	127
19	Little South Fork Elk River	3.59	90	68	27	105	115	116	74
20	Corrigan Creek	1.66	123	94	37	145	159	159	102
Total Upper Elk River		**44.13**	**84**	**64**	**25**	**99**	**108**	**108**	**76**

Note: Values in the bottom table were calculated by averaging the two sets of data in the top table. This bottom table was also used to calculate the revised estimates for the deep-seated influence on natural and management-related bank erosion and streamside landslides. Specifically, these values were 1) added to the Peer Review Draft natural loading estimates; and 2) subtracted from the Peer Review Draft total management-related bank erosion and streamside landslide estimates.

Road-related and Open Slope Shallow Landslides

The rate of sediment delivery from management-related open-slope shallow landslides was calculated based on data contained in Palco's landslide inventory databases, including (for most time periods) landslides on lands owned by GDRC and those managed by BLM, as well as HRC lands. Landslides attributable to roads were separated from those attributable to other management activities.

Land Use-Related and Post-Treatment Discharge Sites

Management discharge sites include sites associated with watercourse crossings, roads, skid trails, and gullies. Typically these sites are treated by removing some volume of fill material and then treating the channel and excavated slopes to minimize post-treatment sediment delivery. Significant progress has been made in identifying, prioritizing, treating and monitoring these sites in the Upper Elk River watershed. Sediment delivery rates associated with management discharge sites were estimated for each time period using data submitted by each of the landowners/managers (HRC, GDRC, and BLM), either as part of their own comprehensive ownership analysis or as required by a permit or enforcement order.

Skid Trails

Sediment delivery associated with skid trails is derived from several sources of data, including: a reconnaissance survey of Elk Head Springs conducted by PWA, a database of sediment sites maintained by HRC, Palco's Freshwater Creek Skid Trail Study (Palco 2007), and HRC's Skid Trail Surveys (HRC 2010). The number of sediment sites influenced by skid trails was identified and a past and future rate of sediment delivery estimated to produce a volume of sediment delivered from the areas studied and was applied as uniform rate across the Upper Elk River watershed.

Road Surface Erosion

The road surface erosion source category includes sediment transport and delivery from road surfaces. The material eroded from road surfaces is fine grained in size and discharge can occur during each rain event (a press disturbance), rather than discharging episodically (pulse disturbance) (ISRP 2003). For this reason, road surface erosion has a chronic effect on water quality. The greatest sediment delivery per unit of road length and the greatest road lengths in the Upper Elk River watershed are associated with unsurfaced roads (including stormproofed and non-stormproofed). As a result, un-surfaced roads have the greatest estimated loading from road surface erosion, accounting for approximately 60-75 percent of the estimated sediment loading from recent road surface erosion.

Harvest Surface Erosion

Surface erosion from harvest areas was estimated from harvest history in clear-cut equivalent areas. This information was based on CalFire, the Palco watershed analysis (Palco 2004), and Palco's data.

6.2.3 Summary of Loadings

The load quantification approaches for each source category presented in Chapter 6.2.2 were applied to the Upper Elk River sub-basin areas for each time period evaluated and also rolled up into an overall watershed loading.

6.2.3.1 Sub-basin Loading

Table 8 presents a summary of the sediment load by sub-basin. This information is useful to prioritize implementation opportunities (using both sub-basin and source category information) to reduce loads to the stream reaches by prioritizing sub-basin-category combinations with the highest risk of additional sediment delivery.

The source analysis estimated total loads for 2004-2011 were compared with those measured at suspended sediment and streamflow gaging stations as presented by Salmon Forever (Lewis 2013) and HRC (2012b) for similar drainage areas as a check for reasonableness. The annual average loads in the South Fork Elk River reported by Lewis (2013) were 4.6 percent lower and 12.7 percent lower in the North Fork Elk River than the sediment source analysis calculated loads (2004-2011 results in Table 8). The loads presented by HRC (2012b) are approximately 12 percent lower in the North Fork Elk River than those quantified in the sediment source analysis. While these comparisons highlight differences in the gaging results (likely due to limited high flow discharge estimates and turbidity-suspended sediment regression analyses), these comparisons confirm that the loading values estimated by this analysis are reasonable.

Figure 14 ranks sub-basins on a graph, based on the total estimated sediment delivery from each sub-basin during the most recent period (2004-2011). This graph identifies the Toms Gulch sub-basin as a clear outlier with exceptionally high rates of sediment delivery. The relative magnitude of total sediment loading for the 2004-2011 time period is between 400-600 $yd^3/mi^2/yr$ for over half of the sub-basins and several others fall just outside that range, indicating consistency in the spatial pattern of loading throughout the watershed.

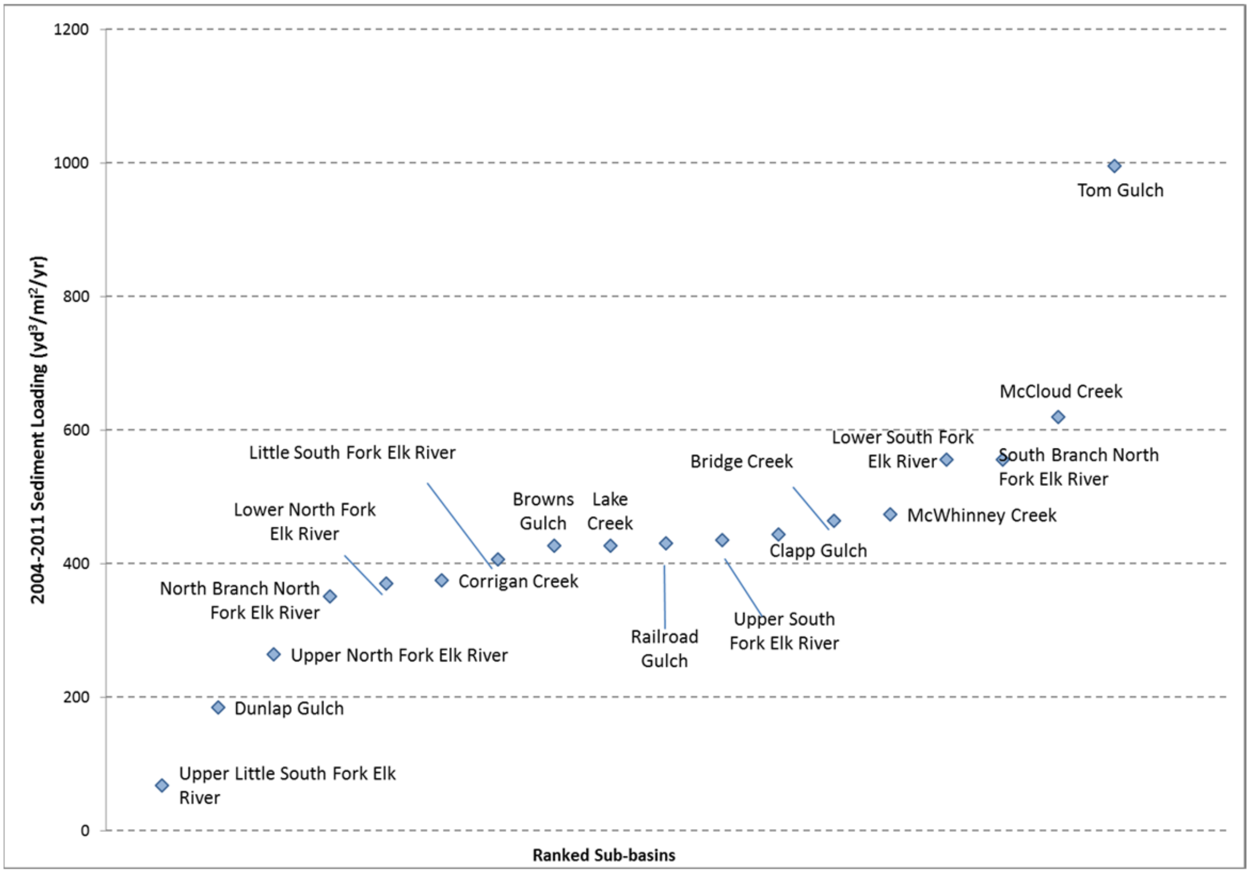

Figure 14. Upper Elk River sub-basin sediment loading for the 2004-2011 analysis time period

Note: The lower-most marker represents the reference sub-basin, Upper Little South Fork Elk River.

During the 1988-1997 time period, open slope landslides and road related landslides were the dominant sources. Specifically, road-related landslides primarily impacted Bridge Creek, Lower North Fork, North Branch North Fork, Railroad Gulch, and Clapp Gulches, while open-slope landslides primarily impacted Lower South Fork, Railroad, Clapp Gulch, Tom Gulch, Lake Creek, and Bridge Creek. All of these sub-basins (with the exception of North Branch North Fork) drain to the impacted reach. The magnitude of discharges during that time period dwarfed other time periods and the location of those large discharges had a direct impact on the impacted reach and the loss of function of the Elk River (see also Regional Water Board 2013b for more discussion of the conditions during this time period).

Table 8. Summary of Sediment Loading to Upper Elk River Sub-basins by Sediment Source Category and Time Period (all units are $yd^3/mi^2/yr$)

Natural Loading Source Categories

Sub-basin		Area (mi^2)	Natural Source Loads (all years)				Additional natural bank erosion and streamside landslide loads based average of associations with DSLED Rough and CGS mapping (Table 7)							Total Natural*						
			Deep-seated	Bank Erosion	Streamside Landslides	Shallow Landslides	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	Bridge Creek	2.20	0.0	9	26	30	47	36	14	55	61	61	59	112	101	79	120	126	126	124
5	Dunlap Gulch	0.66	0.0	9	26	30	46	35	14	54	59	59	10	111	100	79	119	124	124	75
6	Browns Gulch	0.89	0.0	9	26	30	56	43	17	66	72	72	52	121	108	82	131	137	137	117
7	Upper North Fork Elk River	4.36	0.0	9	26	30	37	28	10	43	48	48	7	102	93	75	108	113	113	72
8	McWhinney Creek	1.27	0.0	9	26	30	26	20	8	30	33	33	33	91	85	73	96	98	98	98
9	Lower North Fork Elk River	5.02	0.0	9	26	30	82	63	25	97	106	106	61	148	128	90	162	171	171	126
10	North Branch North Fork Elk River	4.02	0.0	9	26	30	90	67	23	106	117	117	50	156	132	88	171	182	182	116
11	Lower South Fork Elk River	2.90	0.0	9	26	30	68	51	20	79	87	87	18	133	117	85	145	152	152	83
12	Railroad Gulch	1.20	0.0	9	26	30	108	82	32	127	139	139	113	173	147	97	192	204	204	178
13	Clapp Gulch	1.00	0.0	9	26	30	122	93	37	144	158	158	139	187	158	102	209	223	223	204
14	Tom Gulch	2.51	5.9	9	26	30	80	61	24	94	103	103	234	151	132	95	165	174	174	305
15	Lake Creek	2.12	0.0	9	26	30	102	78	31	120	132	132	107	167	143	96	185	197	197	172
16	McCloud Creek	2.36	0.0	9	26	30	90	69	27	106	116	116	74	155	134	92	171	181	181	139
17	Upper South Fork Elk River	6.45	17.2	9	26	30	110	84	33	129	141	142	90	192	166	115	211	224	224	173
18	South Branch North Fork Elk River	1.93	0.0	9	26	30	124	94	37	146	160	160	127	189	159	102	211	225	225	192
19	Little South Fork Elk River	3.59	0.0	9	26	30	90	68	27	105	115	116	74	155	133	92	170	181	181	139
20	Corrigan Creek	1.66	0.0	9	26	30	123	94	37	145	159	159	102	189	159	102	210	224	224	167
Total (area-weighted)		**44.13**	**2.9**	**9**	**26**	**30**	**84**	**64**	**25**	**99**	**108**	**108**	**76**	**152**	**132**	**93**	**167**	**176**	**176**	**144**

*Total natural value for each time period sums the Natural Sources that are consistent for all years as well as the time-variable bank erosion and streamside landslide values.

Management-Related Loading Source Categories

Sub-basin	Low Order Channel Incision							Streamside Landslides and Bank Erosion*							Open Slope Shallow Landslides						
	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	74	25	14	23	34	13	15	226	172	67	265	290	291	281	1314	0	10	922	1603	0	0
5	74	25	14	23	34	13	15	227	173	68	267	292	293	50	0	0	0	0	0	0	0
6	74	25	14	23	34	13	15	217	165	65	254	279	279	200	0	0	0	16	0	0	0
7	37	18	10	16	24	9	11	223	166	57	261	287	287	42	334	559	0	63	0	0	0
8	74	25	14	23	34	13	15	247	188	74	290	318	318	310	0	0	0	2	0	248	0
9	74	25	14	23	34	13	15	190	145	57	224	245	245	141	57	0	0	92	0	53	0
10	37	18	10	16	24	9	11	169	126	44	198	218	218	94	261	36	0	0	0	0	0
11	74	25	14	23	34	13	15	205	156	61	241	264	264	56	0	4	0	1414	0	0	0
12	74	25	14	23	34	13	15	165	125	49	193	212	212	173	1118	0	52	318	32	0	0
13	74	25	14	23	34	13	15	150	114	45	177	194	194	171	0	0	0	126	0	0	0
14	74	25	14	23	34	13	15	193	146	58	226	248	248	561	48	0	0	112	0	0	0
15	74	25	14	23	34	13	15	170	130	51	200	219	220	178	183	97	54	525	401	26	0
16	74	25	14	23	34	13	15	182	139	55	214	235	235	150	37	116	0	14	0	0	0
17	74	25	14	23	34	13	15	163	124	49	191	210	210	134	99	82	0	7	103	249	37
18	74	25	14	23	34	13	15	149	113	44	175	191	192	152	0	0	25	0	0	0	0
19	74	25	14	23	34	13	15	183	139	55	215	236	236	151	25	3	0	0	35	0	0
20	74	25	14	23	34	13	15	149	114	45	175	192	192	123	0	0	0	0	0	0	0
Total	**67**	**23**	**14**	**21**	**32**	**12**	**14**	**186**	**141**	**54**	**219**	**240**	**240**	**160**	**189**	**82**	**6**	**201**	**118**	**51**	**5**

*Values are equal to the sum of the Peer Review Draft management-related streamside landslide and bank erosion values minus the loadings associated with natural deep-seated landslides (Table 7).

Management-Related Loading Source Categories (continued)

Sub-basin	Road-related Landslides							Management discharge sites							Skid Trails							Treatment of Management Discharge Sites						
	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1954-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1954-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	0	0	7	926	12	13	0	0	0	0	10	8	0	8	2	8	7	8	16	15	15	-	-	-	-	1	0	8
5	0	0	1	12	0	0	0	0	13	22	14	8	0	8	1	2	2	2	5	15	15	-	-	-	-	28	0	5
6	154	0	0	100	0	23	19	25	20	20	46	35	0	35	1	3	3	3	6	15	15	-	-	-	-	17	0	10
7	83	9	3	138	0	7	21	18	21	13	49	39	30	39	4	15	13	15	31	15	15	-	-	-	-	47	10	39
8	0	0	0	3	0	0	0	0	0	3	8	6	0	6	1	4	4	4	9	15	15	-	-	-	-	0	0	18
9	24	1	85	719	0	10	13	34	24	16	29	21	240	21	5	18	15	17	36	15	15	-	-	-	-	22	11	23
10	21	32	7	1245	21	22	3	175	143	88	80	53	5	53	4	14	12	14	29	15	15	-	-	-	-	20	0	31
11	0	14	29	31	0	0	318	17	83	198	82	27	41	27	3	10	9	10	21	15	15	-	-	-	-	0	0	22
12	0	25	3	753	0	13	0	0	6	108	58	20	21	20	1	4	4	4	9	15	15	-	-	-	-	0	0	1
13	0	1	0	773	0	0	0	0	2	12	29	21	0	21	1	4	3	3	7	15	15	-	-	-	-	0	0	0
14	0	0	0	3	0	0	0	4	97	26	24	17	64	17	3	9	8	9	18	15	15	-	-	-	-	0	0	40
15	1696	0	0	141	0	112	2	17	19	25	27	17	86	17	2	7	6	7	15	15	15	-	-	-	-	0	0	1
16	1	58	0	12	0	0	0	19	109	127	266	203	203	203	2	8	7	8	17	15	15	-	-	-	-	0	0	57
17	5	34	10	10	0	4	2	12	77	189	68	17	91	17	7	23	19	22	47	15	15	-	-	-	-	0	0	17
18	4	340	13	7	2	12	0	22	133	142	160	115	0	115	2	7	6	7	14	15	15	-	-	-	-	46	6	35
19	0	0	0	0	0	0	0	28	49	19	55	46	46	46	4	13	11	12	26	15	15	-	-	-	-	9	13	28
20	14	2	6	6	2	229	0	2	66	179	57	10	91	10	2	6	5	6	12	15	15	-	-	-	-	0	0	0
Total	**99**	**29**	**15**	**307**	**3**	**20**	**25**	**30**	**60**	**80**	**65**	**39**	**73**	**39**	**4**	**12**	**11**	**12**	**26**	**15**	**15**	**0**	**0**	**0**	**0**	**13**	**4**	**24**

Management-Related Loading Source Categories (continued)

Sub-basin	Road Surface Erosion							Harvest Surface Erosion							Total of Management-Related Loads						
	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	56	84	94	147	69	71	6	2	6	2	2	11	20	8	1,673	294	200	2,302	2,045	423	341
5	58	88	98	154	72	74	7	2	6	2	4	0	0	11	362	306	207	476	439	395	110
6	53	80	89	140	66	68	12	2	6	2	4	0	12	4	526	299	193	586	437	410	310
7	48	72	81	127	60	61	24	2	6	2	10	1	3	1	749	866	179	680	489	423	192
8	54	81	91	143	67	69	5	2	6	2	7	8	4	7	378	304	188	480	441	667	376
9	57	86	97	152	71	73	17	2	6	2	4	5	8	2	444	304	286	1,259	434	668	245
10	51	77	86	136	64	66	22	2	6	2	4	5	6	7	720	452	249	1,694	434	341	236
11	50	75	84	131	38	40	18	2	6	2	2	0	0	1	351	373	397	1,934	384	373	472
12	75	113	127	199	94	96	24	2	6	2	11	0	0	4	1,435	304	359	1,560	400	370	252
13	87	130	146	229	107	110	18	2	6	2	5	0	0	0	314	282	221	1,364	363	332	240
14	52	79	88	138	40	42	36	2	6	2	0	0	0	8	375	362	195	534	357	381	691
15	58	88	98	154	72	74	27	2	6	2	10	0	6	0	2,203	371	250	1,088	759	552	255
16	37	55	62	97	28	29	29	2	6	2	2	15	0	11	355	515	267	637	532	495	480
17	57	86	97	152	44	46	21	2	6	2	5	23	4	4	419	456	380	478	477	631	262
18	58	88	98	154	72	74	32	2	6	2	11	0	1	0	310	711	344	536	473	313	364
19	16	24	27	43	13	13	13	2	6	2	0	0	0	0	333	259	128	348	398	335	267
20	57	86	97	152	44	46	46	2	6	2	0	0	12	0	300	305	348	419	294	597	208
Total	**52**	**78**	**87**	**137**	**55**	**56**	**22**	**2**	**6**	**2**	**5**	**6**	**5**	**4**	**629**	**431**	**268**	**966**	**531**	**476**	**308**

*Total Sediment Loading = Sum of natural loads and management-related loads

Total Sediment Loading*

Sub-basin	Total Sediment Loading						
	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
4	1,786	395	279	2,423	2,171	549	464
5	473	406	285	595	563	519	185
6	647	407	275	718	575	548	427
7	851	959	254	788	602	536	264
8	469	389	261	575	540	766	474
9	592	432	376	1,421	605	840	371
10	876	585	337	1,865	616	523	351
11	483	490	482	2,079	536	525	556
12	1,609	452	457	1,752	604	574	430
13	501	440	323	1,573	586	555	444
14	527	494	290	700	531	556	996
15	2,371	514	346	1,273	956	749	427
16	510	649	359	808	714	677	620
17	611	622	495	689	700	855	435
18	499	871	447	747	698	538	556
19	487	392	220	518	579	516	406
20	489	464	450	629	518	821	375
Total	**781**	**563**	**360**	**1,133**	**707**	**652**	**452**

6.2.3.2 Watershed Loading

Table 9 shows current estimates of loads by source category. These values are derived from the total rows by source from the sub-basin loading summary (Table 8). The loading totals shown in Table 9 for the category *Management-Related Bank Erosion & Streamside Landslides* is reduced relative to 2013 estimates (Regional Water Board 2013a) and loads attributed to natural sources are increased accordingly. As described above, this change was quantified by estimating the potential influence of deep seated landslides on bank erosion and streamside landslides.

Table 9. Summary of Upper Elk River Volumetric Loading (yd^3/mi^2/yr) by Sediment Source Category for Analysis Time Periods

	Sediment Source Category	1955-1966	1967-1974	1975-1987	1988-1997	1998-2000	2001-2003	2004-2011
Natural	Natural Bank Erosion	9	9	9	9	9	9	9
	Natural Streamside Landslides	26	26	26	26	26	26	26
	Shallow Hillslope Landslides	30	30	30	30	30	30	30
	Deep seated Landslides	3	3	3	3	3	3	3
	Deep Seated Influence on Bank Erosion and Streamside Landslides	84	64	25	99	108	108	76
	Natural Loading	**152**	**132**	**93**	**167**	**176**	**176**	**144**
Land Use	In-Channel: Low Order Channel Incision	67	23	14	21	32	12	14
	In-Channel: Management-Related Bank Erosion & Streamside Landslides	186	141	54	219	240	240	160
	Road-Related Landslides	99	29	15	307	3	20	25
	Open Slope shallow landslides	189	82	6	201	118	51	5
	Land Use-related Sediment Discharge Sites	30	60	80	65	39	73	39
	Post-Treatment Sediment Discharge Sites	0	0	0	0	13	4	24
	Skid Trails	4	12	11	12	26	15	15
	Road surface erosion	52	78	87	137	55	56	22
	Harvest Surface Erosion	2	6	2	5	6	5	4
	Land Use Loading	**629**	**431**	**268**	**966**	**531**	**476**	**308**
Total	**Total Loading**	**781**	**563**	**360**	**1,133**	**707**	**652**	**452**
	Percent of total attributable to land use activities	*81%*	*77%*	*74%*	*85%*	*75%*	*73%*	*68%*

Figure 15 presents sediment loads by source category and time period (the same values from Table 9). This illustrates the importance of land use-related streamside landslides, open slope shallow landslides, road-related shallow landslides, and road surface erosion as sources of sediment—these sources are largely attributable to timber harvest operations and associated activities. Also notable is the reduction in sediment delivery over time from these specific source categories (except streamside landslides). Sediment delivery attributable to land use activities has reduced over time from a high of 85 percent in the 1988-1997 period to a low of 68 percent in the more recent period (2004-2011).

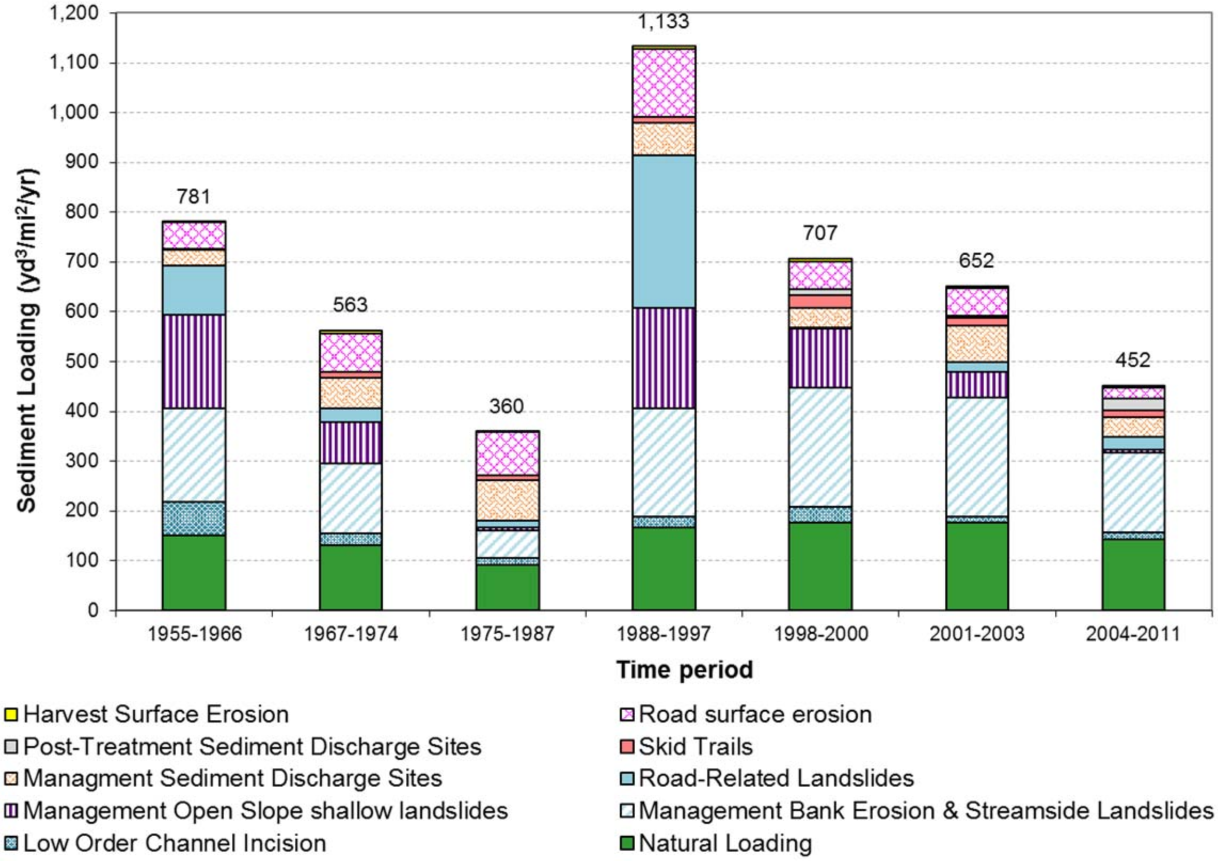

Figure 15. Upper Elk River loading by source category for analysis time periods

The long-term average (1955-2011) land use-related loading is estimated to be 520 $yd^3/mi^2/yr$ (approximately 372 percent of the natural loading). The largest land use-related loading is associated with the 1988-1997 time period, which corresponded with high levels of land disturbance, poor construction and maintenance practices, significant rainfall (1995-1997) and a significant earthquake event (1992) (Regional Water Board 2013b). Natural sediment loading in the same time period is estimated to be approximately 10 percent less than the following six years.

Long-term flow measurements from USGS gage station 11481200 on the Little River near Trinidad, California[19] were evaluated to characterize hydrologic conditions in the area throughout the sediment source analysis time period (Figure 16). These data indicate that the analysis time periods with the wettest years (based on annual water yields) included 1967-1974 and 1998-2000. , The time period with the highest sediment loading rates for the Upper Elk River watershed (Figure 15) was 1988-1997. Therefore, this flow analysis

[19] Little River offers a long-term gage (61 years of record starting in 1953) in a similar-sized coastal watershed located approximately 20 miles north of the Elk River mouth and provides valuable context for the distribution of discharge events for periods when a gage was not operated on Elk River.

suggests that the high sediment loads estimated for the 1988-1997 period were caused by factors other than significant rainfall.

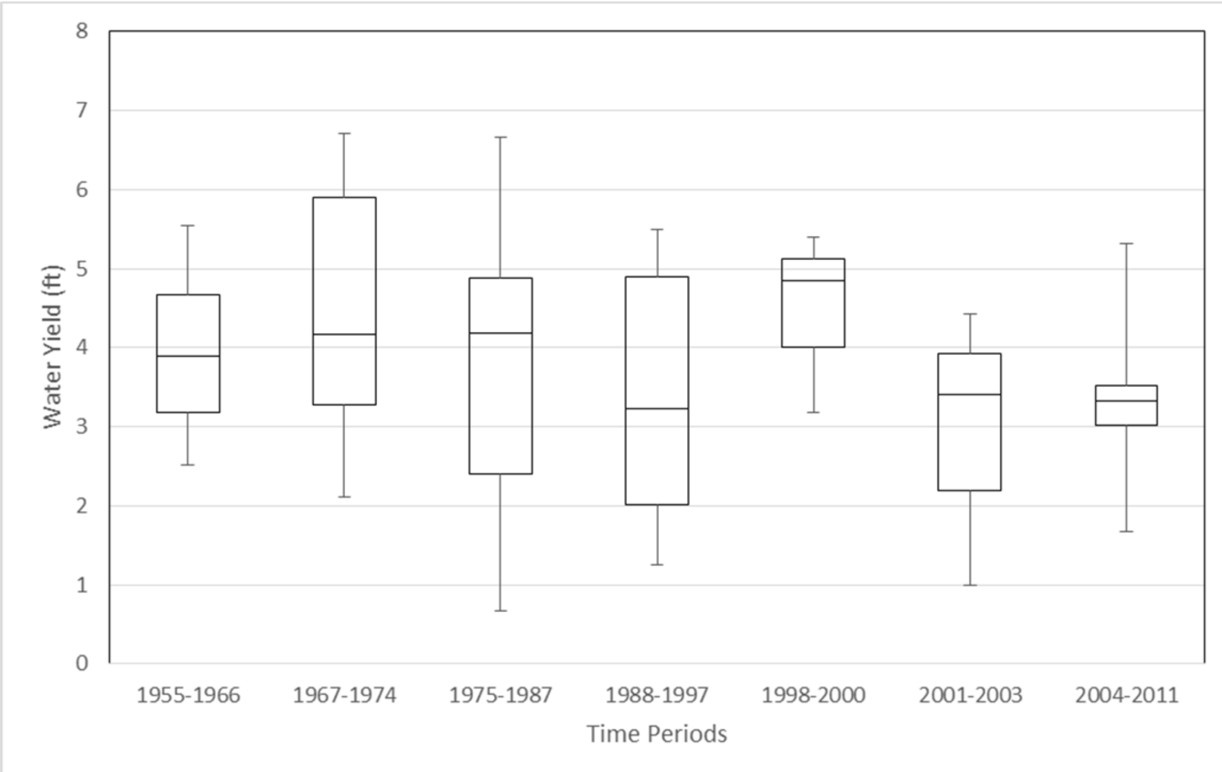

Figure 16. Annual water yields for the Little River near Trinidad, California

Sediment delivery estimates across time periods and source categories have differing levels of uncertainty. Recognizing that uncertainty, loading estimates indicate that in-channel sources of sediment (low order channel incision, bank erosion, and streamside landslides) are the largest controllable source of sediment in the Upper Elk River watershed, and constitute 57 percent of the land use-related sediment delivered to the fluvial system in the most recent period, representing the highest magnitude source though may be the most difficult and currently least controlled. Landslides and management discharge sites represent a medium magnitude source that warrant ongoing control with refinements to the existing programs. Lastly, surface erosion is a chronic, but lower magnitude source that is the most readily controlled.

It should also be noted that different categories of landslides (natural and land use-related) were once identified as a very large component of the total sediment delivered to the Upper Elk River watershed. For example, road-related landslides were the largest single component in the 1988-1997 period (Figure 11). Improvements in land management quality and intensity coincide with a reduction in the proportion of sediment attributable to landslides. This figure illustrates that in-channel sediment sources are the most consistent source of loading to the stream system.

6.2.4 Sediment Transport and Storage

The sediment source analysis describes sediment loading from discrete erosion sources and erosional processes that is available to be delivered to the fluvial system (Chapter 6.2.2 and 6.2.3). Once sediment is delivered to the system, numerous factors influence its transport downstream, including sediment mobility (i.e., grain size) and transport capacity. Conceptually, sediment transport capacity is determined by stream flow, channel characteristics, and roughness features. Land management activities influence these characteristic, as summarized in the Conceptual Model (Chapter 6.1.3), by altering hydrology and reducing LWD recruitment trees. These factors are described below along with a comparison of sediment available in the system and a summary of the sediment deposits in the impacted reach.

6.2.4.1Activities Influencing Sediment Transport Capacity

Large Woody Debris Recruitment Trees

The natural riparian conditions in the watershed created complexity in streams channels, both in the steep upper watershed as well as in the depositional reach (i.e., the impacted reach). Numerous alterations have led to reduced complexity throughout, including reduction in the available recruitable trees within riparian areas. In steep headwater streams, landslides can be important processes by which wood is delivered to streams. Riparian harvesting reduces these inputs. In the event of a landslide, the absence or reduction in trees that may have stabilized the body and toe of the landslide can result in greater volume of sediment delivery. As previously stated, results from streamside landslide surveys in the Upper Elk River and Freshwater Creek indicate increasing delivery volume per slide and increasing frequency of streamside landslides associated with decreasing stand age (PWA 2006). Reduced channel complexity can result in greater sediment transport potential. Large woody debris is critical to restoring natural sediment routing in the Upper Elk River and recruitment of LWD is a critical function of riparian areas.

Altered Hydrology

Within the sediment source analysis period, channel conveyance capacity in the impacted reach was sufficient to contain the majority of high flow events without inundation of the floodplain. Sediment loads associated with the 1988-1997 time period, when combined with downstream channel characteristics and high flows of the mid to late 1990s, resulted in major deposition on the banks and across the floodplain, effectively reducing the stream flow capacity and raising water surface elevations. As a result, frequent floods inundated properties adjacent to the Elk River to unprecedented water surface elevations and lateral flood extents. These events altered the morphology of the river, resulting in a reduction of flow capacity of the channel, effectively reducing the achievable water velocities and the sediment transport capacity of Upper Elk River. This alteration to the hydrologic function in the impacted reaches has made the impacted reach highly sensitive to sediment loads.

6.2.4.2 Sediment within the Stream System

Figure 17 provides a comparison of the total loading as estimated by the void-based sediment source analysis[20] and the suspended sediment load measurements[21]. The comparison of these two datasets, as shown in Figure 17, suggests that there may be some sediment within some of the tributaries that is in addition to the loads delivered from the hillslope. Conceptually, this additional sediment could be sediment stored in the tributary system from past hillslope delivery. It could also include sediment delivered through subsurface erosion. Other possible explanations for the differences are as follows:

1. The void-based estimates amortize sediment loads over a period of years, while the suspended sediment estimates reflect that sediment moves episodically.
2. There are divergent inaccuracies in the estimates of void volume and/or timing and suspended sediment concentration and/or stream flow.
3. There is non-uniformity in the bulk density estimate.

The difference between the two measurements varies across tributaries, but ranges from -60 to 27 percent, with the suspended sediment data generally yielding a higher load estimate (the average difference is 3 percent).

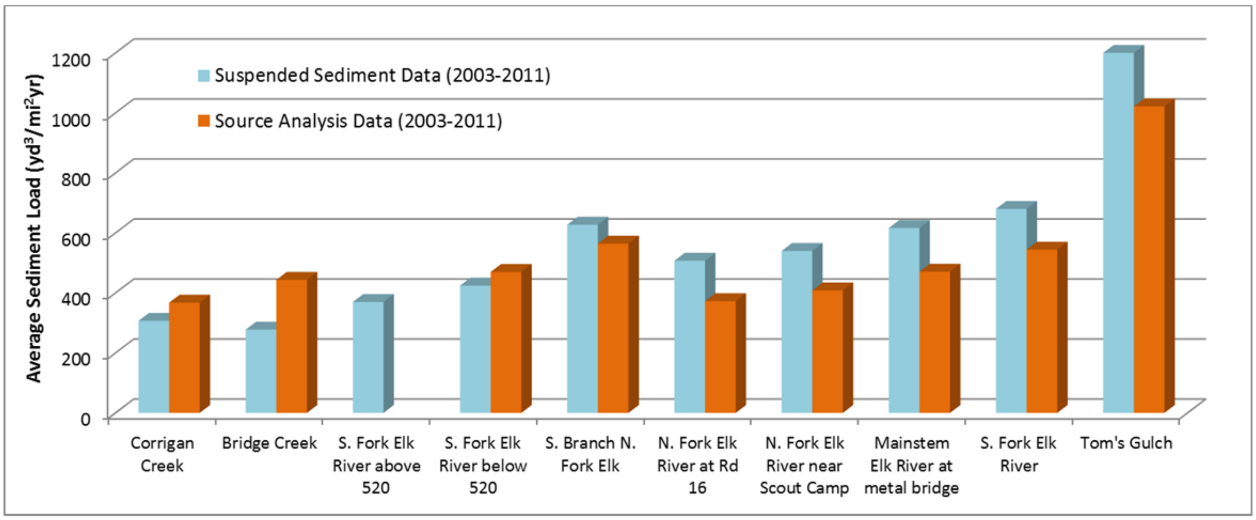

Figure 17. Comparison of average annual sediment loading during the 2003-2011 time period, as estimated by stream flow and suspended sediment data and void-based delivery estimates (source analysis data)

Note: The suspended sediment data were converted using a bulk density of 1.4 tons/yd^3.

In addition to specific land use activities influencing sediment transport capacity, aggradation in the stream influences the altered hydrologic conveyance capacity and the ability of the system to transport sediment downstream.

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[20] The void-based sediment source data represent the rate at which material leaves the hillslope and enters the fluvial system.

[21] The suspended sediment data represents the load of sediment routing through the fluvial system at a given point. These estimates are based on continuous turbidity and stage recording (10-15 minute increments) and empirical stage-discharge and turbidity-suspended sediment concentration relationships.

6.2.4.3 Sediment Deposits in Impacted Reach

The Peer Review Draft identified significant sediment deposits as a primary driver of impaired beneficial uses and nuisance flooding conditions in the impacted reach of the Elk River, which contains the low gradient portions of lower North and South Forks and upper mainstem Elk River (Regional Water Board 2013a). The sediment deposits limit the discharge conveyance capacity, reduce velocities, and limit the stream's ability to pass water and suspended sediment. Table 10 presents estimated volumes of sediment deposits in different segments of the impacted reach, based on calculations of cross-sectional changes identified primarily as of 1993 and described in the Peer Review Draft (Regional Water Board 2013a).

Table 10. Estimated Volume of Instream Sediment Deposits within the Impacted Reach in the Upper Elk River

Reach description (downstream to upstream)	Upstream drainage area (mi^2)	Volume Deposition within Reach (yd^3)	Volume Deposition per Unit Area (yd^3/mi^2)[1]
Upper Mainstem: Shaw Gulch to confluence	45	260,000	6,000
Lower North Fork: confluence to Browns Gulch	22	280,000	13,000
Lower South Fork: confluence to Toms Gulch	19	100,000	5,000
Cumulative excess sediment deposits	**45 (total upstream area)**	**640,000 (sum of upstream reaches)**	**14,000**

[1] Calculated as Volume Deposition divided by Upstream Drainage; rounded to the nearest thousand.

Analysis of cross-section data indicates that recent loading, despite upslope reductions in sediment delivery (Table 9), has nonetheless continued to increase aggradation, including the deposition of sediment in the impacted reach (Lewis 2013; HRC 2012). Table 11 summarizes cross-sectional survey data for several locations in the watershed. These data demonstrate continued deposition at all locations in nearly all years (Regional Water Board 2015).

Figure 18 presents the suspended sediment load data within the impacted reach. Figure 18 illustrates how large flows transport sediment, particularly during 2003 and 2006 when flood heights in the impacted reach were higher than previously observed and significant deposition of sediment was also observed on the bed, banks and floodplain. However, subsequent years also indicated ongoing deposition. The pilot Hydrodynamic and Sediment Transport modeling over a 2.5 mile reach near the confluence of North Fork and South Fork predicted net sediment deposition on the bed, banks, and floodplain (NHE and Stillwater 2013). These results indicate that the majority of the deposition is fine sediment and that deposition has increased since 2003. The surveyed cross-sections within this reach agree with increased deposition (Lewis 2013; HRC 2014; summarized in Table 11 in Regional Water Board 2015).

Table 11. Annual and Cumulative Change in Storage in the Impacted Reach (Regional Water Board 2015).

Year	Mainstem Reach Change in Storage		North Fork Reach Change in Storage		South Fork Reach Change in Storage		Impacted Reach Total Change in Storage	
	Annual (yd^3/yr)	Cumulative (yd^3)	Annual (yd^3/yr)	Cumulative (yd^3)	Annual (yd^3/yr)	Cumulative (yd^3)	Annual (yd^3/yr)	Cumulative (yd^3)
2002	390	390	-3,743	-3,743	-8,678	-8,678	-12,031	-12,031
2003	-4,307	-3,917	-5,428	-9,171	-3,486	-12,164	-13,221	-25,252
2004	791	-3,126	-5,590	-14,761	-3,191	-15,354	-7,989	-33,241
2005	-4,765	-7,891	-6,656	-21,418	-3,717	-19,071	-15,138	-48,379
2006	-7,212	-15,103	-6,087	-27,504	-3,556	-22,627	-16,855	-65,234
2007	-4,833	-19,936	-3,117	-30,622	-3,158	-25,784	-11,108	-76,342
2008	-7,005	-26,941	334	-30,288	-961	-26,746	-7,633	-83,975
2009	-5,314	-32,254	-2,931	-33,219	-1,891	-28,636	-10,136	-94,110
2010	-5,176	-37,430	-3,564	-36,784	-1,339	-29,975	-10,079	-104,189
2011	-3,042	-40,472	-4,414	-41,198	-1,151	-31,126	-8,607	-112,796

Note: Negative numbers indicate deposition in reach and positive numbers indicate scour; yd^3/yr = cubic yards per year.

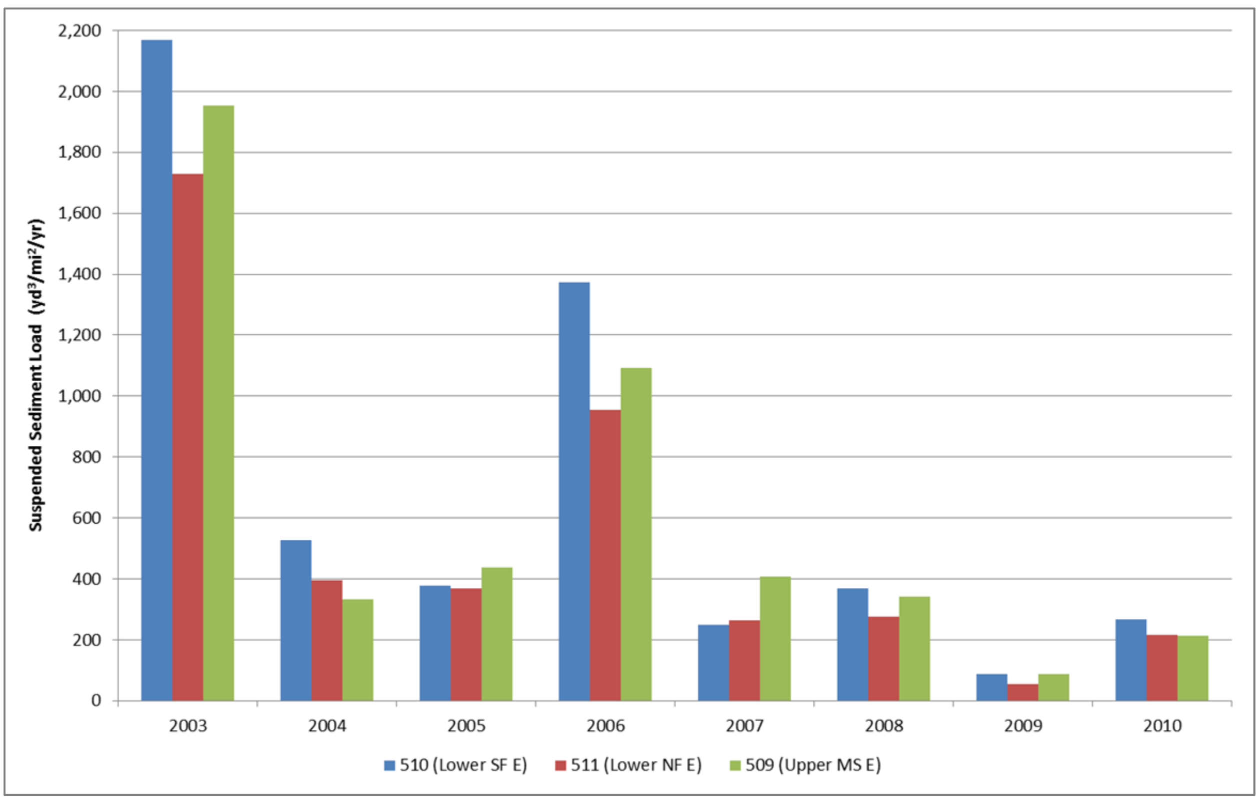

Figure 18. Suspended sediment loads measured near the confluence of South and North Forks of Elk River

6.2.4.4Mass Balance in Impacted reach

It is well established that there is substantial aggradation occurring in the impacted reach of the Upper Elk River. The amount of sediment load entering the impacted reach is also relatively well known based on data collected by HRC and Salmon Forever, among others. In contrast, the data available to establish sediment mass outflow from the impacted reach are limited. The most downstream monitoring station (station 509, mainstem Elk River at Steel Bridge) is in the midst of the impacted reach and does not establish the rate of sediment transport out of the reach.

Ideally, a mass balance could be constructed based upon gage data in the impacted reach. However, gage data are not currently available for the entire impacted reach and entering tributaries. In addition, some data collection and analysis issues have been identified by the Regional Water Board for the available gages, including limitations on capturing the peak discharges at gage sites due to inaccessible locations during floods and inaccuracies in suspended sediment concentrations due to regression techniques and limited depth integrated samples. Efforts are underway to address these issues and should result in a more precise estimate of the sediment mass balance in the impacted reach. Data are, however, already available to accomplish an approximate estimate of the mass balance, as described in the following paragraphs.

One line of evidence is provided by the recently completed pilot hydrodynamic and sediment modeling project (NHE and Stillwater, 2013). The pilot hydrodynamic modeling was calibrated based upon available gage data. NHE and Stillwater compared inflow and outflow from the pilot reach based upon available gage data which indicated that more sediment exits the reach than enters (510, 511, and 509) and more water exits than enters the reach (KRW, SFM, and 509), which was inconsistent with observed aggradation. The pilot modeling ultimately relied on the suspended sediment concentrations from KRW and SFM as upstream inputs and adjusted the discharge estimates to match observed water surface elevations. The pilot modeling results offered reasonable estimates of water surface elevations, scour, and fill as compared to observed conditions during the simulation period. Station 509 is internal to the model grid and thus the model estimates may be compared with the gage estimates of sediment flux.

The pilot model does not extend to the top of the impacted reach on either North Fork or South Fork, nor does it extend to the bottom of the impacted reach. The estimated upstream inputs likely don't change too much on the upper end of the model, although there may be a reduction in the suspended sediment load due to deposition between the top of the impacted reach and the top of the pilot reach. The pilot model extends downstream past station 509, but also does not extend to the downstream end of the impacted reach, ending at Berta Road. Over the simulation period of 2003-2008, the hydrodynamic sediment modeling predicts that 18 percent of the sediment entering the pilot model study area is stored within the channel and floodplain prior to reaching the downstream end of the hydrodynamic model area. Additional storage likely occurs between the end of the geographic extent of the hydrodynamic model and the downstream end of the impacted reach based on the low gradient and observed aggradation of cross sections in this area.

The pilot hydrodynamic modeling in its current preliminary state of calibration does not provide a firm basis for completing the mass balance over the entire impacted reach. First and foremost, the pilot modeling does not cover the downstream extent of the impacted reach. In addition, modeling results appear to be potentially biased relative to suspended sediment monitoring data at station 509: For the period of WY 2004-2008 the model predicts a mean concentration of 349 milligrams per liter (mg/L), whereas the measured mean is 490 mg/L, a difference of -34 percent. However, reliance solely on the gage data indicates that there is net export from the reach bracketed by stations 511 on North Fork, 510 on South Fork, and 509 and on the mainstem.

Observed suspended sediment concentration data are not available at the downstream end of the impacted reach, so a full mass balance cannot be constructed from water column monitoring data. The best currently available evidence for total sediment retention within the impacted reach is provided by analysis of cross-section data over time.[22] This analysis (Regional Water Board 2015) suggests that sediment retention in the impacted reach averages to 8,624 cubic meters per year (m^3/yr), equivalent to 11,280 yd^3/yr, over the period of 2002-2011 (the years for which cross sections throughout the impacted reach are available) and 9,167 m^3/yr, equivalent to 11,990 yd^3/yr, for 2003-2008 (the period covered by the pilot hydrodynamic modeling), with the caveats that there is uncertainty in extending results from a limited number (11) of cross section locations to the entire 6.8 km length of the impacted reach, that not all cross-sections were measured annually, and that this does not include floodplain deposition. Analyses of sediment deposits in the impacted reach (NHE and Stillwater 2013) suggest that the average dry bulk density of these deposits is 0.847 metric tons per cubic meter (mT/m^3)[23], so the estimated mass retention rate (for 2002-2011) is equivalent to approximately 7,300 metric tons per year (mT/yr).

Sediment retention for the 2003-2008 pilot hydrodynamic modeling period based on cross-section data is equivalent to approximately 7,800 mT/yr over the entire impacted reach. The inflow sediment load to the impacted reach from the North Fork, South Fork, Clapp Gulch, and Railroad Gulch for this period is assumed to be approximately the same as the sediment load estimated as influent to the pilot model of 30,100 mT/yr (NHE and Stillwater 2013). On this basis, the fraction of influent sediment stored within the entire impacted reach for this period is estimated at about 26 percent, with the remainder being transported to the Lower Elk River. As would be expected, the sediment load fraction stored in the longer impacted reach is somewhat greater than that estimated for the pilot model area of 18 percent.

The approximate sediment mass balance within the impacted reach for 2003-2008 is summarized in Figure 19. The outflow load is calculated as the difference between the

[22] If more recent LiDAR or detailed topographic survey data become available, they can be compared with the 2005 LiDAR to estimate change in storage.
[23] The bulk density is extremely low thus making the material particularly difficult to transport with the velocities present in the impacted reach since the material goes into suspension and then quickly settles rather than being transported downstream.

estimated inflow load and the retained load as flow and suspended sediment monitoring are not available at that location. As mentioned above, the total sediment load entering the impacted reach may be larger than the upstream load estimated for the pilot modeling study, in which case the estimated downstream load would also be greater and the percentage retained would be smaller.

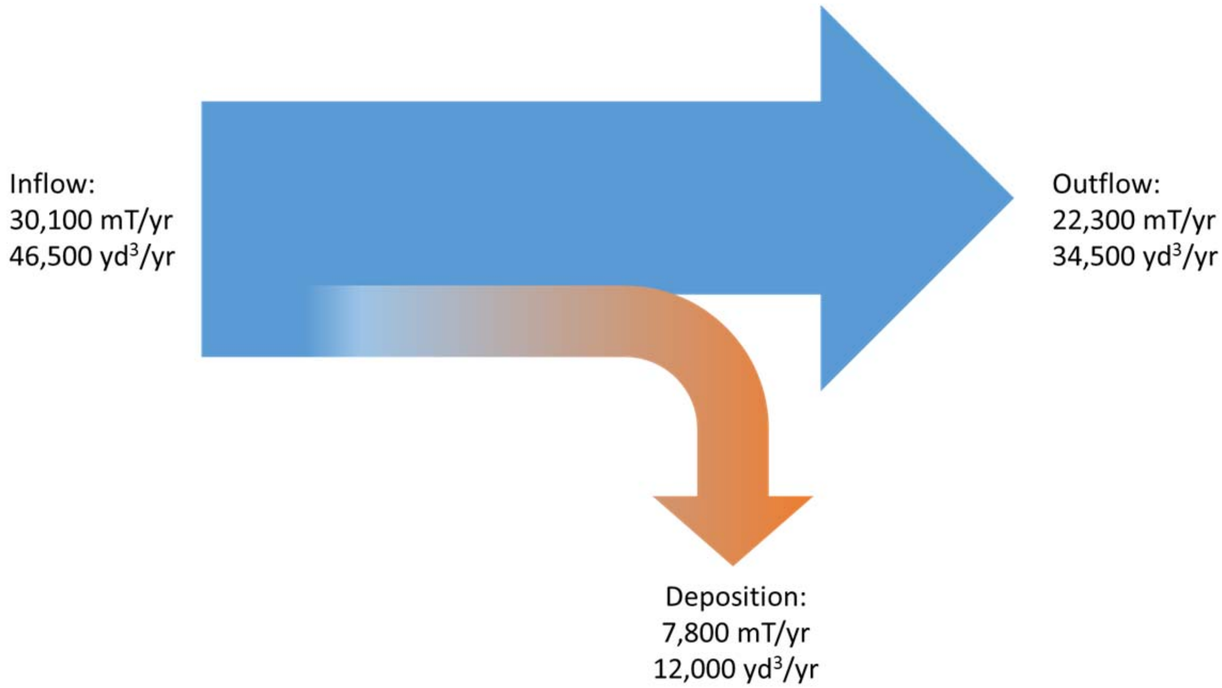

Figure 19. Approximate mass balance within the impacted reach for 2003 – 2008

A majority of the sediment load that enters the impacted reach is passed through to the Lower Elk River. The portion (~26 percent) that is retained is sufficiently large to cause ongoing reduction in channel capacity (e.g., continued aggradation) that induces increased flooding, filling of pools, and other problems. Impairments associated with excess fine sediment in spawning gravels are related to net deposition in the impacted reach, although not linearly. Impairments associated with increased turbidity are more closely tied to the total influent sediment load than to the retention rate within the impacted reach and reducing aggradation rates in the impacted reach may not be sufficient to achieve WQOs associated with those endpoints.

Under current conditions, sediment deposition within the impacted reach is excessive and there is no available assimilative capacity for additional loads (see Chapter 7.2 below). The loading capacity relative to aggradation is not zero, but rather represents a condition in which inflow and outflow loads for the impacted reach are in approximate balance or dynamic equilibrium over time (see Chapter 7.3 below). The mass balance analysis suggests that the river is still capable of moving a sizeable mass of sediment downstream, although less than the recent rate of inflow. The relationship may, however, be non-linear as the pilot hydrodynamic and sediment modeling suggests that, under current conditions, 81 percent of the influent sediment load is transported out of the pilot project reach, whereas under conditions in which the upstream influent load is reduced by 75 percent, 86 percent of the influent load would be transported out of the pilot reach. Because significant retention of sediment is predicted even under reduced upstream loads, it appears to be necessary to consider implementation actions that increase sediment transport capacity within the impacted reach. This is further discussed in Chapter 7 and Chapter 8 below.

Efforts are underway to improve the approach for data collection and analysis to better track changes in sediment deposition and transport. This could inform updates to the mass balance described above. A better understanding of the mass balance could also result from the hydrodynamic modeling currently underway to support remediation and restoration of the impacted reach (Elk River Recovery Assessment). Such refinements could inform a reevaluation of the loading capacity, particularly at the time that sediment remediation and channel restoration are complete. In addition to informing remediation strategies, the Elk River Recovery Assessment could provide information describing sediment transport characteristics, such as the range of particle sizes transported for a given flow in different stream reaches, and the bulk densities of those sediments, thereby allowing for refinement to the mass balance.

Chapter 7 – Sediment Loading Capacity and Load Allocations

The amount of sediment (or any pollutant) a waterbody can assimilate, while maintaining overall waterbody health and experiencing no harmful effects is known as the waterbody's assimilative capacity. The loading capacity of the Upper Elk River is defined as the total sediment load (natural and management-related) that can be discharged into the Upper Elk River and its tributaries without impacting beneficial uses of water, causing an exceedance of WQOs, or creating a nuisance condition.

The balance of sediment input/output may not be achieved every year, but if too little sediment is output (or too much is input) consistently (indicating that the waterbody is not in a state of dynamic equilibrium), then WQS may become impaired. Achieving a state of dynamic equilibrium that meets WQS is the water quality goal for the Elk River. It is anticipated that meeting the loading capacity described in this chapter will achieve this goal.

During development of the loading capacity and subsequent implementation, it is important to consider the relationship between the rate of sediment inflow and outflow, which may be non-linear. Significant retention of sediment is expected even when upstream loads are reduced; therefore, it may be necessary for implementation to include measures that increase sediment transport capacity within the impacted reach (Chapter 6.2.4.4). In light of these technical considerations, this document focuses on three key factors influencing attainment of beneficial uses and elimination of nuisance conditions:

a. Sediment remediation and channel restoration in the impacted reach to better achieve equilibrium conditions associated with sediment <u>output</u> at the bottom of the impacted reach (i.e., improving sediment transport capacity);
b. Control of sediment production and tributary routing as the mechanism to better achieve equilibrium conditions associated with sediment <u>input</u> at the top of the impacted reach; and
c. Document and/or quantify <u>changes in storage</u> to better address the sediment flux within the impacted reach.

Chapter 8 (Framework for Implementation, Monitoring, and Adaptive Management) describes the implementation framework proposed to restore Elk River's assimilative capacity and meet WQS. Implementation is proposed to occur in two phases. The first phase is defined by a zero available assimilative capacity for sediment within the impacted reach. The second phase is expected to be defined once the impacted reach assimilative capacity for additional sediment has been recovered (after which the sediment loading capacity can be recalculated). Discussion of the sediment loading capacity in this chapter mirrors these two phases.

7.1 Total Maximum Daily Load (TMDL)

As described in 40 CFR Part 130.79(c)(1), TMDLs must be established at levels necessary to attain and maintain the applicable narrative and numeric WQS with seasonal variations and a margin of safety (MOS), which takes into account any lack of knowledge concerning the relationship between effluent quality and the resulting influence on ambient water quality conditions. A TMDL is a calculation of the maximum daily amount of a pollutant that can be discharged to a waterbody and still ensure attainment of WQS, taking into account critical conditions of stream flow, loading, and water quality parameters. It is equivalent to the loading capacity of the waterbody for the pollutant in question.

TMDLs attribute pollutant load allocations (LAs) to natural sources and nonpoint sources[24] (e.g., natural background, non-National Pollutant Discharge Elimination System [NPDES][25] permitted discharges) and wasteload allocations (WLAs) to point sources (i.e., NPDES permitted discharges). In addition, the TMDL must include either an explicit or implicit MOS to account for uncertainties in the TMDL development process. The TMDL is represented by the following equation:

$$\textbf{\textit{TMDL = Loading Capacity}} = \sum \textbf{\textit{WLAs}} + \sum \textbf{\textit{LAs + MOS}}$$

TMDLs can be implemented in phases, allowing for a longer-term perspective with a documented point for reassessment to consider new information. The Regional Water Board is considering a phased TMDL in which the TMDL of the first phase is calculated based on existing conditions and the second phase is calculated based on a future condition in which the impacted reach is remediated and restored.

7.2 Phase I—Current Loading Capacity and Load Allocations

The data suggest that sediment supply exceeds sediment transport capacity in the current condition of the impacted reach. This has resulted in a portion of the sediment load stored in the channel, on its banks, and on the floodplain. The volume of this stored sediment is estimated as the largest sediment source contributing to impairment of beneficial uses and nuisance conditions. As discussed in Chapter 6.2.4.3, an estimated 640,000 yd^3 of excess sediment has been deposited in the impacted reach over approximately the past three decades. Changes in historical cross-sectional area suggest that the channel was relatively stable near the Elk River gaging station in the period from 1955-1965, even given the enormity of the 1964 floods that dramatically impacted most other watersheds in the North Coast Region (Regional Water Board 2013b). For example, in this period, the cross-sectional area at the Elk River gaging station changed no more than 2 percent, but from 1965 to 2003, the cross-sectional area at this location lost nearly 35 percent, clearly

[24] NPS pollution, also known as polluted runoff, is unlike pollution from distinct, identifiable sources. NPS pollution comes from many diffuse sources. It is caused by rainfall, snowmelt, or irrigation water that moves over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants and deposits them into lakes, rivers, wetlands, ground water, and other inland and coastal waters. Common sources of NPS pollution include runoff from agricultural activities, including feedlots, grazing and dairies; runoff from urban areas; and erosion from timber harvesting, construction sites, and roads.

[25] The NPDES program is a federal program, which has been delegated to the State of California for implementation. NPDES permits, also referred to as Waste Discharge Requirements, are issued to regulate the discharge of municipal wastewater or industrial process, cleaning, or cooling, wastewaters, commercial wastewater, treated groundwater from cleanup projects, or other wastes to surface waters only. If the waste discharge consists only of non-process storm water, it may be regulated under the NPDES Stormwater program. The discharge of waste to the ground surface or to groundwater is regulated under the Non-Chapter 15 Permitting, Surveillance, and Enforcement Program.

impacting assimilative capacity at this location. This quantifies aggradation at a single point in the watershed; however, similar conditions have been observed at other locations in the watershed (Regional Water Board 2013a, 2013b; Lewis 2013; NHE and Stillwater 2013; HRC 2014).

Because of sediment aggradation, there is currently no apparent loading capacity for additional sediment within the impacted reach. This observation is based on (1) sediment inflows to the impacted reach that exceed outflows, (2) continued aggradation in the impacted reach, (3) continued exceedances of sediment-related WQS, and (4) a delay before sediment remediation and channel restoration can be accomplished in the impacted reach, estimated by the Regional Water Board as 10-15 years.

Without apparent capacity for additional sediment, the impacted reach of the Upper Elk River watershed has a current conceptual and regulatory sediment loading capacity of zero. This is conceptual, since using current technology and techniques, there is no amount of land use restriction and channel restoration that can physically result in zero loading of sediment (i.e., the control of all sediment discharge from the tributary system). This *regulatory* loading capacity cap should be maintained until the impacted reach's physical assimilative capacity has been expanded through sediment remediation and channel restoration during Phase I implementation[26].

There are no point source discharges of sediment in the Upper Elk River watershed. All land use-related sediment delivered to the stream channel is considered a nonpoint source discharge. NPS loads are attributed LAs. The LA encompasses nonpoint source sediment discharges from existing sources (see Chapter 6) and new sources, which could occur as a result of new management activities.

The LA also contains sediment from natural background conditions. There are multiple ways of defining the sediment loads associated with natural background conditions, including:

- Measuring sediment loads within a reference basin that is natural or minimally disturbed (as described in Regional Water Board 2013a);
- Estimating sediment loads during a period of time that represents natural or minimally disturbed conditions; and
- Modeling sediment loads from a theoretical landscape that represents natural or minimally disturbed conditions.

As presented previously, there is zero assimilative capacity for additional sediment in the impacted reach and

> The loading capacity is defined as zero because:
> - Nuisance conditions exist and require remediation to abate.
> - Sediment inflow exceeds outflow.
> - Channel in the impacted reach is aggrading.
> - During high flows (when sediment deposits would be scoured in a functioning system), incoming water and sediment overtops the channel bank and flows across the floodplain. This slows velocities and causes sediment to fall out of suspension.
> - Vegetation readily colonizes newly deposited sediment. This slows down flow due to resistance, causing additional sediment deposition.

[26] A mechanism needs to be developed by which to implement the zero load allocation. The Regional Water Board is intending to develop WDRs, which translate the zero load allocation into permit conditions.

therefore the loading capacity is zero. A zero sediment loading capacity is equivalent to a zero sediment LA. The zero LA is attributed to each nonpoint source of sediment. This approach incorporates a conservative, implicit MOS.

In sum, Phase I of the TMDL is proposed to include a current sediment loading capacity of zero to prevent and minimize sediment delivery to the impacted reach. As described below in Chapter 8, revised or new WDR(s) could be developed to control existing and new sources of sediment in a manner consistent with a zero LA. Phase I would also include remediation and restoration within the impacted reach to reestablish the hydraulic function of the system.

7.3 Phase II – Expanded Sediment Loading Capacity

A second phase of the TMDL (Phase II) could subsequently be considered, as described below. In Phase II the sediment loading capacity of the impacted reach could be recalculated and allocations redistributed. It is important to note that this recalculation could occur at any time since nothing precludes the Regional Water Board from refining the loading capacity in the proposed adaptive management framework. The Phase II updated calculations would quantify the allowable loading to the system that is functioning in dynamic equilibrium (after Phase I efforts are complete).

Once sediment remediation and channel restoration of the impacted reach is accomplished, a process that is anticipated to be informed by the Elk River Recovery Assessment and supported by the stewardship group (Chapter 8), sediment delivery associated with land management and source control activities in the upper watershed might be sufficient to balance sediment input with sediment output through the impacted reach (to minimize changes in storage). The goal of proposed remediation and channel restoration is to restore a dynamic equilibrium in which WQS are attained in the Upper Elk River watershed. This is expected to expand the sediment loading capacity and restore hydrologic function, bringing into balance the sediment output from the impacted reach with the sediment input, thereby justifying the recalculation of the loading capacity in Phase II.

Completion of the sediment and hydrodynamic modeling described in the Elk River Recovery Assessment could help determine this future sediment loading capacity. The revised sediment loading capacity and associated sediment load allocations can then be applied through the chosen regulatory mechanism(s) and restoration of beneficial uses can also be evaluated.

Chapter 8 – Framework for Implementation, Monitoring, and Adaptive Management

The Regional Water Board has identified an implementation framework for the Upper Elk River watershed. They have identified a combination of regulatory and non-regulatory implementation actions that they believe will lead to recovery of beneficial uses and prevention of nuisance conditions in the Upper Elk River:

1. Revise applicable regulatory programs to reduce sediment loads from new and existing sources toward the load allocation,
2. Develop and implement an instream and channel remediation and restoration program to improve hydraulic and sediment transport in the impacted reaches of Upper Elk River,
3. Establish a watershed Stewardship Program to serve as an umbrella in support of beneficial use enhancement, prevention of nuisance, and a trajectory of watershed recovery.

> The conceptual model presented in Chapter 6 identifies eight watershed effects that should be managed to restore beneficial uses and prevent nuisance conditions. If executed, the proposed implementation framework is expected to successfully reduce these effects. The lists below generally characterize the expected linkage between the watershed effects and implementation actions (although it is important to note that each watershed effect may be influenced by more than one implementation action).
>
> - Sediment Load Reduction is expected to control:
>   - Increased peak flows
>   - Increased drainage network
>   - Decreased channel complexity
>   - Increased turbidity
>   - Decreased summer stream flows
> - Instream Remediation and Restoration is expected to control:
>   - Altered sediment storage
>   - Altered sediment transport
>   - Increased aggradation
>
> These anticipated improvements should be quantified through monitoring. In addition, the watershed stewardship process is expected to provide an important mechanism for adaptive management to adjust and refine the regulatory and non-regulatory actions, as determined necessary.

These actions are described below and they are expected to be implemented and monitored as part of an adaptive management framework.

8.1 Sediment Load Reduction

WDR(s) is the primary regulatory mechanism utilized by the Regional Water Board to control the nonpoint source pollution resulting from past and ongoing timber harvesting activities, the primary land use in Upper Elk River watershed. Revision of the WDRs for the timberland owners are anticipated as the primary regulatory action needed to implement water quality improvements. Specifically, WDR revisions ensure that sediment load reductions from new and existing sources of sediment are consistent with a zero load allocation, through the application of a comprehensive prevention and minimization program, in combination with beneficial use enhancement projects. The prevention and minimization measures are informed by more than a decade of BMP implementation and sediment source tracking via ownership management plans, HCPs, CAOs, and ownership-wide WDRs. The updated WDRs are expected to be informed by the sediment source assessment, the hillslope WQIs, and technical reports from landowners and watershed partners. Through the WDR, together with regulated stakeholders, the Regional Water Board can enforce measures to prevent and minimize new sediment discharges, reduce existing sources of sediment loading, and restore watershed functions.

8.2 Instream Remediation and Restoration

In addition to sediment load reduction via a strong regulatory and enforcement program, instream sediment remediation and channel restoration is determined necessary to improve the hydrologic and sediment transport capacity of the impacted reach, thus improving the assimilative capacity for sediment and abating nuisance conditions. Potential recovery actions may include dredging, new channel construction, off-channel sediment detention basins, levee construction or modification, vegetation management, infrastructure improvements, creation of inset floodplains, high flow channels, and placement of in-stream LWD.

Such an undertaking requires the participation, coordination, and support of multiple landowners, scientists, permitting agencies, and funders. As such, the Regional Water Board has opted to pursue primarily non-regulatory means of accomplishing sediment remediation and channel restoration to improve conditions in the impacted reach of the Upper Elk River. The Regional Water Board has initiated a sequence of efforts toward this, including:

1. A pilot feasibility study completed in 2012 which tested the use of hydrodynamic and sediment transport models in predicting system response to sediment loading (NHE and Stillwater 2012). The effort was funded by a State Water Board Proposition 50 Grant to RCAA.
2. The Elk River Recovery Assessment is a full scale feasibility study based upon data collection and modeling of current conditions and predication of system response to a combination of generalized sediment loading and remediation actions. The effort began in 2014 and is expected to result in the technical foundation for an implementation framework to remediate instream stored sediment originating from historic land use activities, contain annual winter flows within the historic stream channel and prevent nuisance flooding conditions, and help lead to recovery of ecosystem functions and beneficial uses in the Elk River. The effort is funded by the State Water Board under a contract with California Trout in coordination with a technical team and in consultation with a technical advisory committee.
3. Pilot remediation permitting and implementation projects are planned for 2016-2018. The goals of the pilot projects are to demonstrate implementation capacity and inform the Recovery Assessment of sediment remediation effectiveness, implementation costs, and logistics (e.g., sediment re-use), and environmental compliance procedures.
4. Full-scale remediation permitting and implementation is anticipated to allow for construction to begin in approximately 2020.
5. Monitoring and maintenance is anticipated for an extended period (e.g., ten to twenty years) following completion of remediation efforts.

8.3 Watershed Stewardship

A key, and overarching, component of implementation is to convene a participatory program that engages community members, residents, scientists, land managers, and regulatory agencies in developing a collaborative planning process that seeks to enhance conditions in the Elk River watershed. The Elk River Watershed Stewardship Program will include the entire Elk River watershed and will work to accomplish the following goals:

1. Promote shared understanding and seek agreements among diverse participants.
2. Identify strategies and solutions to:
    a. Improve the hydrologic, water quality, and habitat functions of Elk River;
    b. Reduce nuisance flooding of private properties and improve public transportation routes during high water conditions; and
    c. Improve domestic and agricultural water supplies.
3. Promote coordinated monitoring and adaptive management.

The Stewardship Program will interface with and augment the other implementation elements. The Stewardship Program will create opportunities for partnerships and projects to improve conditions in the entire watershed. By providing an open, transparent, and primarily non-regulatory process that is sensitive to diverse needs and interests, the program will cultivate the relationships and strategies needed to renew the health and function of the watershed, effect changes in infrastructure and access, and sustain a vibrant working landscape.

Beginning in 2015, a steering committee to provide facilitation and capacity to the Elk River Watershed Stewardship Program convened and is comprised of Humboldt County, University of California Cooperative Extension, Natural Resources Conservations Services, California Trout, and the Regional Water Board. Initial program funding is provided by 319(h) grant funds from the EPA and will support the stewardship efforts through 2017. The Regional Water Board anticipates that the stewardship efforts will be active throughout the watershed recovery process.

8.4 Monitoring and Adaptive Management

A key component of implementation is monitoring and adaptive management. The Regional Water Board has identified four primary goals for near and long-term monitoring in the Elk River:

- Evaluate compliance with WDR requirements and verify that the provisions of the WDRs are being implemented as designed and permitted.
- Evaluate the effectiveness of management measures and management modifications aimed at reducing sediment loads to the impacted reach via the WDR, and remediation efforts aimed at increasing conditions in the impacted reach.
- Track whether conditions are trending toward numeric targets, WQOs, and beneficial use support.
- Inform when and how to reevaluate the loading capacity.

A combination of monitoring resources are anticipate to achieve these goals, including the Elk River stewardship program, monitoring and reporting requirements associated with the WDRs, monitoring associated with evaluating the effectiveness of sediment remediation and channel restoration projects, ongoing ownership specific monitoring for management plans, and habitat and population monitoring. All of these efforts will contribute to tracking improvements in water quality and beneficial use support, reduction in instream storage, increased hydrologic conveyance and sediment transport, and abatement of nuisance conditions.

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