

**STATE OF CALIFORNIA  
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL COAST REGION**

**STAFF REPORT FOR REGULAR MEETING OF JULY 12, 2012**  
Prepared June 11, 2012

**ITEM NUMBER:** 12

**SUBJECT:** Reissuance of General Conditional Waiver of Waste Discharge Requirements for Timber Harvest Activities in the Central Coast Region (Timber Order) Order No. R3-2012-0008

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**KEY INFORMATION**

Location: Region-wide  
Existing Orders: Conditional Waiver of Waste Discharge Requirements Order No. R3-2012-0007  
Monitoring and Reporting Program (MRP) No. R3-2012-0007

**This Action:** Adopt Conditional Waiver Order and MRP Nos. R3-2012-0008

**SUMMARY**

Regional Water Quality Control Board, Central Coast Region (Water Board) staff reviewed the existing Timber Order, Monitoring and Reporting Program (MRP), and application procedures, including the Eligibility Criteria (EC). Leaving the Timber Order essentially unchanged, Water Board staff proposes to improve the EC and MRP while building on their established structures. The review benefited from a GIS-based analysis of the timber harvest area in the Central Coast Region. The analysis provided tools to ease and enhance staff review of applications and planning activities of the Water Board's timber harvesting regulatory program. Water Board staff recommends the Board adopt proposed Order and MRP No. R3-2012-0008.

**DISCUSSION**

**Introduction**

More than 100,000 acres of predominantly redwood forest, mostly in Santa Cruz County, cover the northern portions of the Central Coast Region. A forest-products industry harvests the forests in accordance with local and State regulatory requirements. Many of the regulations include requirements to ensure that timber harvesting does not impair beneficial uses of surface waters, particularly with sediment eroded by winter storms. Compliance with the current Timber Order results in the protection of water quality by means of enforceable waiver conditions, an enforceable MRP, and inspections of post-harvest erosion control measures at timber harvesting sites. As described below, staff proposes to modify the Water Board's regulatory program in light of findings and capabilities new since 2005, when the Water Board adopted the original Timber Order.

This staff report describes the following:

- The environmental conditions and beneficial uses necessitating Water Board staff analysis;
- Existing regulation of erosion control measures on timber harvesting sites by local and State agencies;

- The Water Board's regulation of timber harvesting activities since 2005;
- The basis, findings, and meaning of staff's site inspections;
- Proposed changes to and rationale for the updated EC (the core of the application for enrollment under the Timber Order);
- Proposed changes to and rationale for the updated MRP; and
- New GIS-based validation and analysis tools.

### Hydrogeologic Setting

Timber production areas in the Central Coast Region are concentrated in areas of the Santa Cruz Mountains and in the Northwest portion of Santa Cruz County. These areas of the region are underlain by several major active faults, including the San Andreas, the Zayante, and the Ben Lomond.<sup>1</sup> Several factors contribute to the high risk of soil erosion in the area. The factors include the confluence of highly erodible rock types, tectonic-generated sediment erosion, and precipitation patterns conducive to rapid mass-wasting events. The region's steep topography influences microclimate conditions where high-intensity precipitation events can cause substantial sediment runoff. The region's timber harvest sites are often located in geologically active environments.

Disturbances such as road building often destabilize slopes. Debris slides are frequent along exposed road cuts and fill-constructed roadways. Erosion of existing road surfaces, especially when hydrologically connected to streams, are the dominant source of sediment discharges.<sup>2</sup> Major slope disturbances such as landsliding constitute another major source of chronic sedimentation. The region is prone to widespread landsliding as evidenced in regional landslide maps as well as unmapped features observed in the field.<sup>3</sup>

### Ecological Setting

Redwood (*Sequoia sempervirens*) is the predominant commercial timber species harvested in the Central Coast region. Redwood regeneration is unique among commercial timber species because they readily sprout shortly after harvest. The sprouts in turn utilize the stump root system thereby reducing the loss of root-soil cohesion due to root desiccation that typically occurs following harvest of other species.<sup>4</sup> In riparian areas, redwoods, along with associated riparian vegetation, regulate stream temperatures, stabilize stream banks, and provide large woody debris, all of which are critical for salmonid habitat.

San Mateo and Santa Cruz counties are within the southern-most limit of the Evolutionary Significant Unit of endangered coho salmon (*Oncorhynchus kisutch*) and many more streams in harvested watersheds also provide habitat for threatened steelhead (*Oncorhynchus mykiss*). The National Marine Fisheries Service outlined a recovery plan for the Central California Coast (CCC) steelhead in 2007 and a coho recovery plan in 2010. Habitat degradation and flow conditions are cited as the primary cause of threats to CCC steelhead with the effects of urbanization considered the most severe.<sup>5</sup>

<sup>1</sup> Brabb, E. E. , Graham, S. E. , Wentworth, C., Knifong, D., Graymer, R., and Blissenbach, J., 1997, Geologic map of Santa Cruz county, California: A digital database: U.S. Geological Survey Open-File Report 97-489.

<sup>2</sup> Cafferata, P.H., Coe, D.B.R., and Harris, R.R. 2007. Water resources issues and solutions for forest roads in California. Hydrological Science and Technology 23(1-4).

<sup>3</sup> Roberts, S., Baron, A.D., Brabb, E.E., and Pike, R.J., 1998, Digital Compilation of "Preliminary Map of Landslide Deposits in Santa Cruz County, California, By Cooper-Clark and Associates, 1975": A Digital Map Database: U.S. Geological Survey Open-File Report 98-0792.

<sup>4</sup> Reid, L.M., Lewis, J., 2009. Rates, timing, and mechanisms of rainfall interception loss in a coastal redwood forest. Journal of Hydrology, 375 (3-4), 459-470.

<sup>5</sup> NMFS 2007. [Federal Recovery Outline for the Distinct Population Segment of CCC Steelhead](#)  
NFMS 2010. [Recovery Plan for the Evolutionary Significant Unit of CCC Coho](#)

Steelhead populations in the Gazos, Waddell, and Scotts Creek watersheds appear to be relatively stable whereas coho have exhibited much higher variability since 2006.<sup>6</sup> The coho recovery plan echoes many of the same habitat degradation concerns as the steelhead plan. The coho plan provides additional detailed mapping of habitat protection and restoration priorities in the Central Coast ESU.

### **Regulatory Setting**

The California Department of Forestry and Fire Protection (CalFire) is the lead agency for enforcing the Forest Practice Rules. Petitions to the Board of Forestry (BOF) have resulted in changes to Forest Practice Rules, most notably the petitions brought to the BOF by the counties of San Mateo, Santa Cruz, and Santa Clara, which resulted in the formation of “County Rules” in the Southern Sub-District of the Coast District. The BOF is mandated by Public Resources Code (PRC) 4562.7 to “*Adopt rules for control of timber operations which will result or threaten to result in unreasonable effects on the beneficial uses of the waters of the state.*”<sup>7</sup>

In 2010, the BOF passed a comprehensive set of rule changes concerning stream protection measures in the Coastal Anadromy Zone. The 2010 set of rules changes, commonly referred to as the Anadromous Salmonid Protection rules (ASP), resulted in further delineation of stream protection zones and more adaptive practices aimed at improving conditions along salmonid-bearing streams. Specific BMPs for timber harvest sites are provided in the Forest Practice Rules Handbook, which is updated annually. The Rules guide Registered Professional Foresters (RPFs) with a set of guidelines and procedures, including those dedicated to protecting water quality. Consensus on site-specific water quality measures are developed through the Timber Harvesting Plan (THP) multi-agency review team process, which allows each agency stakeholder to evaluate proposed THPs on a site-by-site basis to protect salmonid habitat from excessive sedimentation and to minimize changes to riparian ecosystems from road-related mass wasting. The THP process has been certified (pursuant to PRC Section 21080.5) to substitute for the EIR process under CEQA.

#### Section 303(d) listing and Total Maximum Daily Loads (TMDLs)

Clean Water Act section 303(d) requires the Water Board to identify all impaired streams in the Central Coast Region and the pollutants causing the impairment. Water Board staff then must develop watershed-specific TMDL studies that identify the means whereby the stream shall be restored to an unimpaired condition and the Water Board amends the Basin Plan to mandate implementation of the actions recommended in the TMDL. The Section 303(d) list includes 11 streams and rivers potentially affected by sediment discharged from timber harvest areas in the Central Coast Region. Resolution No. R3-2002-0063 is the Basin Plan amendment implementing the TMDL for six listed streams (the San Lorenzo River and five tributaries) and Resolution No. R3-2005-0132 implements the TMDL for two listed streams (the Pájaro River and Rider Creek). The Water Board plans to consider the TMDLs for Love Creek, Mountain Charlie Gulch, and Upper Newell Creek in 2021. By reducing the discharge of sediment from timber harvest sites, the Water Board’s Timber Harvest Program is a tool to help restore the listed watercourses to unimpaired status. Map 5 in Appendix C depicts the Section 303(d) status of sediment impaired streams in timber production areas of the region.

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<sup>6</sup> Smith, J.J. 2011, Distribution and Abundance of Juvenile Coho and Steelhead in Gazos, Waddell and Scott Creeks in 2011. San Jose State Univ. San Jose, CA.

<sup>7</sup> BOF. 2012. [Mandate of the Board of Forestry](#)

### The Water Board's Timber Harvest Program

Since passage of the Clean Water Act, the USEPA has asserted that the most effective way to ensure that forest activities protect water quality is to apply Best Management Practice (BMPs). Section 13369 of the California Water Code (CWC) outlines the State's Nonpoint Source Pollution Control Program. The program includes the following components:

- (i) Non-regulatory implementation of BMPs to control excessive sedimentation into State waters;
- (ii) Regulatory-based incentives for BMPs; and
- (iii) Adoption and enforcement of waste discharge requirements that require the implementation of BMPs.

The purpose of the Timber Order is to protect the beneficial uses of waters of the State from waste discharges. The Timber Order's conditions aim to ensure dischargers of waste from timber harvesting sites effectively control erosion and sedimentation caused by timber harvest activities.

In 2005, the Water Board adopted Order No. R3-2005-0066, the first Timber Order. On February 2, 2012, the Water Board extended the term of the Timber Order to February 2, 2017, by means of Order No. R3-2012-0007. The Timber Order requires harvest site landowners to submit a Notice of Intent (NOI) upon CAL FRE's approval of the THP, the final step in the multi-agency review team process. The NOI requires submittal of an accurate and complete EC worksheet, which is available on the Water Board's website.

The EC allows staff to determine the relative risk to water quality posed by a THP and assign an appropriate level of storm-based monitoring. The EC process assigns each THP into one of four tiers with the highest tier (IV) requiring most storm-based monitoring. To monitor the timber program's effects on water quality, the MRP requires landowners to annually monitor the effectiveness of erosion control BMPs and to report findings to the Water Board.

At a July 2009 public meeting, the Water Board revised the MRP to eliminate requirements for temperature and turbidity monitoring, which found no water quality impairment since 2005, when such monitoring was initiated. The 2009 staff report recommended the future course of the Water Board's timber harvesting oversight program be based primarily on harvest site inspections. Accordingly, Water Board staff has inspected 30 percent of the harvest sites (23 of 61) currently enrolled under the Timber Order for effectiveness and maintenance of erosion control BMPs specified in approved THPs. During inspections, Water Board staff also visually evaluates surface water quality. Water Board staff record inspection data in a database that can be queried for compliance levels and analyzed to determine the effectiveness of erosion control measures.

Water Board staff found landowners have routinely implemented BMPs at timber harvest sites and water quality appeared to be protected. Appendix A summarizes the program's inspection results.

These findings are consistent with other studies:

- The Hillslope Monitoring Program (HMP) analyzed data from 300 randomly selected THPs from 1996 through 2001, looking mostly at roads. The HMP's objective was to evaluate the implementation and effectiveness of the Rules in protecting water quality. The HMP found the BMPs were effective when properly implemented and found excessive road erosion where improperly implemented.<sup>9</sup>

- A second CalFIRE study between 2001 and 2004 of 281 THPs found that where road erosion delivered sediment to streams, the cause was invariably improperly implemented BMPs.<sup>10</sup>
- On federal lands in California, the U.S. Forest Service collected data from 1992 through 2002 on over 3,100 randomly selected sites to evaluate the implementation and effectiveness of water quality BMPs. Rates of BMP implementation and effectiveness were relatively high and adverse effects on water quality were relatively rare. Typically, inadequate BMP implementation caused most of the significant water quality degradation observed, and most originated in roadways.<sup>11</sup>
- Other surveys also found improved management practices reduce erosion from road surfaces and landslides.<sup>12</sup>

### **Plan Review, Program Compliance, Enforcement actions**

Water Board staff makes every effort to coordinate any and all site visits with outside agency personnel. Staff reviews CAL FIRE inspection reports for issues concerning sedimentation and erosion control BMPs. In addition, staff routinely reviews public comments, review-team questions, and review-team summary reports to evaluate if harvest plans address water quality concerns.

As of Dec 15, 2011, 48 of 57 waiver enrollees submitted annual reports as required by the MRP. Four of non-reporting sites have not commenced harvest and thus were not required to submit annual reports. Water Board staff identified the remaining five non-reporting sites and have either received reports of inspections or have inspected the sites. The most common reason for non-reporting was a change in the plans RPF or the landowner has assumed responsibility for reporting.

In 2011, Water Board staff issued two Notices of Violation for two separate harvest sites. At both sites, a new RPF has assumed responsibility and has been engaged with staff to provide the necessary documentation on water quality measures. Water Board staff has since investigated downstream conditions of one site located in the Kings Creek watershed and will re-inspect the other site at the Pre-Harvest Inspection, which is currently being incorporated into an NTMP.

### **GIS Spatial Analysis Project (SAP)**

Water Board staff conducted a GIS-based spatial analysis project with the goal of identifying key statistics important in the Water Board's timber harvesting regulatory program and to explore potential program management tools utilizing GIS. The specific objectives of the SAP were to provide planning watershed statistics for the following uses:

- Automate EC spreadsheet functions;
- Provide a baseline for key planning watershed data;
- Develop statistical trends for planning watershed data ; and
- Support decisions regarding inspection and monitoring priorities.

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<sup>9</sup> Cafferata, P.H., and Munn, J.R. 2006. Hillslope Monitoring Program: monitoring results from 1996 through 2001. Monitoring Study Group Final Report prepared for the California State Board of Forestry and Fire Protection. Sacramento, CA. 114p.

<sup>10</sup> Brandow, C.A., Cafferata, P.H., and Munn, J.R. 2006 Modified Completion Report monitoring program prepared for the California State Board of Forestry and Fire Protection. Sacramento, Ca. 80p.

<sup>11</sup> United States Forest Service. 2004. Best management practices evaluation program: 1992-2002 monitoring results Final Report. USDA Forest Service Pacific Southwest Region. Vallejo, Ca. 76p, plus Appendix.

<sup>12</sup> Cafferata, P.H., and Spittler, T.E. 1998. Logging impacts of the 1970's vs the 1990's in the Caspar Creek watershed. 103-106 in the *Proceedings of the Conference on Coastal Watersheds: The Caspar Creek Story*. General Technical Report PSW-GTR-168. Albany, Ca:USDA Forest Service, Pacific Southwest Research Station

Statistical results for each planning watershed included in the Central Coast Region's timber harvest areas are provided in Table 1, Appendix B. Results are available for the entire timber harvest area in the Central Coast Region and include the number of THPs, THP areas, acres harvested, harvest rate, and miles of 303d-listed streams from each watershed and subwatershed. Water Board staff included the statistics in spreadsheet tables accessed automatically by the revised EC to derive the Cumulative Effects Ratio (CER) harvest rate and Section 303(d) status.

Each map in Appendix B contains a statistical summary table related to the GIS file depicted for the hydrologic subarea contained within the project area. The GIS-harvest boundary layers, provided by CAL FIRE, enable Water Board staff to generate timber harvest rates for the planning watersheds in the region. Water Board staff has prepared a table for reference functions in the EC spreadsheet to automate the formulation of the cumulative effects ratio utilizing the data derived from agency GIS files. By using agency-derived data, Water Board staff time spent on individual plan review validating data submitted in the NOI's EC is reduced.

The SAP enables Water Board staff to monitor the Central Coast Region's timber harvest regulatory program in three new ways. First, information from the SAP provides the Water Board with a baseline set of parameters about timber harvest activity in the region. Staff can analyze overall changes to sediment-impaired streams in relation to timber harvest activity to track trends in the region. Maps 3 and 5 in Appendix B are particularly well-suited for use in this trend analysis. Second, the SAP provides Water Board staff with the means to target areas of impairment or habitat importance for sites currently enrolled under the Timber Order (Map 6, Appendix B). Third, inspection data can now be entered into a GIS layer of current waiver sites to measure compliance in a spatially explicit manner at both the watershed and basin scales.

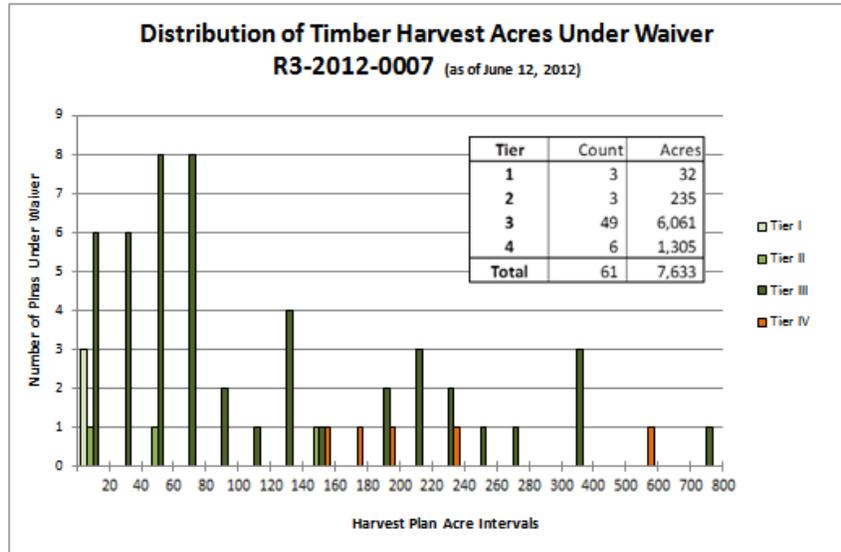
While the proposed changes to the EC (refer to Appendix C) utilize the potential of available GIS data, it is not a completely GIS-based system. Eventually, all Water Board office analyses of timber harvest activity should be integrated into a GIS-based platform, similar to how the Ag Program applicants utilize Geotracker. Future utilization of GIS-based tools would require, at minimum, Timber Order applicants to submit a layer file of the proposed THP boundary, a stream segments layer (delineated by stream class), and a roads/skid trail/landings layer. Additional data on watershed restoration projects and county development projects would also be especially useful to conduct more in-depth analyses of adverse effects at the watershed scale.

Water Board staff concluded that the SAP achieved the goal of providing baseline statistics about timber harvest activities in the region and revealed areas where improved program management can be achieved. See Appendix B for SAP results and associated maps.

### **Eligibility Criteria**

The NOI's EC procedure provides Water Board staff with a rapid assessment of the risk factors to water quality from individual timber harvesting sites as described in THPs. The proposed EC incorporates the first set of modifications and improvements since 2005.

Audit of Existing EC. To initiate the Timber Order renewal process, Water Board staff audited the existing EC procedure. The objective of the audit was to determine if the existing EC procedure meaningfully differentiates proposed timber harvests by appropriate measures of the risk to water quality and beneficial uses. Water Board staff audited 57 of the timber harvest sites currently regulated by the Timber Order, evaluating the acreage and the number of sites in each tier. The results clearly indicate the existing EC places most sites in Tier III (See Figure 1, below).



**Figure 1. Distribution of Timber Harvest sites under waiver by Tier and Acres**

Two causes of the existing Tier bias:

- If a THP proposes winter operations, the existing EC automatically assigns it to Tier III, and
- The hierarchical structure of the existing tier determination (Figure 1, Appendix C) assigns a disproportionate weight to the CER and Drainage Density Index (DDI) before the EC considers the Soil Disturbance Factor (SDF).

Winter operations bias resolution. Water Board staff evaluated the duration and extent of all winter operations outlined in plans for the 2011-2012 season and spoke with RPFs during inspections. Winter operations in THPs are designed to minimize erosion. Staff found, for instance, winter operations in some cases involve no ground-based equipment and RPFs were only entering sites to maintain erosion control measures. In other cases, RPFs stipulate winter operations to provide more flexibility in choosing the best licensed timber operator who may be available during the winter period but would not actually conduct winter operations. Moreover, THPs require winter operations plans, which must stipulate restrictions on operations given certain soil moisture thresholds to prevent equipment-induced erosion.

Therefore, Water Board staff revised the EC to incorporate winter operations into the CER as a proportional factor, wherein it is considered but not given absolute authority to decide the tier ranking. While this changes the weight winter operations is given in the EC computation, the approach recognizes that winter operations vary widely in scope and should not be the sole basis to rank a THP as Tier III. Staff review of winter operation plans will continue to be focused priority for staff inspections.

**Proposed Eligibility Criteria Study and Analysis**

The proposed EC procedure is further based on a pilot study staff conducted to develop a statistically based tier range. Table 2 provides statistics of both the existing and revised EC applied to the chosen sample's harvest sites. As shown, Water Board staff chose the standard deviation of the final EC score of the sample sites to set the Tier II and Tier III ranges. Also, since the distribution of results from the revised EC sample study was skewed, Water Board staff chose the median, instead of the mean, to

better represent the divide between Tier II and Tier III.

Sensitivity analysis. In judging the effectiveness of the proposed changes, Water Board staff studied the variation of each category, the sensitivity of each category to the final tier determination, and the 95 percent confidence interval of the sample mean to the true mean. See Table 2 (below) for the results. The study included 16 percent (9 of 57) of sites, representing 16 percent (1,195 of 7,443) of all acres under the Timber Order. Water Board staff deemed the sample representative because all counties where timber harvest could occur were included, the typical range of harvest acreages was analyzed, and both THP and NTMP, with and without Section 303(d)-listed streams due to silviculture, were represented in the sample.

When considering the results for region-wide application, Water Board staff observed a consistent standard deviation within one percent between eligibility categories, which indicates each category is consistent enough to be weighted equally. Furthermore, as shown, the confidence interval for the final monitoring and tier determination (EC percent) was an acceptable  $\pm 3\%$ . Under the statistical approach, neither the CER, DDI, nor SDF exhibits a disproportionate variability around their mean that would unduly bias the final EC score. Averaging the scores from each category effectively eliminates the hierarchical bias noted above.

As can be seen from Table 2, the existing EC procedure provides the CER as a ratio and the DDI and SDF as integers, rendering statistical comparison between EC categories impossible. In contrast, the proposed EC statistically ranks the categories according to where the score falls relative to the standard deviation of the median. This approach provides the following advantages:

- More meaningful differentiation of sites and thus more accurate initial monitoring determination;
- Improved statistical audit capabilities of the EC; and
- The ability to scale the EC tier determination to subarea or planning watershed level, a possible future staff undertaking.

**Table 2. Eligibility Criteria Statistical Pilot Study Results**

County	CalwaterID	Acres	Current EC Tier	CER	DDI	SDF	Revised Criteria				Tier
							CER	DDI	SDF	EC	
SCR	3304.110202	143	<sup>1</sup> III	12%	159	1,392	37%	43%	12%	31%	I
SCR	3304.120203	128	<sup>1</sup> III	35%	148	748	51%	46%	26%	41%	II
SCR	3304.120300	59	<sup>1</sup> II	14%	202	939	46%	69%	43%	53%	III
SCR	3304.120300	38	IV	15%	123	<sup>2</sup> 44,344	46%	73%	21%	47%	III
SCR	3304.120300	73	<sup>1</sup> III	10%	75	1,070	46%	54%	44%	48%	III
SCR	3304.130201	10	I	9%	95	587	3%	39%	27%	23%	I
SCR	3304.130201	75	II	10%	19	422	26%	37%	20%	28%	I
SMO	3304.200004	341	NA	-	-	-	27%	71%	38%	45%	II
SCL	3305.200202	328	<sup>1</sup> III	11%	85	9,675	27%	68%	53%	49%	III
		1,195									
				<i>StdDev</i>	9%	57	3,347	15%	15%	14%	<b>11%</b>
				<i>Average</i>	15%	113	2,119	34%	56%	32%	40%
				95% CI	2%	15	869	4%	4%	4%	3%
				<i>median</i>	12%	109	939	37%	54%	27%	<b>45%</b>

<sup>1</sup>Winter ops proposed

<sup>2</sup>Error detected in original eligibility criteria calculation, included in statistical analysis.

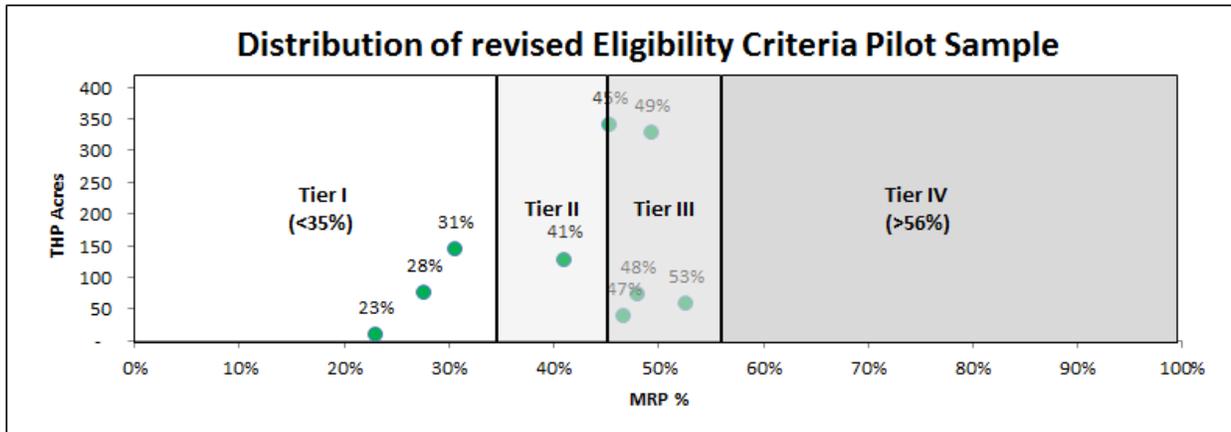


Figure 2 depicts the distribution of sample sites and the monitoring tier ranges.

See Appendix C for more information on the EC revision process, including a comprehensive summary table (Appendix C, Table 1) and a detailed discussion of CER, DDI and SDF development.

### Monitoring Program

The Water Board is the sole review agency that requires dischargers to routinely monitor harvest sites and report the findings. The monitoring and reporting, when added to the results of staff's onsite verification inspections (Appendix A), allows the Water Board to evaluate the extent to which dischargers implement and maintain the BMPs they agreed to in THPs approved by CAL FIRE. A high level of BMP implementation and maintenance should result in greater protection of the beneficial uses of streams in the timber harvest areas.

Proposed MRP No. R3-2012-0008 retains many of the existing MRP's requirements. However, Water Board staff rearranged the proposed MRP for clarity and modified some requirements. Review of the proposed MRP (Attachment 2) will show it requires the dischargers to undertake the following activities:

- BMP Effectiveness Monitoring, before the designated winter period, for four years after the harvest, reporting annually by May 15.
- Storm-based Forensic Monitoring, based on the 24-hour return frequency of storms and according to the tier assigned by the EC, for four years after the end of harvesting, reported within 21 days after the discharger's inspection.
- Forensic Monitoring, conducted when a discharger observes a condition of pollution, contamination, or condition of nuisance, as defined by CWC Section 13050.

Water Board staff also simplified the proposed MRP's report format. Dischargers will use readily available spreadsheet software to prepare reports according to the format specified in the MRP. Electronic submittal will ease Water Board staff integration of monitoring data into existing databases and will help initiate staff's use of features of the GIS-based program. Electronic submittal will reduce the time dischargers must spend drafting reports.

If the Water Board requires dischargers to submit data into existing programs applications, then the monitoring data will be substantially easier to add to current electronic databases. Photo-monitoring will ensure monitoring reports are supported by photo evidence. The required format will ease review of stored digital photos.

The following are the proposed MRP's objectives:

- Effectiveness Monitoring shall verify BMPs functioned to protect water quality during the preceding winter.
- Storm-based Monitoring shall verify BMPs functioned as designed during the specified storm events.
- Forensic Monitoring shall verify immediate action was taken to correct a condition of pollution, contamination, or condition of nuisance was abated.

## **CONCLUSION**

The proposed Timber Order includes the same Findings, Prohibitions, and Provisions of the existing Order. Water Board staff substantially modified the critical EC procedure, basing it more on comparable statistics and incorporating automatic features that ease the application process and improve its accuracy. Water Board staff also clarified the MRP's requirements and added electronic reporting features that simplify the reporting process and enable staff to more easily incorporate monitoring data into existing databases. The GIS-based SAP enabled or simplified these improvements and will increasingly aid staff oversight of the Water Board's timber harvesting regulatory program in the future.

## **ENVIRONMENTAL SUMMARY**

The Water Board adopted a negative declaration on July 8, 2005, with respect to Waiver of Waste Discharge Requirements for Timber Harvest Activities upon adoption of Resolution No. R3-2005-0066 pursuant to the California Environmental Quality Act (CEQA) (PRC 21000 et seq.). California Code of Regulations (CCR) Section 15162 and 15163 specify the circumstances under which the Water Board must prepare subsequent or supplemental environmental documents.

The action to renew the Timber Order is a ministerial process pursuant CWC Section 13269 and does not require the preparation of a subsequent or supplemental environmental document pursuant to CCR Sections 15162 or 15163. Water Board staff review of the whole record included the following: the petition response SWRCB/OCC File A-1714 (Oct 19, 2005), staff report for the regular meeting of July 10, 2009 item number 15, and the program audit and changes outlined in this staff report prepared for the regular meeting of July 12, 2012. Water Board staff finds no substantial changes based on the following: the conditions of the proposed Timber Order are consistent with the existing Order, the filing of a Notice of Intent (NOI) remains, the types of monitoring required have not changed, and landowners are still responsible for reporting monitoring results.

The proposed modification to the EC and the MRP are based on findings of Water Board staff research of scientific literature and changes to the Forest Practice Rules since 2005. The modifications to the program were designed to improve data analysis and Timber Order compliance and do not diminish the responsibilities of the landowner to protect water quality.

Previous environmental documents prepared by Water Board staff described the potential environmental effects of timber harvest activities; such potential effects have not changed since adoption of the Timber Order in 2005. The Water Board does not approve timber harvest projects; the Water Board sets the conditions of the waiver of waste discharge requirements for timber harvest activities. This Timber Order contains conditions that, when adhered to by enrollees, will prevent significant impacts to waters of the state. These conditions are the same as those in the existing Order.

## COMMENTS AND RESPONSES

Water Board staff held a workshop in Felton on May 9, 2012. Staff received some written comments prior to the workshop and oral comments during the workshop. Water Board staff also received written comments after the workshop. Attachment 4 includes all comment letters that were received prior to the close of the public comment period on May 18, 2012.

Because of the volume of comments received, Water Board staff summarized substantive comments and responded to these comments below.

### City of Santa Cruz

1. The City recommends the Board inspect every timber harvest site to ensure adequate erosion controls are in place for winter operations.

Staff Response: Water Board staff has determined that inspections of a selected sample of harvest sites are the optimal means to evaluate the effectiveness of the Board's timber harvesting program. This quasi-statistical approach is consistent with a truly statistical approach in that Water Board staff often selects inspection sites randomly but also inspects sites known to pose greater threats to beneficial uses. Water Board staff has inspected more than 30 percent of the active harvest sites, which substantially exceeds the typical sample size required to achieve statistical validity. Since the Dischargers know that staff randomly inspects sites, Dischargers are encouraged to maintain erosion-control BMPs in anticipation of staff's possible inspection of their sites. Appendix A summarizes the findings of the inspection program so far.

Random inspections by Water Board staff, coupled with Discharger submittal of self-monitoring reports, are performed for other waste discharges in the Central Coast Region.

2. The City supports the approach included in the proposed Timber Order whereby Dischargers inspect harvest sites according to site-specific MRPs, photo-document the inspections, and staff inspects harvest sites, instead of Discharger monitoring of turbidity and temperature. However, the City is concerned that the proposed Order and MRP no longer require Forensic Monitoring of certain areas of concern, in particular of water diversions.

Staff Response: The proposed Order and MRP require monitoring of all significant erosion-control BMPs, as approved by the Executive Officer (EO), which includes all areas of concern and water diversions.

### Lompico Watershed Conservancy

3. The Conservancy states that the proposed Timber Order is largely administrative nonsense and does very little to protect water quality in the Santa Cruz Mountains. The Conservancy states that, while this discharge permit may be of minor interest to Board staff, it is a significant issue in Santa Cruz County. Varied sources, including logging sites, homesites, and residential roadways, contribute sediment to local watercourses. The Conservancy recommends Board staff participate in the THP review process, including Pre-harvest Inspections. This is the means the Board has to affect logging conduct, which determines the levels of sediment discharge, not after-the-fact monitoring and reporting. The MRP is altogether useless and has no practical effect on improving water quality.

Staff Response: Water Board staff participates in the review process and plans to increase participation, if resources allow. Preharvest inspections Water Board staff has attended have also been attended by staff from the California Geologic Survey, State Fish and Game, CalFire, and by RPFs, all of whom possess significant expertise in the Forest Practice Rules and erosion-control BMPs. The goal of the review process is, among other things, to ensure the design and installation of adequate erosion-control BMPs in accordance with those Rules dedicated to protecting water quality. Accordingly, at the culmination of the review process, approved THPs specify BMPs for sites in the harvest area deemed to pose significant threats to water quality. To ensure their ongoing effectiveness, the Discharger must regularly inspect and maintain erosion-control BMPs. The proposed MRP requires Dischargers to monitor and maintain the BMPs after the harvest before and during the rainy period, and to photo-document a representative sample of BMPs specified in a site-specific MRP issued by the EO. Based on review of the THP, the EO may add erosion-control BMPs to those proposed by Dischargers in NOIs. The BMP design and installation required of Dischargers by the THP, the BMP maintenance and reporting required by the proposed MRP, in addition to random staff inspections and inspections by CAL FIRE staff, constitute a robust effort to protect watercourse beneficial uses. With more resources, Water Board staff could participate more; however, Water Board staff resources have declined in the past five years. Even with our limited resources, Water Board staff has inspected more than 30 percent of the active harvest sites. With the increased efficiencies provided by the proposed NOI procedures, staff should be able to participate more. The joint efforts of the regulatory agencies appear to substantially protect beneficial uses in the harvest areas, as supported by the results of the Board's inspections, summarized in Appendix A. In addition, actions required of Dischargers by the proposed MRP will provide the Board with better oversight of timber harvest erosion control. Water Board staff will continue to employ the Board's enforcement powers to require Dischargers to correct failures, actual and potential, of erosion-control BMPs.

#### **Drew Fenton**

4. Personal complaints in 2009, 2010, and 2012 were ignored. That is, approximately six-foot deep pools at Camp Lindblad in 2006-2007 were filled with sediment after harvest. Staff did not follow up on the complaint.

Staff Response: The Executive Officer issued a Notice of Violation, mentioned in the staff report, to Camp Lindblad for failure to submit the annual monitoring report on time. Camp Lindblad acknowledged the notice and addressed the violations through consultation with the RPF and the site manager during a Water Board staff inspection on December 6, 2011. Staff's inspection preceded the commenter's April 2012 complaint. The commenter asserts pools at Camp Lindblad filled with sediment after the harvest. However, the harvest has not occurred. Moreover, the commenter provided neither location of the pools nor any evidence that the sediment suspected of filling the pools derived from the harvest site. During staff's inspection of the Camp Lindblad harvest site, the RPF and site manager agreed to apply additional rocking to several locations, and have provided photo-documentation of the work as required by the Notice of Violation. On April 25 and May 23, 2012, Water Board staff observed potential sources of sediment along Kings Creek below the Camp Lindblad property. Water Board staff concluded there is insufficient evidence at this time to proceed with an enforcement action on the Camp Lindblad THP.

Ms. Fenton's May 18, 2012, email includes numerous other comments, which staff either could not understand or determined to be non-substantive. The email in its entirety is included in Attachment 4.

**San Lorenzo Valley Water District (SLVWD)**

5. SLVWD emphasizes the importance of staff participation in the THP review process. It is critical that staff ensure adequate controls on winter operations. Plans with winter operations should require Tier III monitoring and be adequately inspected. Such inspections are critical to the program's success. SLVWD also stresses the importance of staff taking a lead role in selecting erosion-control BMPs for the Dischargers to monitor. Selection should be based on the potential for sites to degrade water quality. Secondary factors should play no role. If a site is too remote to inspect, then it is too remote to harvest.

Staff Response: Please see staff's response to Comment No. 3. The response describes the essential mechanisms of the Board's oversight of timber harvest sites. Water Board staff concurs that inspections of harvest sites in the rainy period are important. Staff will review NOIs submitted to enroll under the proposed Order and MRP and shall recommend additional monitoring and additional monitoring sites when appropriate.

**Central Coast Forest Watch**

6. Central Coast Forest Watch (CCFW) expressed concern that they received the draft Order but two days before the end of the comment period (May 18, 2012) and that staff did not extend the comment period. CCFW objects to last minute revisions without an extension of the comment period.

Staff Response: Based on input obtained from attendees of the workshop conducted by Board staff in Felton on May 9, 2012, and based on staff discussions, staff modified the proposed MRP. The changes made to the MRP subsequent the workshop addressed the concerns of interested parties in attendance of the workshop (see Attachment 4 for complete attendance list), adding additional time for comments was not necessary.

7. CCFW recommends Board staff participate in the CAL FIRE review process for THP approval. The Board is on the review team and has been derelict in its duties to review timber harvest proposals, both on paper and on the ground, and submit written pre-harvest inspection comments before plan approval.

Staff Response: Staff participates in the review process as our resources allow. Please see Staff's Response to a similar comment by the Lompico Watershed Conservancy (Comment No. 3) regarding the effectiveness of the Board's oversight of timber harvesting.

8. State law allows timber harvests to be exempt from waste discharge requirements if USEPA and the State Board certify that provisions in the Rules constitute best management practices for silviculture. The waiver program was created because the certification has not occurred. For the waiver to refer to BMPs is confusing and inaccurate.

Staff Response: Staff found that the use of erosion-control BMPs designed and installed in CAL FIRE-approved THPs to reduce the discharge of sediment is the optimal means to protect watercourse beneficial uses from impairment in timber harvesting areas. Discharger inspection and maintenance of the BMPs, self-reporting in accordance with the MRP, and staff inspections allow staff to evaluate the effectiveness of the Board's timber harvesting oversight.

9. We would like to share more information from CAL FIRE's Hillslope Monitoring Program, as our review led us to different conclusions than those formed by staff. We believe that the Hillslope

Monitoring Program (HMP) supports implementation of adequate mitigations and monitoring to ensure that roads and culverts do not contribute to sediment pollution of streams.

Staff Response: The stated purpose of the HMP was to determine if erosion-control BMPs implemented in accordance with California's Forest Practice Rules (FPRs) adequately protect the beneficial uses of watercourses (Cafferata and Munn, 2002). Central Coast Forest Watch quotes statistics from the HMP for a subset of crossing features which misrepresents the overall findings (see Table 44 below for the implementation rates for all features monitored by the HMP). The key HMP finding is: when the erosion-control BMPs are implemented and maintained, they effectively prevent erosion. The HMP assessment found that non-compliance with erosion-control BMPs was the source of sediment in 98% of "problem points"<sup>13</sup> (Cafferata and Munn, 2002). Water Board staff determined their inspection program is consistent with the HMP findings and that erosion-control BMPs at harvest sites were adequately to optimally implemented in the majority of cases. Based on further analysis of the HMP and staff inspection methods, the data submission of monitoring and reporting was modified to utilize assessment terminology and criteria used in the HMP. Staff will continue to verify the monitoring results submitted by Dischargers with random and priority watershed inspections.

Table 44. HMP. (Cafferata and Munn, 2002).

Hillslope Monitoring Program Sample Area	% Acceptable Implementation
Road Transects	93.2
Skid Trail Transects	95.1
Landings	93.5
Watercourse Crossings	86.3
Watercourse Protection Zones (WLPZ, ELZ, EEZ)	98.4
Total	94.5

<sup>13</sup>Problem point: In the Hillslope Monitoring Program the occurrence of: 1) erosion features (rills, gullies, mass failures, or cutbank/sidecast sloughing) found at sample sites or along transects, 2) canopy reduction, streambank erosion, or ground cover reduction in a watercourse protection zone, or 3) Forest Practice Rule violations (e.g., waterbreak improperly constructed) (Lee 1997).

10. We continue to believe that winter operations provide a higher risk to water quality. We strongly urge your Board to continue to place all plans with winter operations in at least the Tier III category.

Staff Response: Water Board staff understands winter operations often pose a higher risk to water quality and did not remove winter operations entirely from the EC process. In fact, the proportional weight of winter operations in the revised EC is only matched by the status of the plans watershed for sediment impairment and the status of the plans watershed as impaired from sediment attributed to silviculture. Approximately 80 percent of current waiver sites have proposed winter operations. Specific and measurable winter operating parameters are found in all winter operating plans, which THPs must provide. The operating parameters include: provisions for erosion hazard rating assessment; the extent, timing, and proximity to watercourses for mechanical site preparation and yarding systems; provisions for ground cover; and precipitation thresholds for when operation must cease. Based on the limited duration and extent of winter ops in the Central Coast region, staff does not find that because a plan proposes winter operations that this warrants automatically placing the plan in a Tier III monitoring requirement. Our findings are further supported by the results of inspections, which are a representative sample of all sites with proposed winter operations.

11. We believe that the CER should be based on 15-year harvest rate, as impacts can last for years. Appendix C also discusses return of pre-harvest canopy recovery under Harvest Rate. Impacts are not from canopy reduction alone. It is largely the roads, slides and slope failures that are a sediment source in areas of selection harvest. These roads are re-opened with every entry. Many impacts do not occur until significant rain events and saturated soil events, which may not happen within 5 years of harvest. Thus, 15-year harvest rates are appropriate to utilize for ranking risk.

Staff Response: The proposed CER utilizes an average rate of change given readily available data for 15 and 5 year harvest rates. The continued use of only the past 15 year harvest rate limits our understanding of the intensity of recent harvest activity, which is known to have a higher impact. Water Board staff understands there are a numerous non-timber land use changes occurring in a given watershed and that stochastic events such as extraordinary precipitation and land sliding can have a profound impact on cumulative effects. However, those stochastic events are not solely driven by timber harvest activities. The data to effectively model cumulative impacts on a watershed or even site specific scale are often limited or cost-prohibitive. The spatial analysis project (SAP) was a first step to quantify some of the relationships between timber harvest activities and the subsequent water quality conditions at the watershed scale. Staff utilizes the data obtained from the SAP to reduce the time spent validating reported data submitted for the CER. The proposed harvest rate method utilizes the data from the SAP to account for the diminishing effect over time each individual timber harvest exhibits at the watershed scale within the construct of the available data. Water Board staff has the ability to update the data used in the proposed criteria on an annual basis or as needed, without the need for a GIS specialist.

12. For the RPFs to choose the monitoring sites is inappropriate. Staff should participate in pre-harvest inspections and can then choose the appropriate sites.

Staff Response: Please see staff's response to Comment No. 3.

### **Big Creek Lumber Company**

13. We have previously commented on the inherent limitations of photo points. They provide a very limited field of view and photos taken in the middle of storm events will likely be blurry to the point of being not useful. Staff cites the United States Department of Agriculture Photo Point Monitoring handbook as a guideline, but none of the sample photos in that handbook appear to have been taken during a rain storm...In separate conversations with staff it was suggested that producing photo points is a way of demonstrating that site inspections are occurring. In 2003, the Board stated that it was important for the forestry community to establish trust with the CCRWQCB. We certainly hope the rationale for requiring increased photo monitoring is not a trust issue.

Staff Response: The inherent limitations of photo monitoring (i.e. field-of-view) does not preclude the use of photos to verify a crossing is stable or an in-lieu practice at a crossing did not result in further erosion. The purpose of photo points for storm-based monitoring is to demonstrate the effectiveness of crossings designed for certain flow criteria that are based on storm magnitudes. Water Board staff does not expect photos to be taken at a time when there is a significant risk to safety, such as in the middle of storms. The insistence on the continued use of photo monitoring is not an issue of trust with the forestry community; rather it is a key element to the Non-Point Source Policy and Program which must continue to provide a method of verification. It would be impossible to provide such verification of the effectiveness of erosion and sedimentation control practices through inspection alone. Staff is committed to the effective use of photo monitoring through review team recommendations and

consultation with a harvest plan's RPF.

14. Separate reporting for Storm Based Monitoring is unnecessary and potentially redundant. Properties are being inspected during and immediately after qualifying storm events. Under the current draft MRP language, an expedited report would be produced as a result of Storm Based Monitoring regardless of whether any problems are found. If a problem is found during a storm event, the waiver holder would be responsible for submitting a Forensic Monitoring Report for the same inspection.

Staff Response: Under the revised MRP, a separate Forensic Monitoring report is not required if there is a qualifying Storm Event. Any problems encountered during storm-based monitoring shall be incorporated into the Storm-based monitoring report. If no problems are encountered an expedited report is still required, and if no event or problem is encountered for the duration of the winter the SBM report will meet the annual BMP reporting requirement.

15. Section C(1) requires a Forensic Monitoring Report must be submitted if the Discharger observes a discharge of sediment, soil, organic matter, or other waste. The MRP does not specify whether the requirement refers to natural discharge or discharge associated with timber harvest activities. Section C(1) requires Dischargers to notify the EO within 72 hours and submit a report within 14 days if a discharge is observed. However, Section C(3) requires a report with photo-documentation no later than May 15. Is a report required by May 15 if there was no forensic event or if separate forensic events were previously reported? The entire Forensic Monitoring section needs to be clarified and discharge needs to be defined so that the waiver holder clearly understands what is required for compliance.

Staff Response: The requirement addresses discharges of waste to watercourses. A Discharger who observes such a discharge from a timber harvest site (the only sites covered by the Board's Order) should report the discharge along with mitigation measures taken to repair the source of the discharge. Dischargers are required to submit a report by May 15 if no forensic events occurred or if forensic events were previously reported. However, the May 15 report should state that either no forensic events occurred or should refer to the prior submitted reports.

16. Section E (Violation Reporting) states that a narrative written report is required which must include water quality data. "Water quality data" needs to be clearly described and defined in order to comply with this requirement.

Staff Response: Staff removed the requirement for water quality data because the MRP no longer requires Dischargers to monitor watercourse water quality.

17. Allow staff to begin their internal waiver review after the close of CalFire second review. Harvest plans cannot be changed after second review and staff is already reviewing the plans as part of the THP review team. A waiver would not be authorized until the THP or NTMP is approved, but this would lessen the unnecessary waiver delay landowners have experienced in the past. At the May 9, 2012 workshop, representatives of both CalFire and the California Geological Survey concurred with this recommendation.

Staff Response: A Discharger may submit an NOI according to the proposal above. The Board will issue an enrollment letter after CalFire approves the THP.

18. The new proposed side-slope analysis is complicated, arbitrary, and will provide no direct benefit to water quality assessment.

Staff Response: The side-slope analysis in the proposed Drainage Density Index (DDI) is based on measurable factors, principally the areal extent of watercourse protection zones as determined by the side slope. The measurements provide a proportional and objective measure of the general risk to water quality. Staff analysis of the previous DDI revealed the multipliers used failed to adequately capture the known risk to water quality from class II and class III streams (i.e. low order streams). The method employed in the proposed DDI is founded on a conceptual model framework. The revised statistical Tier determination method relies on the performance of the DDI as designed. Water Board staff has prepared the necessary GIS slope class files to assist Dischargers in calculating their plan's watercourse protection zone area and provide an alternative method for Dischargers who do not possess the necessary GIS capabilities. Both proposed methods for calculating the DDI rely on discrete objective measurements instead of arbitrary and unsupported multipliers.

19. Section F (1) requires that Board staff shall be allowed "entry on premises where timber harvest activities occur." It is recommended that a new provision state that "a reasonable attempt will be made to contact the landowner and RPF before a site visit."

Staff Response: Order No. R3-2012-2008, Section 1.(j) states: "The Discharger shall allow Central Coast Water Board staff reasonable access, in accordance with Public Resources Code section 4604(b) and California Water Code section 13267, onto the affected property for the purpose of performing inspections to determine compliance with the conditional waiver requirements." Water Board staff endeavors to call Dischargers before inspecting a site, and shall continue to do so.

20. The proposed MRP has reporting requirements beyond the electronic capabilities of some landowners. The MRP should provide an alternative method for submitting reports.

Staff Response: The ability for people to submit information electronically daily becomes easier and cheaper. The RPF who prepares the THP can show the Discharger how to do it or can do it for them.

21. The five new Soil Disturbance Factor criteria listed on Page 12, Section 4.0 of the Staff Report place inappropriate emphasis on arbitrary factors that may not directly affect water quality. The Board should rely on the previous numeric criteria and remove criteria 1 through 5 listed at the end of the SDF worksheet.

Staff Response: Staff proposes the new criteria based on inspection findings, personal communications with review agency staff, and the sensitivity analysis performed as part of EC review, as described in the staff report. Unfortunately there was a lack of evidence supporting the continued use and effectiveness of the current EC to objectively and appropriately differentiate sites for monitoring requirements. The proposed criteria is designed to allow staff to re-evaluated the performance of the criteria and modify the tier thresholds accordingly. Staff made every effort to weigh the overall criteria proportionally and without arbitrarily setting the tier based on one factor. Question 1 through 5 at the end of the SDF were selected from problems encountered in the field and which can be particularly problematic in the region. Staff will continue to engage the forestry community on the problematic circumstances on a site by site basis.

### **Redwood Empire**

22. MRP section A. 1. It is unclear how the MRP directs the Discharger for plans with Winter Operations. Forensic Monitoring & Reporting is required, but without a triggering event.

Staff Response: Unlike the storm-based monitoring, forensic monitoring is not triggered by an event; it is triggered whenever the discharger witnesses a qualifying condition specified in MRP section I. i-iv.

Routine road maintenance or inspections following the close of operations or any significant break in operations could conceivably reveal such conditions.

23. In MRP section B. 2. (SBM), a Storm Based Monitoring Report is required 14 days after a triggering storm event. This report serves the same purpose as either the BMP Monitoring Report if no problem exists or the Forensic Monitoring Report if a problem is discovered.

Staff Response: Storm-based monitoring is intended to be the minimum event trigger for verifying if erosion-control BMPs are effective, particularly the crossings designed for the specified storm magnitude listed in the MRP. BMP monitoring is intended to be described in an annual report on the effectiveness of erosion-control measures if no storm based monitoring event occurs. Language has been added to the BMP monitoring instruction to clarify the reporting requirements. If a storm-based event occurs, there will not be a separate report required on May 15 if there was a qualifying storm event.

24. The Buffer for the class I watercourses is 100 feet, regardless of slope.

Staff Response: The latest version of the EC now reflects the change in the class I buffer. Staff also clarified language in the Soil Disturbance Factor Questions Nos. 2 and 5.

25. Will the Water Board staff be updating the Cumulative Effect Ratio index (harvested acres) with the most recent harvest acreage information? This will require more staff time to accomplish.

Staff Response: Staff has the ability to update the index as needed or at a minimum on an annual basis.

### **Drew Fenton's Additional Comments**

26. On May 31, 2012, after the end of the public comment period (May 18, 2012), Ms. Fenton submitted a second set of comments and a revised MRP No. R3-2012-0008 via email. Please see our response to Ms. Fenton's comments on page 12 (above). Staff also included Ms. Fenton's comments in Attachment 4.

### **RECOMMENDATION**

Adopt proposed Order No. R3-2012-0008, MRP No. R3-2012-0008, and the revised EC including the revised Notice of Intent.

### **APPENDICES**

Appendix A	Inspection Data Summary
Appendix B	GIS Spatial Analysis Project
Appendix C	Explanation of Revised Eligibility Criteria
Appendix D	Key Terms related to the Timber Harvest Program

### **ATTACHMENTS**

1. Draft Waste Discharge Requirements Order No. R3-2012-0008
2. Draft Monitoring and Reporting Program No. R3-2012-0008
3. Revised Notice of Intent (Revised EC spreadsheet available on the Central Coast website)
4. Public Comment letters

Table 1. Timber Harvest Inspection Summary

last updated 6/14/2012

<b>General</b>	
Mitigation Point count	<b>288</b>
Removed	<b>60.4%</b>
Installed	<b>82.4%</b>
Erosion Controlled	<b>88.3%</b>
Sedimentation Controlled	<b>84.9%</b>
Within WPLZ	<b>66.7%</b>
Unstable Area	<b>12.7%</b>
Average Water Qual.(1-5)	<b>1.0</b>
In Violation	<b>3%</b>
<b>Road Segment (PR, TR)</b>	
Perm Roads Count	<b>18</b>
Temp Roads Count	<b>21</b>
Outsloped	<b>75.8%</b>
Crossed Drained	<b>90.8%</b>
Failed Cutbank	<b>10.8%</b>
Adequate WB Spacing	<b>87.5%</b>
Road Surface	<b>80.8%</b>
<b>Skid Trails (ST)</b>	
Skid Trails Count	<b>32</b>
Adequate Grade <65%	<b>100.0%</b>
Slash Cover %	<b>84.6%</b>
Water breaks %	<b>92.3%</b>
<b>Crossing (SX, PS, TX)</b>	
Skid Trail X	<b>25</b>
Perm Road X	<b>59</b>
Temp Road X	<b>30</b>
Appropriately Sized? (%)	<b>94.8%</b>
Armored Protection (%)	<b>80.4%</b>
Energy Dissipaters? (%)	<b>88.8%</b>
Failure Control? (%)	<b>71.1%</b>
<b>Landing (L)</b>	
Landing Count	<b>103</b>
Effective Drains Water	<b>95%</b>
Energy Dissipaters %	<b>77%</b>
Surface Cover %	<b>78%</b>

Table 2. Timber Harvest Inspection Sites

		2398		77%		
THP Number	Acres	Tier	WtrOps	CalwaterID	Date Inspected	
1-07NTMP-020 SCR	143	III	Yes	3304.110201	12/14/09	
1-04-115 SCR	165	IV	Yes	3305.110201	1/12/10	
1-07-017 SCR	161	IV	Yes	3305.100102	1/29/10	
1-04NTMP-022 SCR	91	III	Yes	3305.100102	4/23/10	
1-08-164 SCR	150	III	No	3305.200202	4/23/10	
1-98NTMP-022 NTO#6	121	III	Yes	3305.100101	4/23/10	
1-08-091 SCR	135	III	Yes	3304.120203	4/29/10	
1-08-045 SCR	60	II	No	3304.110203	10/12/10	
1-09-068 SCR	59	III	Yes	3304.120300	11/23/10	
1-10-003 SCR	18	III	Yes	3305.100101	11/23/10	
1-06NTMP-021 SCR	22	III	Yes	3305.100102	12/2/10	
1-09-098 SCR	128	III	Yes	3304.120203	6/14/11	
1-06-187 SCR	73	III	Yes	3304.120300	8/23/11	
1-10NTMP-002 NTO#1	75	III	No	3304.130201	8/23/11	
1-10-045 SCR	10	I	No	3304.130201	8/23/11	
1-07-119 SCR	150	IV	Yes	3304.120101	12/6/11	
1-11-038 SCR	38	III	Yes	3304.120501	4/25/12	
1-09-098 SCR	128	III	Yes	3304.120203	4/25/12	
1-09-045 SCR	235	III	Yes	3304.110203	5/2/12	
1-11-011 SCR	211	III	No	3304.110202	5/2/12	
1-08-073 SCR	213	III	Yes	3304.120101	5/23/12	
1-09-087 SCR	12	III	Yes	3304.120101	5/23/12	

Table 3. Tier and Inspection Rates Since 2009

Waiver Tier	Currently Enrolled		Inspected	
I	3	5%	1	33%
II	3	5%	1	33%
III	49	80%	17	35%
IV	6	10%	3	50%

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## **Project Overview and General Methodology**

The Central Coast Timber Program's Spatial Analysis Project (SAP) is designed to provide a standardized set of parameters to measure each planning watershed. Timber program staff conducted the spatial analysis of the regions watersheds to quantify timber harvest conditions relevant to water quality and improve program management capabilities. Initial processing of publically available GIS files was a coordinated effort with a project based GIS course offered through Cal Poly University. The project assembled and rendered the necessary layer attributes for statistical summary by the region's timber harvest planning watersheds (calwater 2.2).<sup>1</sup> Numeric results for each planning watersheds included project area are provided in Table 1. The timber production zone layers were obtained from county sources.<sup>2</sup> Timber harvest boundary layers were collected from Cal Fire and cover timber harvests since 1998.<sup>3</sup> Harvest sites under waiver and inspected were correlated from local records and derived from the boundary layer files obtained from Cal Fire. The 303d stream layer was derived from the statewide 2010 EPA approved 303d list utilizing the National Hydrographic Plus Dataset.<sup>4</sup> Coho and Steelhead layers were obtained from Cal Fish and Game which are based on hydrographic features from the National Hydrographic Dataset.<sup>5</sup> The slope class layer was prepared by staff from the 10m National Elevation Dataset.<sup>6</sup>

### **Focus of the Analysis**

Because SAP is intended to meet the Timber Program objectives, it focuses on all planning watersheds that could be commercially harvested in the region, those lands either have land zoned for timber production or have had commercial timber harvest in the last 15 years.

### **Areas excluded from the Analysis**

Any planning watersheds for which there are have not been commercial timber harvest within the last 15 years or do not have lands zoned for timber production are excluded. Information specific to public lands within the project area were not included in the analysis results.

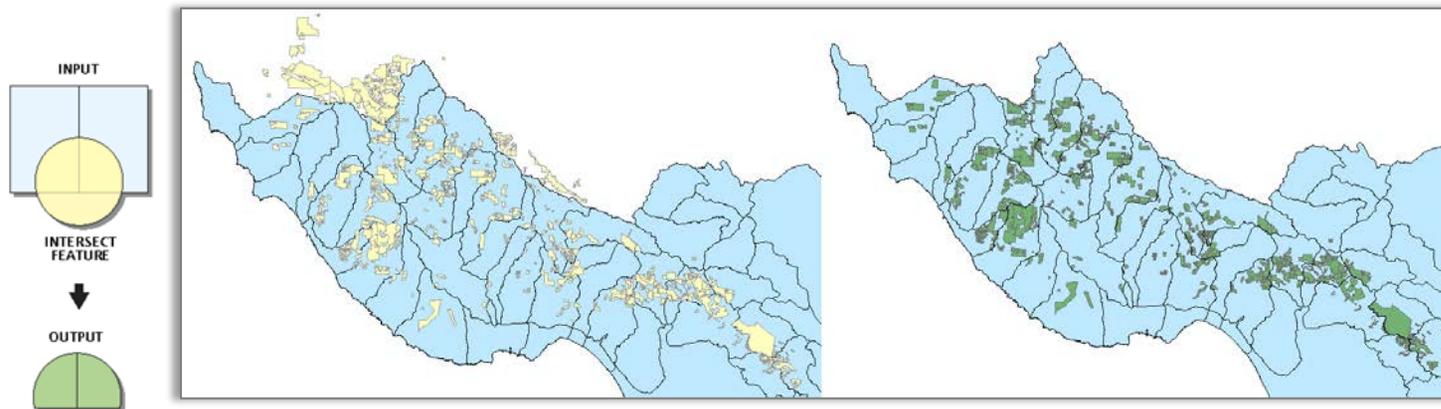
### **SAP Components**

1. Vector and raster data covering the area of focus.
2. Tabular data derived from exporting attribute table information from vector and raster data.

- 
- 1 California Watershed Map (CALWATER version 2.2). 2004. Downloaded: Sep 2011  
<<http://atlas.ca.gov/catalog/CaSpatialInformationLibrary/Calwater.html>>
  - 2 Santa Cruz Timber Production Zoning Layer. 2010. Downloaded: Sep 2011  
<[http://gis.co.santa-cruz.ca.us/Gis/File\\_Download\\_Site/Landuse](http://gis.co.santa-cruz.ca.us/Gis/File_Download_Site/Landuse)>  
San Mateo timber production zoning layer was provided by County GIS department staff via email.
  - 3 THP and NTMP Boundary. 2011. Cal Fire: Forest Practice GIS.  
<[ftp://ftp.fire.ca.gov/forest/SCruz\\_SMateo\\_SClara/Shape\\_files/](ftp://ftp.fire.ca.gov/forest/SCruz_SMateo_SClara/Shape_files/)> Downloaded: Oct 2011
  - 4 2010 Integrated 303d list  
<[http://maps.waterboards.ca.gov/webmap/303d/files/2010\\_USEPA\\_approv\\_303d\\_List\\_Final\\_122311wsracs.xls](http://maps.waterboards.ca.gov/webmap/303d/files/2010_USEPA_approv_303d_List_Final_122311wsracs.xls)>
  - 5 Coho and Steelhead. 2010. CalFish and Game.  
<<http://www.calfish.org/DataandMaps/CalFishDataDownloads/tabid/93/Default.aspx>>Downloaded: Sep 2011.
  - 6 Gesch, D., Oimoen, M., Greenlee, S., Nelson, C., Steuck, M., and Tyler, D., 2002, The National Elevation Dataset: Photogrammetric Engineering and Remote Sensing, v. 68, no. 1, p. 5-11.  
R3 DEM File location: X:\GIS-Data\CA\3\Elevation\DEMs\NED\_10m\S\_Cruz

## Methods

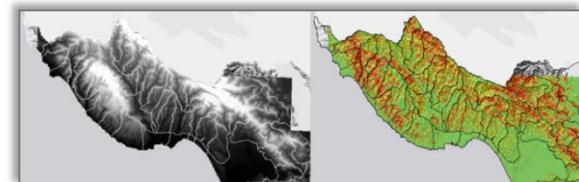
State and local agency data layers were systematically processed using the intersect tool to add watershed attributes to agency layers. After data layers with calwater 2.2 attributes were created the attribute table of the combined data was exported to excel<sup>™</sup> where the desired statistics were sorted using pivot table menu options. After the data was sorted by planning watershed from the pivot table the data was then entered into Table 1 where the remaining calculations such as rates or subtotals were tallied with standard excel<sup>™</sup> formulas.



The DEM raster file used to create the slope class shapefile is derived from the 10m NED 'clipped' to the regional boundary. The following steps were used to create the finished slope class shapefile:

In Arcmap<sup>™</sup> Toolbox ->

1. Data Management Tools -> Raster -> Raster Processing -> Clip *input DEM raster*
2. Spatial Analyst Tool -> Surface -> Slope *input DEM raster*
3. Spatial Analyst Tool -> Reclass -> *input slope raster*
4. Conversion Tools -> Raster -> Raster to Polygon -> *input reclass slope raster*
5. Analysis Tools -> Overlay -> Intersect *slope polygon file and calwater2.2*



## Results

R3 Timber	Total Acres <sup>1</sup>	TPZ Acres <sup>2</sup>	TPZ % area	No. of THP <sup>3</sup>	THP (acres) <sup>3</sup>	No. of NTMP & NTO <sup>3</sup>	NTMP & NTO (acres) <sup>3</sup>	Acres Harvested (acres)	Harvest Rate (1998-2011)	303(d) miles of stream <sup>4</sup>	miles impaired all Sediment sources	miles impaired from Silviculture	Coho Habitat miles of stream <sup>5</sup>	Coho Habitat % within TPZ	Steelhead Habitat miles of stream <sup>6</sup>	Steelhead Habitat % within TPZ
<b>SubArea</b>																
Davenport	67,696	25,995	38%	28	3,864.0	6	1,428	5,292	8%	103.8	9.1	-	24.2	44%	50.9	35%
San Lorenzo	93,456	23,802	25%	110	5,641.4	32	2,560	8,201	9%	166.1	107.0	78.2	16.7	2%	104.6	16%
Aptos-Soquel	49,364	9,407	19%	55	3,201.1	11	1,714	4,915	10%	80.7	14.1	-	9.4	19%	48.2	25%
Ano Nuevo	24,667	6,643	27%	7	525.7	1	83	609	2%	41.1	-	-	5.4	30%	16.1	35%
Watsonville	79,557	6,892	9%	40	2,175.9	29	2,610	4,785	6%	87.1	1.8	1.8	-	-	57.6	11%
Sant Cruz Mtns	101,370	612	1%	9	968.5	11	3,029	3,998	4%	64.7	-	-	-	-	28.6	2%
total	416,110	73,350	18%	249	16,376.5	90	11,424	27,801	7%	543.4	131.9	80.02	55.7	26%	306.1	19%
<b>Subwatershed</b>																
Waddell Creek	7,829	1,259	16%	0	0.0	0	0	0	0%	14.5	-	-	6.3	9%	7.1	7%
East Waddell Creek	7,607	757	10%	1	0.0	0	0	0	0%	17.1	-	-	0.9	0%	1.4	-
Big Creek	7,206	5,802	81%	7	677.8	1	38	716	10%	12.5	-	-	1.4	70%	1.6	73%
Little Creek	4,470	2,524	56%	4	347.8	1	664	1,012	23%	5.0	-	-	2.8	15%	4.8	48%
San Vincente Creek	10,233	4,765	47%	10	1,998.5	0	0	1,999	20%	15.2	9.1	-	3.8	25%	6.8	5%
Scott Creek	8,804	5,424	62%	3	724.3	0	0	724	8%	8.8	-	-	8.9	87%	9.3	84%
Majors Creek	12,596	3,159	25%	1	8.1	4	726	734	6%	17.2	-	-	-	-	12.4	35%
Laguna Creek	8,951	2,305	26%	2	107.5	0	0	108	1%	13.6	-	-	-	-	7.5	21%
Kings Creek	7,774	3,190	41%	17	1,258.4	4	391	1,649	21%	13.4	10.0	10.0	-	-	13.1	29%
Castlerock Falls	7,376	2,888	39%	15	387.9	4	107	495	7%	8.1	8.1	8.1	-	-	5.7	24%
Love Creek	6,610	1,243	19%	8	265.7	0	0	266	4%	16.4	9.6	9.6	-	-	5.5	-
Lorenzo River	10,619	925	9%	3	145.8	2	66	212	2%	26.4	16.3	11.1	7.4	5%	15.7	7%
Boulder Creek	7,347	3,527	48%	15	1,137.3	3	635	1,773	24%	13.5	9.1	9.1	-	-	9.4	29%
Bear Creek	10,385	3,293	32%	19	824.1	7	379	1,203	12%	14.0	6.3	6.3	-	-	10.7	28%
Bean Creek	6,665	1,217	18%	5	251.5	0	0	251	4%	17.0	8.9	-	4.5	0%	7.4	15%
Zayante Creek	10,734	3,163	29%	11	537.7	7	498	1,036	10%	17.1	17.1	12.6	-	-	12.2	21%
Branciforte Creek	7,823	639	8%	4	129.3	0	0	129	2%	13.1	5.8	5.8	0.8	0%	13.6	3%
Carbonera Creek	4,532	574	13%	3	13.9	0	0	14	0%	9.3	10.1	-	-	-	3.2	27%
Newell Creek	6,224	3,145	51%	10	689.8	5	484	1,173	19%	11.3	5.7	5.7	-	-	1.8	16%
Soquel Creek	9,068	3,943	43%	10	1,399.9	0	0	1,400	15%	11.6	-	-	0.1	100%	9.5	64%
Hinckley Creek	3,181	581	18%	5	706.8	1	0	707	22%	6.0	-	-	2.1	38%	3.3	37%
Bates Creek	8,294	1,078	13%	10	405.6	3	292	698	8%	19.1	-	-	5.5	15%	8.9	15%
West Branch Soquel	7,846	1,323	17%	12	198.8	2	277	476	6%	15.4	-	-	-	-	8.7	19%
Valencia Creek	8,399	2,198	26%	10	402.9	5	1,145	1,548	18%	9.4	6.7	-	-	-	5.9	27%
Aptos Creek	7,288	283	4%	8	87.1	0	0	87	1%	9.6	7.4	-	-	-	8.8	5%
Cascade Creek	5,894	1,072	18%	1	80.5	1	83	164	3%	8.7	-	-	-	-	5.3	30%
Green Oaks Creek	4,605	829	18%	0	0.0	0	0	0	0%	12.5	-	-	-	-	0.8	36%
Gazos Creek	7,473	4,742	63%	6	445.2	0	0	445	6%	11.9	-	-	5.4	30%	10.0	37%
Browns Creek	4,877	2,524	52%	14	743.7	7	692	1,436	29%	8.8	-	-	-	-	7.5	44%
Corralitos Creek	6,968	2,752	39%	17	1,319.1	13	710	2,029	29%	13.1	1.8	1.8	-	-	7.3	36%
Hughes Creek	10,253	1,553	15%	6	106.9	9	1,208	1,315	13%	2.3	-	-	-	-	8.7	4%
Corralitos Lagoon	9,120	63	1%	1	3.2	0	0	3	0%	-	-	-	-	-	-	-
Coward Creek	5,045	-	-	2	2.9	2	270	273	5%	0.0	-	-	-	-	-	-
Uvas Creek	8,986	-	-	1	28.4	0	0	28	0%	12.3	-	-	-	-	-	-
Arthuro Creek	5,953	-	-	4	608.9	2	1	610	10%	6.3	-	-	-	-	2.0	-
Pescadero Creek	6,895	553	8%	1	183.5	5	892	1,075	16%	8.6	-	-	-	-	8.6	6%
Blackhawk Canyon	6,499	59	1%	3	147.7	2	1,866	2,014	31%	5.2	-	-	-	-	2.4	-
subtotal	280,429	73,350	26%	249	16,376.5	90	11,424	27,801	10%	424.1	131.9	80.02	50.0	29%	246.8	24%

<sup>1</sup> California Watershed Map (CALWATER version 2.2). 2004. <<http://atlas.ca.gov/catalog/CaSpatialInformationLibrary/Calwater.html>> Downloaded: Sep 2011

<sup>2</sup> Santa Cruz Timber Production Zoning Layer. 2010. <[http://gis.co.santa-cruz.ca.us/Gis/File\\_Download\\_Site/Landuse/](http://gis.co.santa-cruz.ca.us/Gis/File_Download_Site/Landuse/)> Downloaded: Sep 2011.   
San Mateo Timber Production Zoning Layer. 2011. TPZ layer provided by County GIS department.

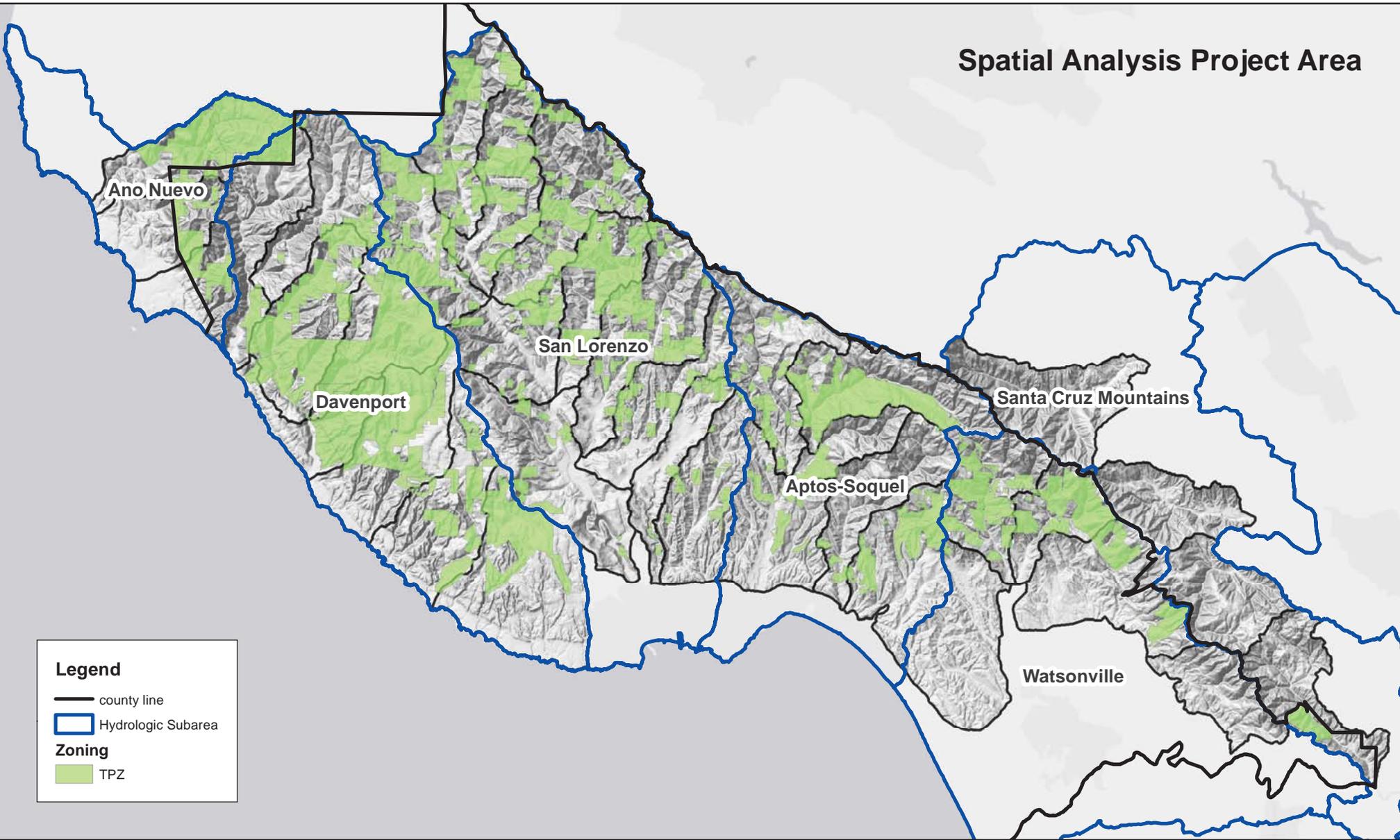
<sup>3</sup> THP NTMP Boundary. 2011. Cal Fire: Forest Practice GIS. <[ftp://ftp.fire.ca.gov/forest/SCruz\\_SMateo\\_SClara/Shape\\_files/](ftp://ftp.fire.ca.gov/forest/SCruz_SMateo_SClara/Shape_files/)> Downloaded: Oct 2011

<sup>4</sup> EPA 303(d). 2010. Downloaded Dec 2011. <[http://www.waterboards.ca.gov/water\\_issues/programs/tmdl/integrated2010.shtml](http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml)>

<sup>5</sup> Coho Distribution and Range. 2010. <http://www.calfish.org/DataandMaps/CalFishDataDownloads/tabid/93/Default.aspx>. Downloaded: Sep 2011.

<sup>6</sup> Steelhead Distribution and Range. 2010. <http://www.calfish.org/DataandMaps/CalFishDataDownloads/tabid/93/Default.aspx>. Downloaded: Sep 2011.

# Spatial Analysis Project Area



**Legend**

- county line
- Hydrologic Subarea

**Zoning**

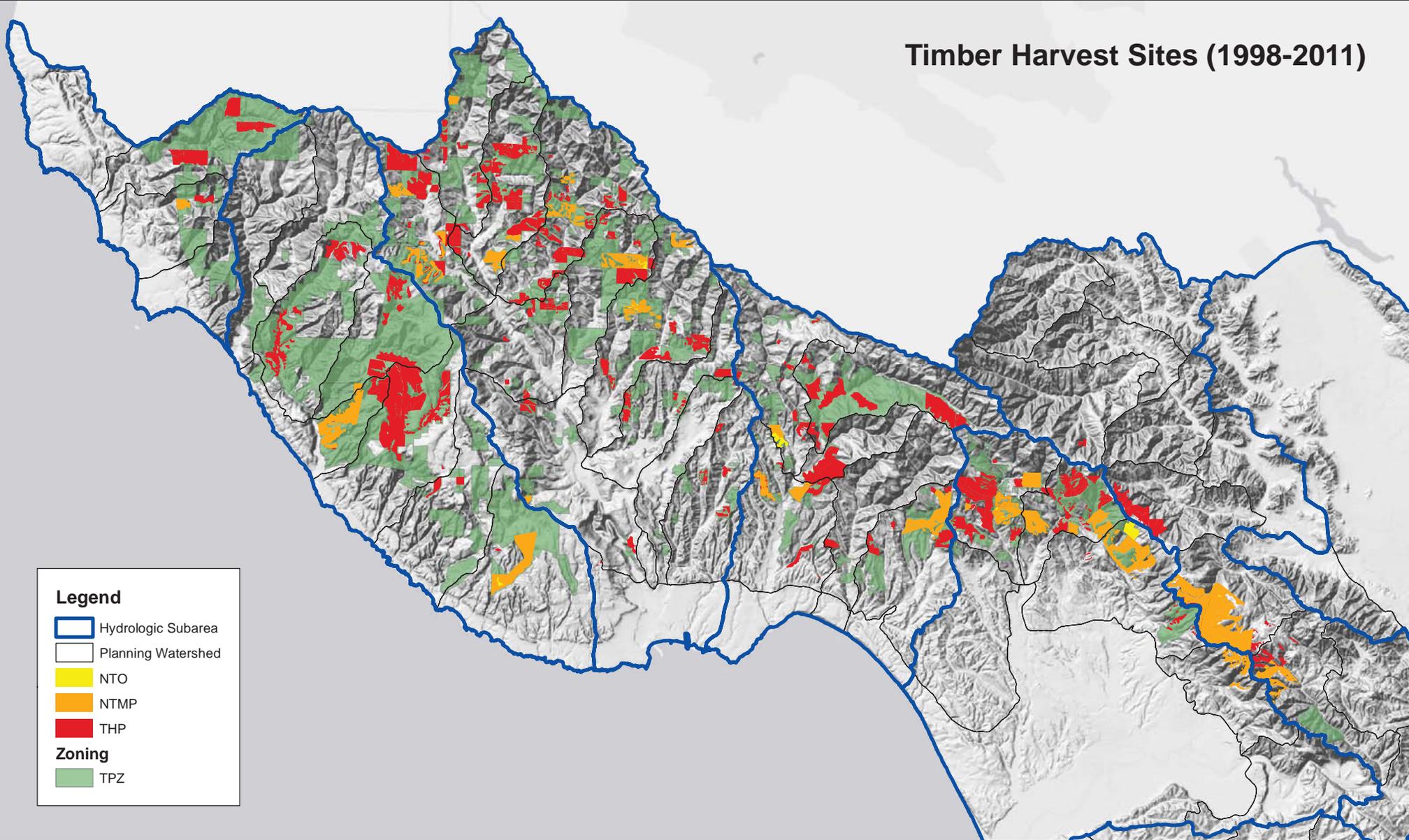
- TPZ

Hydologic SubArea	Total (acres)	TPZ (acres)	SAP (acres)	SAP (%TPZ)
Davenport	67,696	25,995	67,696	38%
San Lorenzo	93,456	23,802	86,089	28%
Aptos-Soquel	49,364	9,407	44,076	21%
Ano Nuevo	24,667	6,643	17,972	37%
Watsonville	79,557	6,892	36,263	19%
Santa Cruz Mtns	101,370	612	28,333	2%
<b>total</b>	<b>416,110</b>	<b>73,350</b>	<b>280,429</b>	<b>26%</b>



Santa Cruz TPZ. 2010. <[http://gis.co.santacruz.ca.us/Gis/File\\_Download\\_Site/Landuse](http://gis.co.santacruz.ca.us/Gis/File_Download_Site/Landuse)> Downloaded: Sep14, 2011  
 San Mateo TPZ Layer. Sep14, 2011. balbini@smcgov.org.

# Timber Harvest Sites (1998-2011)



**Legend**

- Hydrologic Subarea
- Planning Watershed
- NTO
- NTMP
- THP

**Zoning**

- TPZ

Hydrologic Subarea	Total Acres	No. of THP	THP (acres)	No. of NTMP & NTO	NTMP & NTO (acres)	Harvest (acres)	Harvest Rate (1998-2011)
Davenport	67,696	28	3,864.0	6	1,428.2	5,292.2	8%
San Lorenzo	93,456	110	5,641.4	32	2,559.9	8,201.4	9%
Aptos-Soquel	49,364	55	3,201.1	11	1,714.3	4,915.4	10%
Ano Nuevo	24,667	7	525.7	1	83.2	608.9	2%
Watsonville	79,557	40	2,175.9	29	2,609.6	4,785.5	6%
Santa Cruz Mtns	101,370	9	968.5	11	3,029.2	3,997.6	4%
<b>total</b>	<b>416,110</b>	<b>249</b>	<b>16,376.5</b>	<b>90</b>	<b>11,424.4</b>	<b>27,800.9</b>	<b>7%</b>

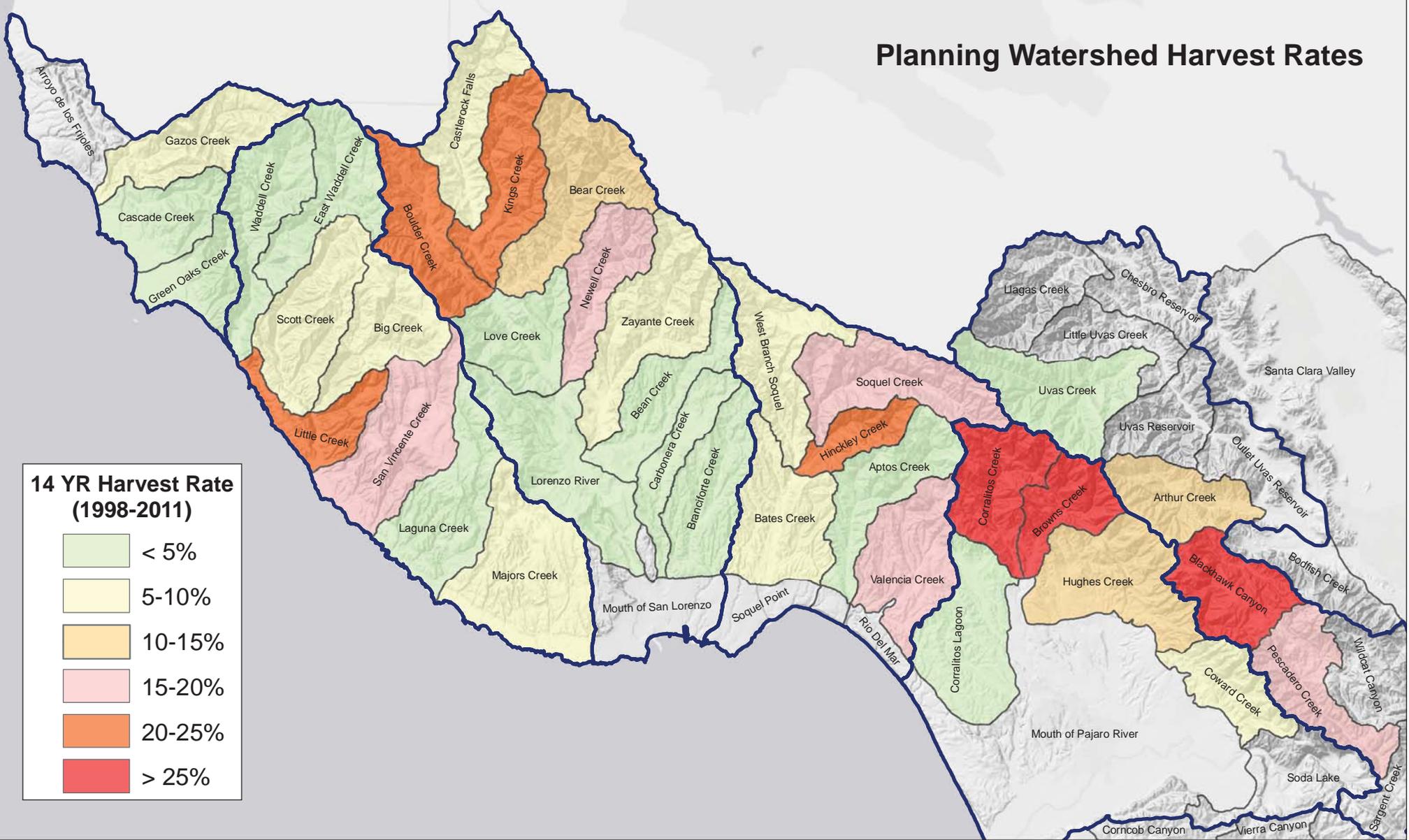


R3-Timber-Map 2. Jan 2012

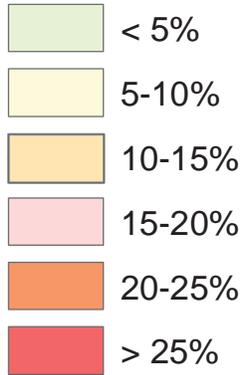


THP NTMP Boundary, 2011. Cal Fire: Forest Practice GIS. <ftp://ftp.fire.ca.gov/forest/SCruz\_SMateo\_SClara/Shape\_files/> Downloaded: Oct 2011  
 THP NTMP Boundary, June 13, 2011. THP\_czu\_Dec\_2010\_tealen27.shp. John.Martinez@fire.ca.gov

# Planning Watershed Harvest Rates



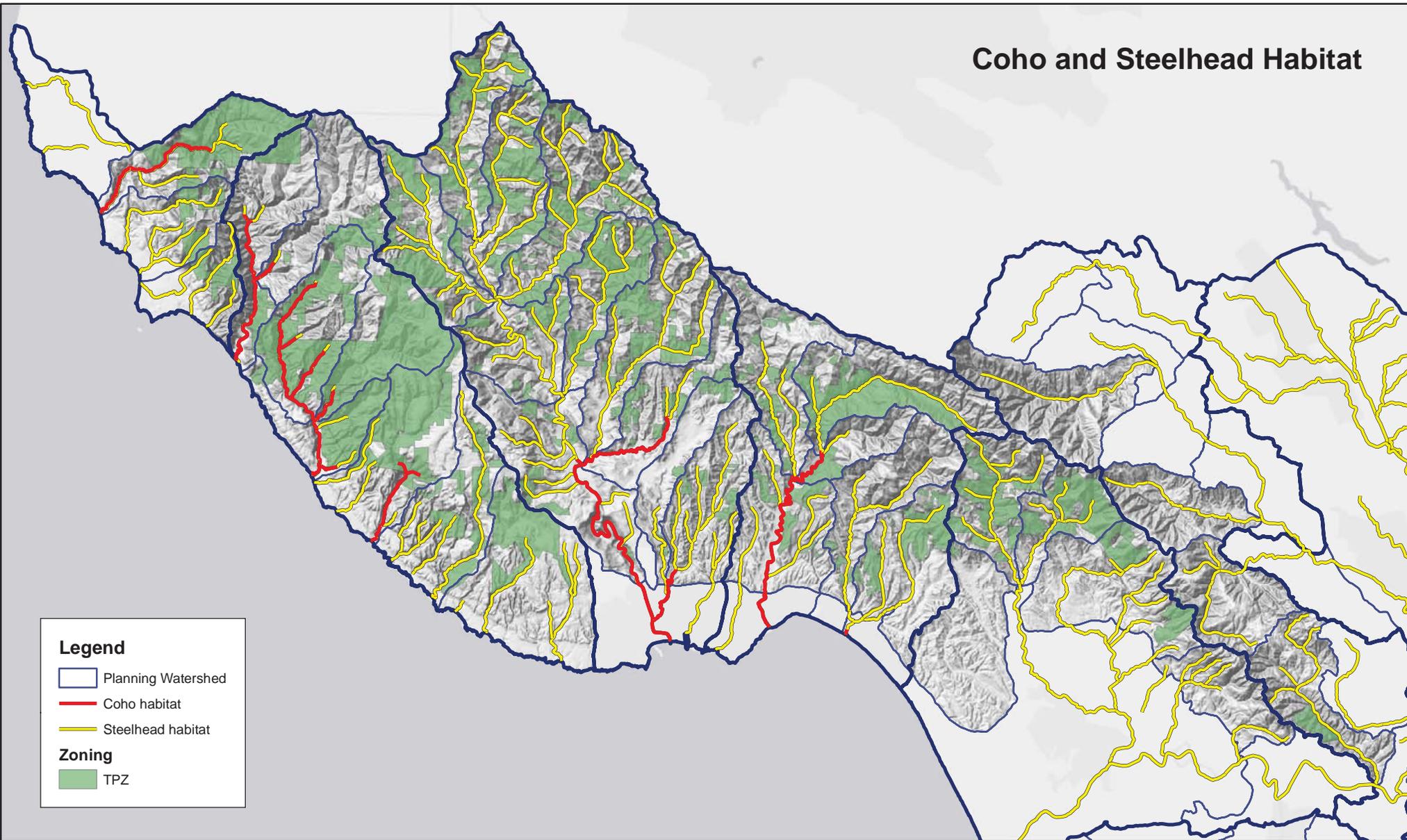
## 14 YR Harvest Rate (1998-2011)



Annualized Harvest Rate (1998-2011)											
Ano Nuevo		Davenport		San Lorenzo		Aptos-Soquel		Watsonville		Santa Cruz Mtns	
Cascade Creek	0.2%	Waddell Creek	0.0%	Kings Creek	1.5%	Soquel Creek	1.1%	Browns Creek	2.1%	Uvas Creek	0.0%
Green Oaks Creek	0.0%	East Waddell Creek	0.0%	Castlerock Falls	0.5%	Hinckley Creek	1.6%	Corralitos Creek	2.1%	Arthur Creek	0.7%
Gazos Creek	0.4%	Big Creek	0.7%	Love Creek	0.3%	Bates Creek	0.6%	Hughes Creek	0.9%	Pescadero Creek	1.1%
		Little Creek	1.6%	Lorenzo River	0.1%	West Branch Soquel	0.4%	Corralitos Lagoon	0.0%	Blackhawk Canyon	2.2%
		San Vincente Creek	1.4%	Boulder Creek	1.7%	Valencia Creek	1.3%	Coward Creek	0.4%		
		Scot Creek	0.6%	Bear Creek	0.8%	Aptos Creek	0.1%				
		Majors Creek	0.4%	Bean Creek	0.3%						
		Laguna Creek	0.1%	Zayante Creek	0.7%						
				Branciforte Creek	0.1%						
				Carbonera Creek	0.0%						
				Newell Creek	1.3%						



# Coho and Steelhead Habitat



**Legend**

- Planning Watershed
- Coho habitat
- Steelhead habitat

**Zoning**

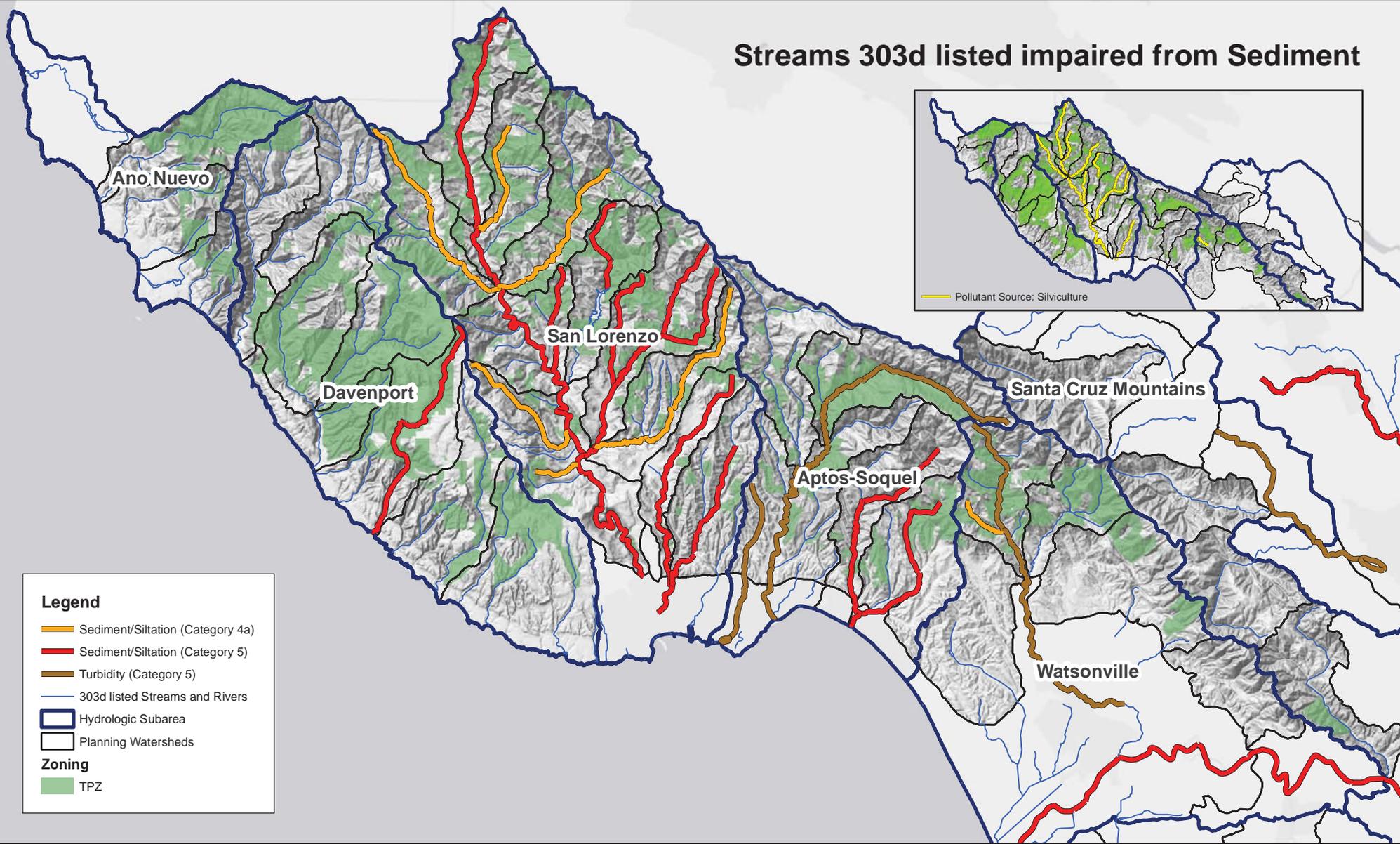
- TPZ



Hydrologic Subarea	Coho Habitat miles of stream	Coho Habitat % within TPZ	Steelhead Habitat miles of stream	Steelhead Habitat % within TPZ
Davenport	24.2	44%	50.9	35%
San Lorenzo	16.7	2%	104.6	16%
Aptos-Soquel	9.4	19%	48.2	25%
Ano Nuevo	5.4	30%	16.1	35%
Watsonville	-	-	57.6	11%
Santa Cruz Mtns	-	-	28.6	2%
<b>total</b>	<b>55.7</b>	<b>26%</b>	<b>306.1</b>	<b>19%</b>



# Streams 303d listed impaired from Sediment



**Legend**

- Sediment/Siltation (Category 4a)
- Sediment/Siltation (Category 5)
- Turbidity (Category 5)
- 303d listed Streams and Rivers
- Hydrologic Subarea
- Planning Watersheds

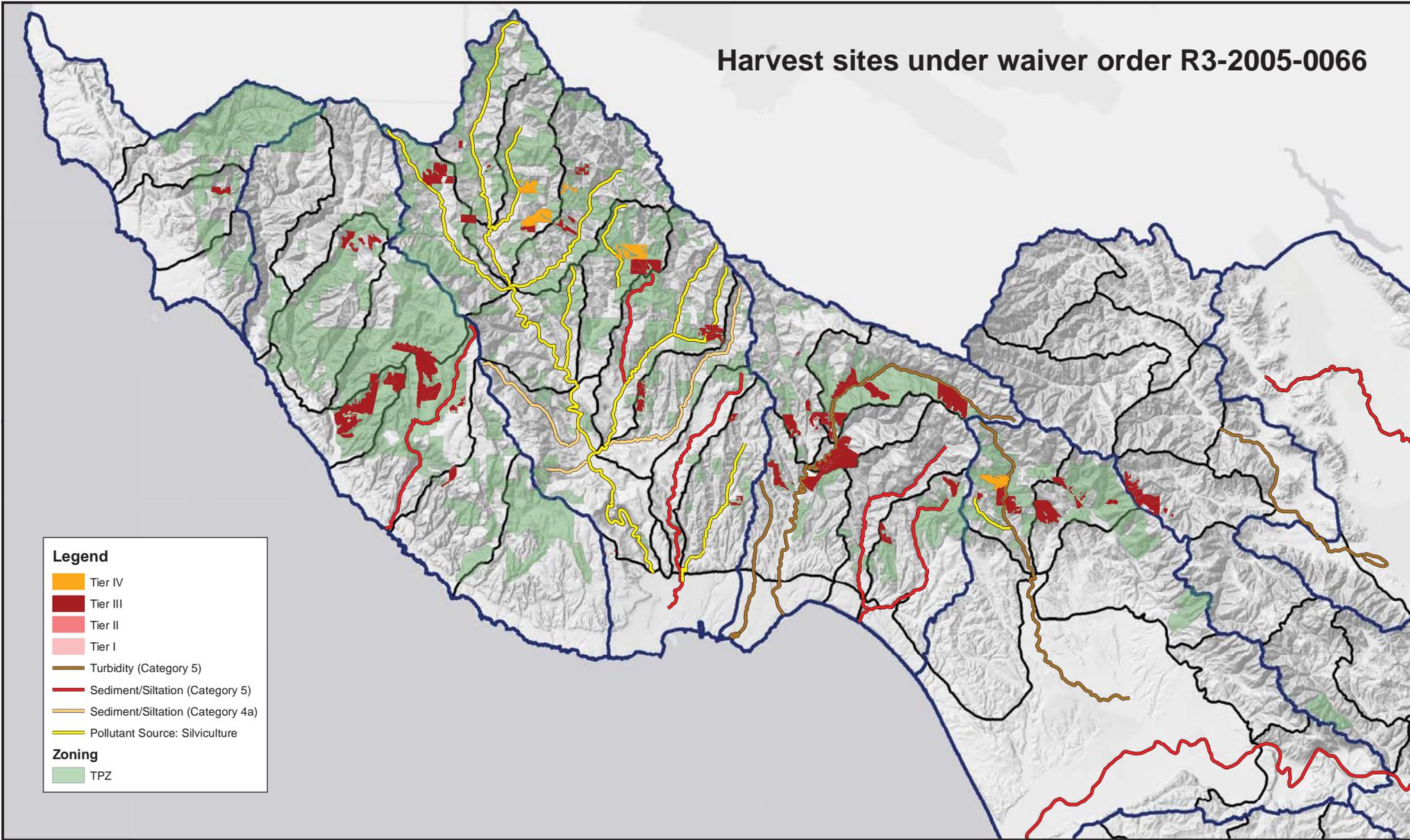
**Zoning**

- TPZ

Hydrologic Subarea	miles of 303d listed streams	% 303d listed stream for Sediment	% 303d listed stream Silviculture
Davenport	103.8	9%	-
San Lorenzo	166.1	64%	47%
Aptos-Soquel	80.7	17%	-
Ano Nuevo	41.1	-	-
Watsonville	87.1	2%	2%
Santa Cruz Mtns	64.7	-	-
<b>total</b>	<b>543.4</b>	<b>24%</b>	<b>15%</b>



# Harvest sites under waiver order R3-2005-0066



**Legend**

- Tier IV
- Tier III
- Tier II
- Tier I
- Turbidity (Category 5)
- Sediment/Siltation (Category 5)
- Sediment/Siltation (Category 4a)
- Pollutant Source: Silviculture

**Zoning**

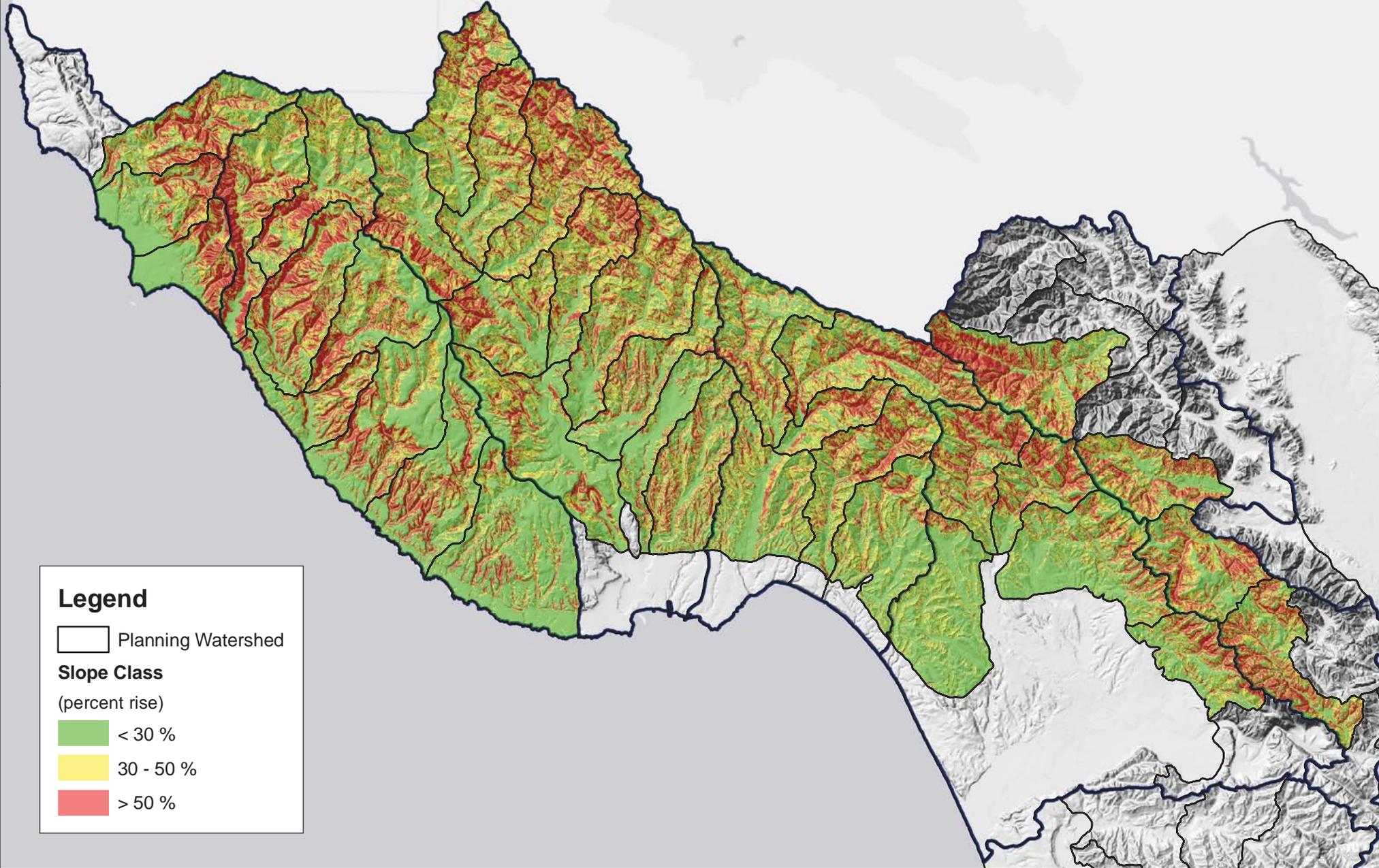
- TPZ

Tier	Acres	% Acres	Count	% of Waivers
I	94	1%	3	5%
II	327	4%	4	7%
III	5,656	77%	44	77%
IV	1,305	18%	6	11%
	<b>7,382</b>		<b>57</b>	



R3-Timber-Map 6. Jan 2012





**Legend**

□ Planning Watershed

**Slope Class**  
(percent rise)

- < 30 %
- 30 - 50 %
- > 50 %

## Eligibility Criteria Explanation

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## Eligibility Criteria Explanation

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**Table 1. Summary of Eligibility Criteria Changes**

Existing Criteria	Revised Criteria	Proposed Changes																									
<p>Monitoring Tier Determination (Refer to Figure 8)</p> <table border="0"> <tr> <td></td> <td>High</td> <td>Med</td> <td>Low</td> <td></td> </tr> <tr> <td>Cumulative Effects Ratio</td> <td>&gt;15%</td> <td>15% to 10%</td> <td>&lt;10%</td> <td>I &lt; 35 %</td> </tr> <tr> <td>Drainage Density Index</td> <td>&gt;100</td> <td></td> <td>&lt;100</td> <td>II 36-45 %</td> </tr> <tr> <td>Soil Disturbance Factor</td> <td>&gt;2500</td> <td>2500 to 1000</td> <td>&lt;1000</td> <td>III 46-55 %</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>IV &gt; 56%</td> </tr> </table>		High	Med	Low		Cumulative Effects Ratio	>15%	15% to 10%	<10%	I < 35 %	Drainage Density Index	>100		<100	II 36-45 %	Soil Disturbance Factor	>2500	2500 to 1000	<1000	III 46-55 %					IV > 56%	<p>Monitoring Tier Determination</p>	<p>Existing Criteria: monitoring tier threshold formulation uses weighted values through a hierachical set.</p> <p>Revised Criteria: Tiers based on analysis of statistical sample sites (Table 2). Formulation of submitted inputs assessed through an equally weighted criteria set.</p>
	High	Med	Low																								
Cumulative Effects Ratio	>15%	15% to 10%	<10%	I < 35 %																							
Drainage Density Index	>100		<100	II 36-45 %																							
Soil Disturbance Factor	>2500	2500 to 1000	<1000	III 46-55 %																							
				IV > 56%																							
<p><b>Cumulative Effects Ratio (CER)</b></p>	<p><b>Cumulative Effects Ratio (CER)</b></p>	<p><b>Cumulative Effects Ratio (CER)</b></p>																									
<p><b>Q1.</b> Is proposed harvest in a 303(d) listed watershed?***                      **Watershed 303d listed as impaired from sediment or temperature? If yes type "yes" or leave blank.</p> <p><b>Q2.</b> Acres Proposed for Harvest or Harvested in Planning Watershed (CalWater) in last fifteen years (includes all acreage in proposed and approved THPs/NTMPs)</p> <p><b>Q3.</b> Acres to be harvested as part of proposed THP/NTMP</p> <p><b>Q4.</b> Total Acres in Planning Watershed</p>	<p><b>Q1.</b> Number of Harvest Acres</p> <p><b>Q2.</b> Planning Watershed Number (Calwater2.2)</p> <p><b>Q3.</b> Planning watershed is listed for sediment under 303(d)*</p> <p><b>Q4.</b> Silviculture listed as a source for sediment under 303(d)*                      *Response automatically references the 'CalwaterID stats' to determine y or n response.</p> <p><b>Q5.</b> Are Winter operations proposed?</p>	<p>Existing Criteria: Calculates rate of harvest for last 15 years from NOI applicant submitted data.</p> <p>Revised Criteria: Calculates an average harvest rate from the 15 and 5 year data available.</p> <p>Three additional questions weighted with the avg harvest rate are based on 1) presence of sediment impaired streams regardless of sources, 2) presence of sediment impaired stream attributed to silviculture, and 3) whether or not the plan calls for winter operations.</p>																									

Existing Criteria	Revised Criteria	Proposed Changes
<p align="center"><b>Drainage Density Index (DDI)</b></p> <p><b>Q1. Linear feet of Class I stream</b></p> <p><b>Q2. Linear feet of Class II stream</b></p> <p><b>Q3. Linear feet Class III stream</b></p> <p><b>Q4. Plan area acres</b></p>	<p align="center"><b>Drainage Density Index (DDI)</b></p> <p><b>Q1.</b> Linear feet of Class I stream a. in slope class &lt; 30% b. in slope class 30-50% c. in slope class &gt;50%</p> <p><b>Q2.</b> Linear feet of Class II stream a. in slope class &lt; 30% b. in slope class 30-50% c. in slope class &gt;50%</p> <p><b>Q3.</b> Linear feet Class III stream a. in slope class &lt; 30% b. in slope class 30-50% c. in slope class &gt;50%</p> <p>Note: Plan Acres automatically references Plan Acres input from CER.</p>	<p align="center"><b>Drainage Density Index (DDI)</b></p> <p>Existing Criteria: weights class 1 stream highest and class 3 streams lowest.</p> <p>Revised Criteria: Based on proportion of combined risk factors 1) extent of WLPZ/ ELZ acres, 2) proportion of stream side slope class greater than 30%, and 3) proportion of class II and III streams within plan boundary.</p>
<p align="center"><b>Soil Disturbance Factor (SDF)</b></p> <p><b>Q1. Silviculture</b> a) Harvest Area (ac): Group and Selection b) Area in THP (ac)</p> <p><b>Q2. Roads</b> a) Linear Feet of Existing and Proposed: Seasonal/Temporary and All weather/ Permanent b) Number of: Class I, Class II, and Class III streams crossed c) Number of feet In-lieu/Alt rule in WLPZ d) Number of feet in high or extreme EHR</p> <p><b>Q3. Skid Trails</b> a) Linear Feet of Existing and Proposed b) Number of: Class I, Class II, and Class III streams crossed c) Number of In-lieu/Alt rule in WLPZ d) Number of feet in high or extreme EHR</p> <p><b>Q4. Landings (Existing Proposed)</b> a) Ground-based b) Helicopter c) No. of In-lieu/Alt rule in WLPZ</p> <p><b>Q5. Winter Operations Proposed? Yes or No (Yes=Automatic Tier III)</b></p>	<p align="center"><b>Soil Disturbance Factor (SDF)</b></p> <p><b>Q1.</b> Roads (Existing and Proposed) a) Linear Feet of : Seasonal/Temporary and All weather/ Permanent b) Linear Feet in stream protection zone: Seasonal and All weather. c) Number of Class I, Class II, and Class III streams crossed: Seasonal and All weather.</p> <p><b>Q2.</b> Skid Trails (Existing and Proposed) a) Linear Feet: total and in stream protection zones. b) Number of feet in high or extreme EHR and Number of feet in high or extreme EHR in stream protection zones. c) Number of Class I, Class II, and Class III streams crossed and Number of Class I, Class II, and Class III streams crossed under In-lieu/Alt rule of FPR.</p> <p><b>Q3.</b> Landings (Existing and Proposed) a) Number of landings and Number of landings under In-lieu/Alt rule of FPR. b) Number of landings in high or extreme EHR and Number of landings in high or extreme EHR in stream protection zones.</p> <p><b>Q4.</b> At present, are all appropriate road surface materials in place?</p> <p><b>Q5.</b> Are any roads to be regraded before, during, or after the proposed harvest?</p> <p><b>Q6.</b> Are there debris slides associated with sidecast or fill constructed roads?</p> <p><b>Q7.</b> Are there in-sloped road drainages hydrologically connected to stream crossings?</p> <p><b>Q8.</b> Is traffic restricted on plan roads?</p>	<p align="center"><b>Soil Disturbance Factor (SDF)</b></p> <p>Existing Criteria: multiplies inputs for roads, skid trails, and landings by various multipliers to formulate a numerical total. Existing Criteria automatically sets Tier I and Tier II plans into Tier III monitoring requirements if the timber harvest includes winter operation.</p> <p>Revised Criteria: Assessment of inputs based on a proportion of combination of the proportion of roads, skid trails, and landings in close proximity to streams (ie within WLPZ/ELZ and current road management issues. Revised SDF send does not automatically categorize plan in Tier III for winter operations (winter operations is a factor for CER formulation).</p>

### 1.0 Monitoring Tier Determination, Existing and Proposed

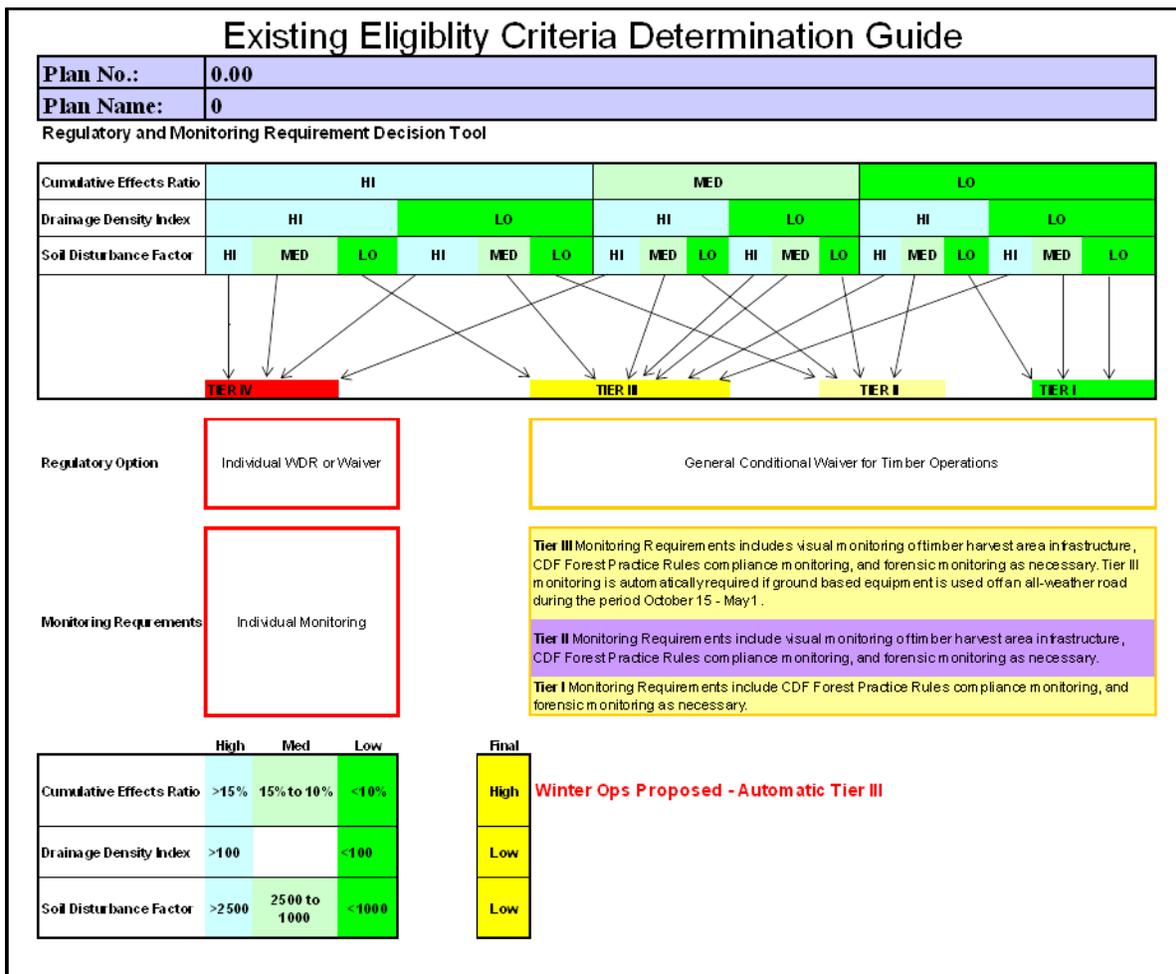


Figure 1. Existing Monitoring Tier Determination (Example)

R3 Timber Harvest Monitoring Tier Determination							
Plan No.:	1-12-### SCR						
Plan Name:	"THP Name"						
				<b>Minimum Monitoring and Reporting Requirements</b>			
	EC Score	score range	Tier	Implementation	Storm Based	Effectiveness	
CER	41%	<35%	I	Nov 15	100 yr	May 15	
DDI	61%	35-45%	II	Nov 15	100 & 50 yr	May 15	
SDF	58%	46-56%	III	Nov 15	100, 50 & 25 yr	May 15	
	$\Sigma \div 3 =$	<b>53%</b>	IV	Nov 15	100, 50, 25, & 10 yr	May 15	

Figure 2. Revised Monitoring Tier Determination (Example)

**2.0 Cumulative Effects Ratio (CER), Existing and Proposed**

<b>Plan No.:</b>	
<b>Plan Name:</b>	

### Cumulative Effects Ratio

Is the proposed harvest in a 303(d) listed watershed? **	Acres Proposed for Harvest or Harvested in Planning Watershed (CalWater) in last fifteen years*	Acres to be harvested as part of proposed THP/NTMP	Sum	Total Acres in Planning Watershed	CER
yes	1,649	100	1749	7,774	22%

\* Include all acreage in proposed and approved THPs/NTMPs

\*\* Watershed 303d listed as impaired from sediment or temperature?  
If yes type "yes" or leave blank.

**Figure 3. Existing Cumulative Effects Ratio**

### Cumulative Effects Ratio (CER)

<b>Plan No.:</b>	1-12-### SCR
<b>Plan Name:</b>	"THP Name"

CER 41%

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Enter values in cells shaded yellow.

THP acres	Planning watershed (Calwater 330#.#####)	Acres Harvested in last 15 yrs	Acres harvested in last 15 years + THP acres	15 year Harvest rate
100	3304.120101	1,649	1749	22%
Calwater ID Acres	% of TPZ in Planning watershed	Acres Harvested in last 5 yrs	Acres harvested in last 5 years + THP acres	5 year Harvest rate
7,774	41%	458	558	7%

15%

---

Planning watershed is listed for sediment under 303(d)	Y	67%
Silviculture listed as a source for sediment under 303(d)	Y	
Are Winter operations proposed ?	N	

**Figure 4. Revised Cumulative Effects Ratio**

## 2.1 Basis for CER Changes

Quantitation and repeatability. Part of the process of preparing THPs requires RPFs to conduct cumulative watershed effects (CWE) assessments for timber harvests in accordance with FPR section 912.9.<sup>1</sup> To a large degree, RPFs base the assessments on a checklist specified in the FPR. The checklist provides comprehensive, detailed recommendations RPFs must consider when evaluating the potential for a timber harvest to adversely affect forest resources, including the potential for sediment, organic debris and other pollutants to impair stream beneficial uses. Some problems with the CWE assessments have been noted as follows: some CWEs have been qualitative, and have lacked repeatability and other important features.<sup>2</sup> However, both the existing and proposed CERs require the input of measured quantities and factual information to a standardized spreadsheet, ensuring its repeatability and consistency from one harvest site to another. Both therefore are welcome additions to the analytical tools available to evaluate the effects of timber harvests on surface water quality.

Automation. The existing CER utilizes the number of acres harvested in past 15 years to estimate relative cumulative effects over time. The proposed CER also considers more recent harvests (i.e. last five years) to provide a better measure of cumulative effects over time. A watershed's sites harvested less than five years earlier potentially contribute more sediment per acre than sites harvested more than five years before. The CER therefore assigns additional risk to acreage harvested within five years before enrollment. Based on the harvest site's planning watershed identification number (WID), which the RPF enters into the spreadsheet, the CER automatically retrieves the 15-year harvest rates and the five-year rate from other spreadsheets stored on the Water Board's website: the CalWater ID statistics table and the Water Board's local file source, respectively; see section 2.2, below.)

The existing CER provides no mechanism to incorporate the 303d status for sediment pollution of streams traversing a harvest site into the CER assessment. In the revised CER, the spreadsheet automatically obtains the 303d status for all streams in the timber harvest zone from the CalWater ID table. If the stream is on the 303d list, the spreadsheet assigns additional risk to the proposed harvest. An additional automatic query to the table establishes whether or not the sediment source has been attributed to silviculture (ie timber management). If so, the spreadsheet assigns more risk. A final query to the RPF: are winter operations proposed? If so, more cumulative risk is assigned.

Other land uses. Water Board staff evaluated whether the EC should consider other land uses in a watershed where timber is harvested. Estimating the CWEs is complicated by the difficulty in quantifying the hydrologic effects of other land use activity. Water Board staff examined suggestions from public comments<sup>4</sup> that the CER consider other land uses. Timber Production Zone (TPZ) GIS layers were readily available for both San Mateo and Santa Cruz Counties. However, data on the extent and locations of unsealed roads out of the TPZ was not found to be sufficiently detailed to justify considering the contribution of CWEs from other land uses in a watershed.

Equivalent clearcut area method. In the absence of a wildfire or major landslide the vegetative recovery on harvest sites in the region is rapid, especially in cases where recovery is supplemented by tree planting. To consider the effect of accelerated vegetative recovery on the cumulative watershed effects (CWE) it is necessary to consider how harvest rates are calculated. In other regions, including the North Coast Region, the method of calculating an acceptable harvest rate is based on an equivalent clearcut area (ECA). ECA is a regression between hydrologic recovery and height of the second growth.<sup>3</sup> An ECA can be used in calculating peak flow indices, which are used to graph the change in peak flows in a given watershed. To date there is little

evidence or example to suggest that ECA calibrated for redwood harvest sites in one region could be universally applied to another region.<sup>3</sup> Substantial additional time and effort would also be needed to run the necessary regression analyses because numerous measurements of forest parameters, unavailable in the Central Coast Region, must be obtained. At present the ECA method is more suited to regions where timber is rarely harvested by selective cutting.

Chosen harvest rate. Water Board staff reviewed the available data and established that the average rate of harvest based on harvested acres reported for the preceding 15 and 5 years, in any given watershed, was the 'best fit' for the selective harvest conditions in the Central Coast Region. By using the average harvest rate staff is able to weigh recent increases in the rate of harvested acres while accounting for the vegetative recovery evident in the field. Calculating the harvest rate using readily available GIS data from Cal Fire also provides a consistent measure and will be instantly validated upon the applicant entering the appropriate planning watershed ID. The issues of site specific cumulative impacts from activity in close proximity to stream channels and impacts related to soil compaction is addressed in the drainage density index and soil disturbance factor of the eligibility criteria discussed on the following pages.

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- <sup>1</sup> Board of Forestry. 2012. Cumulative Impact Assessment. [Technical Rule Addendum No. 2](#) (14 CCR 912.9)
  - <sup>2</sup> Longley, K. 2008. Central Valley Regional Water Quality [Control Board Comments on Key Questions for Agencies \(Group #3 –Cumulative Impacts\)](#). California Board of Forestry and Fire Protection.
  - <sup>3</sup> Klein, R., Trush, W., Buffleben, M. 2008. [Watershed condition, turbidity, and implications for anadromous salmonids in North Coastal California streams](#). A Report to the NCRWQCB.
  - <sup>4</sup> Dennis Jackson (Hydrologist). Mar. 7, 2005. [Eligibility Criteria comments](#).

## 2.2 Data Sources (CER)

The 15 year harvest rate data should be derived from the latest Cal Fire GIS data. The 5 year harvest rate is obtained from the number of acres under waiver.

### 15 & 5 yr GIS harvest boundary files

<[ftp://ftp.fire.ca.gov/forest/SCruz\\_SMateo\\_SClara/Shape\\_files/](ftp://ftp.fire.ca.gov/forest/SCruz_SMateo_SClara/Shape_files/)>

10/31/2011 12:14PM Southbay\_NTMPs.zip  
10/31/2011 12:14PM Southbay\_NTOS.zip  
10/31/2011 12:14PM Southbay\_THPS.zip  
06/13/2011 01:33PM THP\_czu\_Dec\_2010\_tealen27.shp

### 5 yr harvest rate figures

Water Board local file source **S:\NPS\Timber\_Harvest\Monitoring\ MRP status "mm yyyy"**

### 303d listed streams

<[http://maps.waterboards.ca.gov/webmap/303d/files/2010\\_USEPA\\_approv\\_303d\\_List\\_Final\\_122311wsrsrcs.xls](http://maps.waterboards.ca.gov/webmap/303d/files/2010_USEPA_approv_303d_List_Final_122311wsrsrcs.xls)>

### 2.3 Methods and Procedures (CER)

The CER automatically retrieves harvest data by the planning watershed ID number (WID) entered by the RPF into the spreadsheet. 303d listed information is also automatically triggered by the planning watershed submitted. The only information required for input into the CER is the number of acres to be harvested, the WID number, and whether or not winter operations are planned.

When completing the revised, CER applicants should review the data in the 'CalwaterID stats' workbook contained within the EC spreadsheet. If data in the EC spreadsheet is not consistent with the stated data sources, the applicant should notify the designated Water Board staff as soon as possible to enable staff to make adjustments to the EC 'CalwaterID stats' workbook.

### 3.0 Drainage Density Index (DDI), Existing and Proposed

<b>Plan No.:</b>	<b>0.00</b>																		
<b>Plan Name:</b>	<b>0</b>																		
<table border="1"> <tr> <th colspan="6"><b>Drainage Density Index</b></th> </tr> <tr> <th>ft. of Class I</th> <th>ft. of Class II</th> <th>ft. of Class III</th> <th>Corrected Sum</th> <th>Plan Area (ac)</th> <th>DDI</th> </tr> <tr> <td>400</td> <td>500</td> <td>2,000</td> <td>4200</td> <td>100</td> <td>42</td> </tr> </table>		<b>Drainage Density Index</b>						ft. of Class I	ft. of Class II	ft. of Class III	Corrected Sum	Plan Area (ac)	DDI	400	500	2,000	4200	100	42
<b>Drainage Density Index</b>																			
ft. of Class I	ft. of Class II	ft. of Class III	Corrected Sum	Plan Area (ac)	DDI														
400	500	2,000	4200	100	42														

Figure 5. Existing Drainage Density Index

Drainage Density Index					
Plan No.:	I-12-### SCR				
Plan Name:	"THP Name"				
DDI					<b>61%</b>
Enter values in cells shaded yellow.					
Stream Class	WLPZ slope (percent rise)	Linear Feet of Stream in Harvest Plan	Percent of stream class by slope range	Stream Protection Zone widths (feet)	Number of Acres in WLPZ
I	< 30 slope	0	0%	100	0.0
	30 - 50 slope	400	22%	100	1.8
	> 50 slope	0	0%	150	0.0
II	< 30 slope	0	0%	50	0.0
	30 - 50 slope	400	22%	75	1.4
	> 50 slope	100	6%	100	0.5
III	< 30 slope	0	0%	25	0.0
	30 - 50 slope	700	39%	50	1.6
	> 50 slope	200	11%	50	0.5
subtotal		1800		WLPZ Acres	5.7
Plan Acres					100
% plan acres in WLPZ					6%
Stream Class 1		400	22%		
Stream Class 2		500	28%		
Stream Class 3		900	50%		
< 30 slope		0	0%		
30 - 50 slope		1500	83%		
> 50 slope		300	17%		

Figure 6. Revised Drainage Density Index

### 3.1 Basis for Changes (DDI)

The purpose of the DDI is to provide Water Board staff with a quantitative measure of the hydrologic conditions that affect water quality. The Forest Practice Rules (FPR) classifies streams by the aquatic habitat characteristics or key indicators of beneficial uses.<sup>5</sup> Under the FPR class I streams are afforded the highest level of protection (FPR 916.9). The EC incorporates DDI into its risk assessment because threat to water quality from harvest sites increases with the density of watercourses within the watershed. See Figure 7, below. Accordingly, staff developed a method based on the ratio of hydrologic factors posing a greater risk to water quality to factors posing less risk. Higher ratios indicate greater threat to water quality. The ratios developed by staff follow:

- The ratio of areas within the Watershed Lake Protection Zones (WLPZ) and Equipment Limitation Zones (ELZ) to the harvest site area. Both WLPZ and ELZ are riparian zones and pose a greater threat to stream water quality as their area increases in proportion to the harvest site area. The proportion of riparian buffer area reflects the extent of drainage density, while still incorporating the magnitude of importance of stream class because the riparian buffer width is determined by the stream class.<sup>5</sup>
- The ration of class II and class III stream lengths to overall stream length in a harvest area is intended to measure first and second order streams, which compose the uppermost segments of a stream network (i.e. in the headwaters). The headwater streams in a given drainage area typically contribute a larger proportion of stream flow, and sediment and debris inputs.<sup>6</sup>
- The revised DDI uses the ratio of side slopes greater than 30 percent to those less than 30 percent to estimate the level of risk posed by harvests on steeper slopes.

(Staff considered incorporating into the DDI the soil Erosion Hazard Rating (EHR) as a risk assessment factor. However, the sampling suggested for EHRs, which is primarily conducted along roads, for approximately every 20 acres (FPR 932.5) and does not typically capture conditions in and around stream channels.)

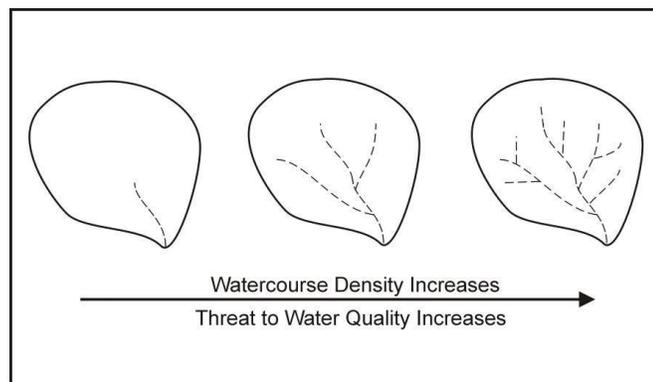


Figure 7. Diagram of drainage density in relation to threat to water quality<sup>7</sup>

<sup>5</sup> FPR [916.5 Table 1](#)

<sup>6</sup> MacDonald, L.H., Coe, D. 2007. [Influence of Headwater Streams on Downstream Reaches in Forested Areas](#). Forest Science, 53, 148–168 Research, Vol. 34:10, pages 2751–2764

<sup>7</sup> CVRWQCB. 2010. [Guidelines for Conducting Required Monitoring for Timber Harvest Related Discharges Enrolled Under the Waiver of Waste Discharge Requirements](#). Central Valley Regional Water Quality Control Board.

### 3.2 Data Sources (DDI)

#### GIS method

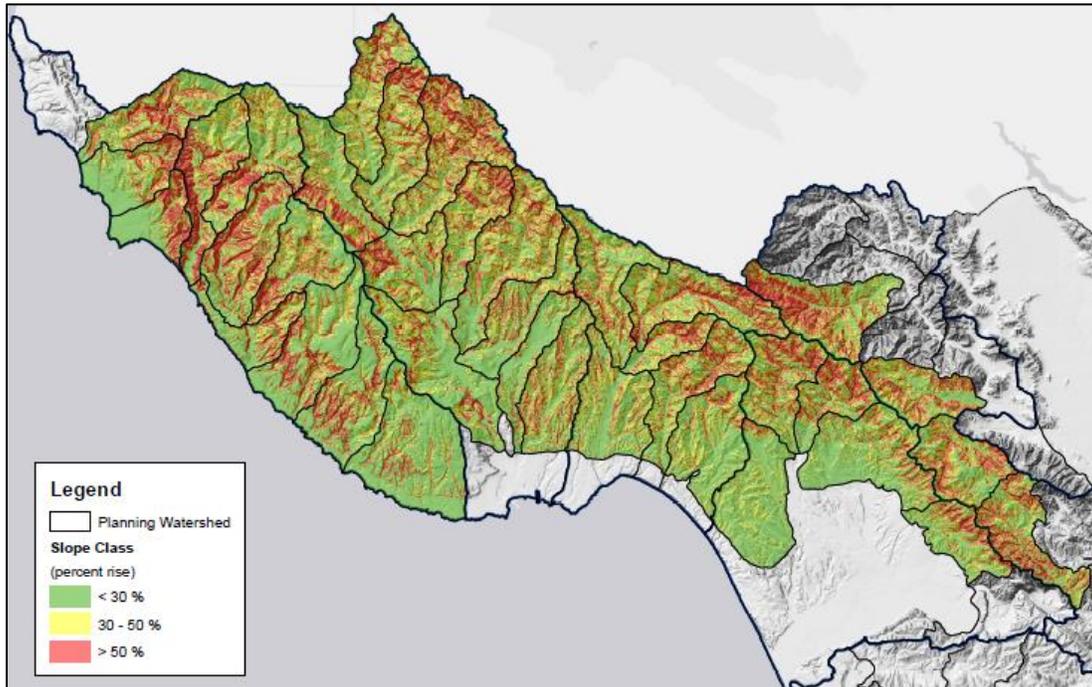


Figure 8. Planning watershed coverage of Slope Class GIS file.

#### Soil EHR method

Soil type slope attribute <<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>>

### 3.3 Methods and Procedures (DDI)

There are two methods to rapidly calculate the necessary linear measurement (in feet) for the revised DDI. The most precise method would be to develop a GIS layer which would delineate stream classes intersected with the staff-generated slope class layer file. The slope class file will be accessible on the Board's website for RPF use. Map 7 in the Timber Program Spatial Analysis project (Appendix B) is a view of the coverage of the slope class layer. The slope class file will be available if applicants choose to use a GIS based system to calculate the DDI.

Without using GIS, it is reasonable to derive the necessary measurements from the proposed harvest soil Erosion Hazard Rating (EHR) map developed by RPFs while preparing THPs. Each soil unit has an associated slope range that can be correlated to an appropriate slope class (percent rise). The stream lengths can be measured with an opsimeter on the EHR map or with a measuring tool in the software used to create the EHR map. Water Board staff plans to replace data sources for both methods when a region-wide slope class layer from a LiDAR generated Digital Elevation Model (DEM) becomes available.



Soil Disturbance Factor										
1-12-### SCR										
"THP Name"										
								<b>SDF</b>	<b>58%</b>	
Enter values in cells shaded yellow.										
<b>Roads<sup>1</sup></b>		<b>Seasonal</b>			<b>All weather</b>					
	Linear feet	Existing	Proposed	Existing	Proposed	Existing	Proposed			
	<b>Total</b>	3000	0	2,000	0					
	<b>In WLPZ</b>	500	100	0	0					
	<b>Number of Crossings</b>									
	rock	0	0	1	0					
	culvert	2	0	4	0					
	bridge	2	0	0	0					
	<sup>1</sup> include non-appurtenant road segments used as the off site hauling route									
<b>Skid Trails</b>		<b>in WLPZ/ELZ</b>			<b>in WLPZ/ELZ</b>					
	Linear feet	Existing	Proposed	Existing	Proposed	Existing	Proposed			
	<b>Total</b>	5,700	1,500	500	500					
	<b>Number of Crossings</b>									
	temporary	3	0	4	5					
	permanent	0	2	0	1					
<b>Landings</b>		<b>in WLPZ/ELZ</b>			<b>in WLPZ/ELZ</b>					
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed		
	<b>Total</b>	4	1	1	0					
	1. At present, are all appropriate road surface materials in place?									N
	2. Are any roads to be re-shaped or regraded, before, during, or after the proposed harvest?									Y
	3. Are there debris slides associated with cutslope or fill constructed roads?									Y
	4. Are there insloped road drainages hydrologically connected to stream crossings?									Y
	5. Is traffic restricted on plan roads by locked gates?									N
										<b>100%</b>

% Road Existing + Proposed in WLPZ	% Skid Trail Existing + Proposed in WLPZ	% Landing Existing + Proposed in WLPZ	SDF
12%	14%	20%	15%

Seasonal		All weather	
Existing	Proposed	Existing	Proposed
60%	0%	40%	0%
10%	2%	0%	0%
0%	0%	11%	0%
22%	0%	44%	0%
22%	0%	0%	0%

in WLPZ/ELZ		in WLPZ/ELZ	
Existing	Proposed	Existing	Proposed
79%	21%	7%	7%

In lieu / Alt Rule		In lieu / Alt Rule	
Existing	Proposed	Existing	Proposed
20%	0%	27%	33%
0%	13%	0%	7%

in WLPZ/ELZ		in WLPZ/ELZ	
Existing	Proposed	Existing	Proposed
80%	20%	20%	0%

Figure 10. Revised Soil Disturbance Factor

### 4.1 Basis for Changes to SDF

The purpose of the SDF is to quantify the proportion of roads, skid trails, and landings that are near to and hydrologically connected to streams and to incorporate known threats to water quality from road management. Accordingly, the spreadsheet requires input of the lengths of roads and skid trails in the harvest site and the lengths in the WLPZ. The spreadsheet then computes the ratios and assigns the associated risk level.

The SDF spreadsheet also poses a set of five road management questions that reflect more commonly observed issues in the region and which the body of forest road literature has addressed in greater detail.

For instance, the findings in the following citation support the basis for Question 1: In forested areas, roads, skid trails, and landings (i.e. exposed compacted surfaces) are chronic and episodic source of excess sediment.<sup>9</sup> In Central Coast Region, uneven age management typically results in more frequent harvest return intervals when compared to even age management.<sup>9</sup> Higher frequency harvest can result in more frequent road use, and if left unmaintained, can lead to more rapid deterioration of road surface aggregates. Implementing appropriate aggregate surface design is a way to minimize rutting.<sup>10</sup> Surface rock installed on forest roads in California have been shown to drastically reduce road surface sediment.<sup>11</sup>

Questions 2 and 4 are supported by the following: Surface erodibility has also been shown to significantly increase when grading involves blading the ditch, cutslope, and travelway.<sup>12</sup> Insloped roads segments tend to concentrate sediment and require additional drainage features to prevent sediment discharges to streams.<sup>13</sup>

Question 3 finds support from the following: Surface erosion from forest roads is not the dominant source of management-related sediment production in all cases.<sup>9</sup> Where hillslope processes are the dominant sources of sediment, cutslope or fill constructed roads, especially on debris slides, exhibit serious mass wasting potential, particularly during intense rainfall.<sup>14</sup> Question 3 in the SDF indicates there is an elevated risk from cutslope and fill roads on or near debris slides. The extent of slide features and proximity to streams is best assessed in the field and by carefully reviewing the 'Engineering Geologic' report.

### 4.3 Data Sources

Linear measurements are derived from the harvest plan maps or by GIS based tools. The number and type of stream crossings are derived from the most recent road inventory assessment.

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- <sup>9</sup> Cafferata, P.H., Coe, D., and Harris, R.R. 2007. [Water resource issues and solutions for forest roads in California](#). Proceedings of the American Institute of Hydrology 2007 Annual Meeting and International Conference. Hydrological Science and Technology 23(1-4):39-56
- <sup>10</sup> Toman, E.M., Skaugset, A.E. 2007. [Designing forest roads to minimize turbid runoff during wet weather use](#). In: Proceedings of the 10-14 March 2007 Conference titled "Watershed Management to Meet Water Quality Standards and TMDLs," San Antonio, TX. American Society of Agricultural and Biological Engineers. p. 612-616.
- <sup>11</sup> Coe, D. 2006. Sediment production and delivery from forest roads in the Sierra Nevada, California. M.S. Thesis, Colorado State University, Fort Collins, CO. 110 p.
- <sup>12</sup> Luce, C. H., Black, T. A.. 2001. [Effects of traffic and ditch maintenance on forest road sediment production](#). Pages V67-V74 in The Seventh Federal Interagency Sedimentation Conference, Reno, Nevada.
- <sup>13</sup> Cafferata, P., Spittler, T., Wopat, M., Bundros, G., Flanagan, S. 2004. [Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment](#). California Forestry Note 1. State of California. Natural Resources Agency. Department of Forestry & Fire Protection.
- <sup>14</sup> California Department of Conservation. 1999. [Factors Affecting Landsliding in Forested Terrain](#). Division of Mines and Geology. Note 50.

## Key Terms related to the Timber Harvest Program

- *Relevant links related to timber harvest and water quality*

### **BMP** Best Management Practices (40 CFR 130.2(Q))

A practice or combination of practices considered by a State [or authorized Tribe] to be the most effective means (including technological, economic and institutional considerations) of preventing or reducing the amount of pollution by nonpoint sources to a level compatible with water quality goals.

### **BOF** [Board of Forestry](#) (PRC 740)

The Board of Forestry and Fire Protection is a government-appointed body within the Department of Forestry and Fire Protection. It is responsible for developing the general forest policy of the state, for determining the guidance policies of the Department and for representing the state's interest in federal forestland in California.

- [Water Quality Monitoring in the Forested Watersheds of California: Status and Future Directions](#) (BOF, Monitoring Study Group, 2009)
- [FRAP: Water Quality and Quantity Assessment](#) (Cal Fire, 2010)

### **FPR** [Forest Practice Rules](#), (14 CCR Chapters 4, 4.5, 10)

Prepared for: California Licensed Timber Operators and California Registered Professional Foresters. Contains: Z'berg-Nejedly Forest Practice Act; Pertinent Excerpts from Protection of Forest, Range and Forage Lands - Prohibited Activities and The Wild and Scenic Rivers Act; The Professional Foresters Law and Registration of Professional Foresters Rules, and with information related to Forest Roadbed Materials.

- [Calfire's Role in Timber Harvest](#)
- [California Geologic Survey Role in Timber Harvest](#)
- [Department of Fish and Games Role in Timber Harvest](#)

### **GIS** Geographic Information System

An integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed. ([ESRI](#), 2012)

### **MRP** Monitoring and Reporting Program

A set of specific measurable requirements to achieve and procedures for reporting the attainment of the Regional Water Quality Control Boards Basin Plan objectives.

**NTMP** Non-Industrial Timber Management Plan, ([PRC § 4593.2\(e\)](#))

- [Cal Fire report to the Legislature on NTMP](#) (2003)

**NTO** Notice of Timber Operations

Notification filed under the NTMP pursuant 14 CCR § 1090.7 and PRC § 4594. This Notice of Timber Operations is effective for a maximum of one year from the date of filing. Timber operations may commence immediately unless the Notice has been filed by mailing, in which case operations may commence 3 days after the Notice has been mailed.

**Planning Watershed (same as ‘subwatershed’)**

A contiguous land base and associated watershed system that forms a fourth order or other watershed typically 10,000 acres or less in size. Planning watersheds are used in planning forest management and assessing impacts. Third order basins flowing directly into the ocean shall also be considered an appropriate planning watershed. (FPR, 2012)

**SAP** Spatial Analysis Project

A GIS-based strategic management tool that allows agencies to spatially display relevant information and identify areas of opportunity to focus future program efforts. ([USFS](#), 2009)

**Silviculture** is the theory and practice of controlling the establishment, composition and growth of forests. (FPR, 2012)

**Uneven-Aged Management**

Management of a specific forest, with the goal of establishing a well stocked stand of various age classes and permits the periodic harvest of individual or small groups of trees to realize the yield and continually establish a new crop. (FPR, 2012)

**THP** Timber Harvest Plan, ([PRC § 4582](#))

**WLPZ** Watercourse and Lake Protection Zone (**pages 66-103, FPR Handbook, 2012**)

A strip of land, along both sides of a watercourse or around the circumference of a lake or spring, where additional practices may be required for protection of the quality and beneficial uses of water, fish and riparian wildlife habitat, other forest resources and for controlling erosion. (FPR, 2012)

<b>Procedures for Determining Watercourse and Lake Protection Zone Widths and Protective Measures<sup>1</sup></b>								
<b>Water Class Characteristics or Key Indicator Beneficial Use</b>	1) Domestic supplies, including springs, on site and/or within 100 feet downstream of the operations area and/or		1) Fish always or seasonally present offsite within 1000 feet downstream and/or		No aquatic life present, watercourse showing evidence of being capable of sediment transport to Class I and II waters under normal high water flow conditions after completion of timber operations.		Man-made watercourses, usually downstream, established domestic, agricultural, hydroelectric supply or other beneficial use.	
	2) Fish always or seasonally present onsite, includes habitat to sustain fish migration and spawning.		2) Aquatic habitat for nonfish aquatic species.					
	3) Excludes Class III waters that are tributary to Class I waters.							
<b>Water Class</b>	<b>Class I</b>		<b>Class II</b>		<b>Class III</b>		<b>Class IV</b>	
<b>Slope Class (%)</b>	<b>Width Feet</b>	<b>Protection Measure</b>	<b>Width Feet</b>	<b>Protection Measure</b>	<b>Width Feet</b>	<b>Protection Measure</b>	<b>Width Feet</b>	<b>Protection Measure</b>
					[see 916.4(c)] [see 936.4(c)] [see 956.4(c)]		[see 916.4(c)] [see 936.4(c)] [see 956.4(c)]	
<30	75	BDG	50	BEI	See CFH		See CFI	
30-50	100	BDG	75	BEI	See CFH		See CFI	
>50	150 <sup>2</sup>	ADG	100 <sup>3</sup>	BEI	See CFH		See CFI	
1 - See Section 916.5(e) for letter designations application to this table. 2 - Subtract 50 feet width for cable yarding operations. 3 - Subtract 25 feet width for cable yarding operations.								

Source: FPR, page 72.