5.0 REGIONAL POLICY TO IMPLEMENT THE WATER QUALITY OBJECTIVES FOR TEMPERATURE

The staff of the Regional Water Board is proposing a Basin Plan amendment that will establish a Policy for the Implementation of the Water Quality Objectives for Temperature (Policy) in the North Coast Region. The Policy identifies land use and discharge factors that have potential to elevate water temperatures, and directs staff to use all available tools and approaches, both regulatory and non-regulatory, to ensure water temperature concerns are addressed. The land use and discharge factors have been identified during the development of north coast temperature TMDLs. The amendment identifies actions staff will undertake to address those factors that may prevent the attainment of the water quality objectives for temperature. The actions were developed so that implementation of the actions implement load allocations established in temperature TMDLs and maintains compliance with the water quality objectives for temperature in waterbodies not already impaired by elevated water temperatures.

5.1 Factors Identified in the Policy to Implement the Water Quality Objectives For Temperature

The proposed Policy identifies a number of activities and other actions (factors) that have potential to elevate water temperatures. The Policy identifies these general factors as those the Regional Water Board will address through implementation of regulatory programs and collaboration with partners to attain and maintain the intrastate and interstate water quality objectives for temperature. The factors were identified based on the conclusions and insights developed during the development of temperature TMDL analyses, as explained in Section 2.0. The factors are:

1. Activities with the potential to reduce riparian shading of waterbodies;
2. Activities with the potential to increase sediment delivery;
3. The quality, quantity, location and timing of effluent, storm water, and agricultural return flow discharges;
4. The location, size, and operation of in-channel impoundments with the ability to alter the natural temperature regime;
5. Actions with the potential to change stream channel geometry;
6. Activities with the potential to reduce instream flows or reduce specific sources of cold water, including cold water refugia.

The factors identified above represent a range of activities and actions. Many of the factors come under the direct permitting authority of the Regional Water Board, while others are regulated through the authorities of other agencies.

5.2 Justification of the Policy Factors

The justification and scientific rationale for each of the identified factors is presented below. Each of the Policy Factors is also represented in Figure 5.1, a conceptual model originally developed for the Klamath River temperature TMDL which graphically represents the drivers of temperature alteration, the resulting physical changes to environmental conditions, and consequent impacts to beneficial uses.

5.2.1 Activities with the potential to reduce riparian shading of waterbodies

Direct solar radiation is the primary factor influencing stream temperatures in most stream environments during summer months. The energy added to a stream from solar radiation far outweighs the energy lost or gained from evaporation or convection (Beschta et al. 1987, Johnson 2004, Sinokrot and Stefan 1993). At a given location, incoming solar radiation is a function of position of the sun, which in turn is determined by latitude, day of the year, and time of day. During the summer months, when solar radiation levels are highest and streamflows are low, shade from streamside forests and vegetation can be a significant control on direct solar radiation reaching streams (Beschta et al. 1987). Because shade limits the amount of direct solar radiation reaching the water, it provides a direct control on the amount of heat energy the water receives. At a workshop convened by the state of Oregon's Independent Multidisciplinary Science Team, 21 scientists reached consensus that solar radiation is the principal energy source that causes stream heating (Independent Multidisciplinary Science Team 2000).

Although the dominance of solar radiation as the primary driver of stream temperature is well accepted (Johnson 2004, Johnson 2003, Sinokrot and Stefan 1993, Theurer et al. 1984), some studies have indicated that air temperatures are the prime determinant of stream temperatures. This is because of the relationship between air temperature and equilibrium temperature discussed in section 2.2. In short, air temperature determines equilibrium temperatures, and thus how hot a stream can be, while shade and flow determine how quickly a stream approaches the equilibrium, and thus how hot a stream actually becomes. Heat budgets developed to track heat exchange consistently demonstrate that solar radiation is the dominant source of heat energy in stream systems (Johnson 2004, ODEQ 2002, Sinokrot and Stefan 1993). Stream temperature modeling conducted in support of north coast temperature TMDLs (see section 2.4, above) confirmed that solar radiation is the dominant heat exchange process in the North Coast Region.

The conclusion that solar radiation is the dominant source of stream temperature increases is supported by studies that have demonstrated both temperature increases following removal of shade-producing vegetation, and temperature decreases in response to riparian planting. Johnson and Jones (2000) documented temperature increases following shade reductions by timber harvesting and debris flows, followed by temperature reductions as riparian vegetation became re-established. Shade loss caused by debris flows and high waters of the flood of 1997 led to temperature increases in some Klamath National Forest streams (de la Fuente

and Elder 1998). Riparian restoration efforts by the Coos Watershed Association reduced the maximum value of the weekly average temperature of Willanch Creek by 2.8 °C (6.9 °F) over a six-year period (Coos Watershed Association undated). Miner and Godwin (2003) reported similar successes following riparian planting efforts.

Shade is created by vegetation and topography; however, vegetation typically provides more shade to rivers and streams than topography in streams that are not wide relative to the height of vegetation. In these streams the shade provided by vegetation has a dramatic, beneficial effect on stream temperatures. The removal of vegetation can decrease shade, which increases solar radiation levels, which, in turn, increases both average and maximum stream temperatures, and leads to large daily temperature variations (see Figure 5.1). Additionally, the removal of vegetation can alter microclimates, increasing ambient air temperatures, and vegetation removal can result in bank erosion, and result in a wider and shallower stream channel geometry, all of which can increase water temperatures.

Activities with the potential to reduce riparian shade include timber harvest, road building and maintenance, property development, vegetation conversions, agriculture, grazing, and other activities that have the potential to result in modification of riparian vegetation conditions.

5.2.2 Activities with the potential to increase sediment delivery

Increased sediment loads and associated changes in channel morphology can affect stream temperature conditions in multiple ways. These effects can manifest at both large (watershed-wide) and small (individual reach) scales. Sediment is defined as any inorganic or organic earthen material, including but not limited to: soil, silt, sand, clay, and rock (NCRWQCB 2007). The sizes of sediment that present a temperature concern are those that may result in pool filling, increased channel width, decreased channel depth, and/or a reduction of hyporheic (i.e., intergravel) flow.

Increased sediment loads may also reduce heat exchange associated with hyporheic processes through simplification of the bed topography and reduced permeability due to increases in fine sediment deposition. Hyporheic exchange occurs when surface waters infiltrate into the interstitial spaces of streambeds. As surface water passes through the porous sediment, heat is lost (or gained) through conduction with the sediments. In some settings, streambed conduction can be a significant heat sink that buffers daily maximum temperatures in the summer season (Loheide and Gorelick 2006).

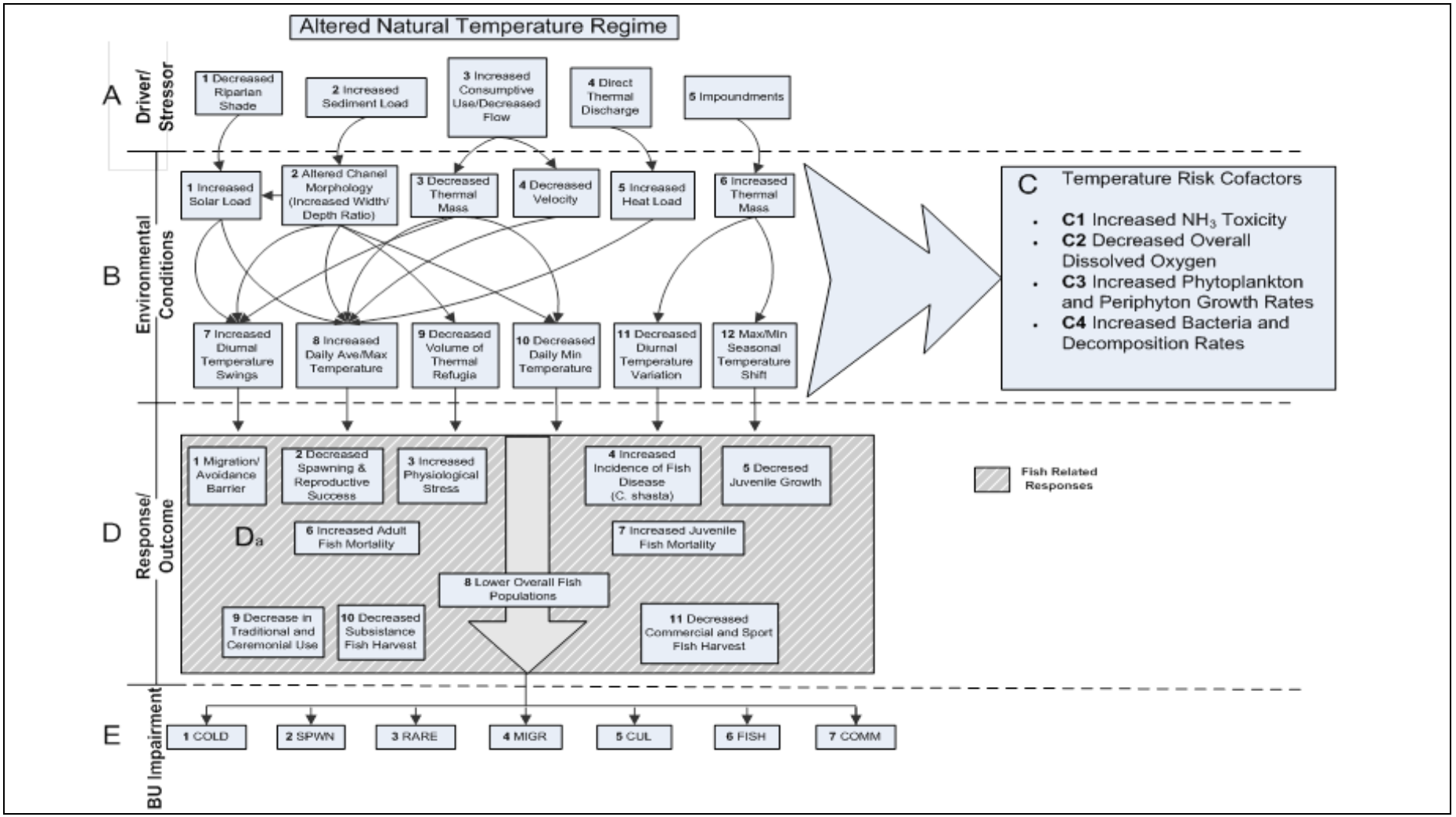

Figure 5.1: Conceptual representation of the causes and effects of temperature alteration and associated impacts to beneficial uses. (Source: NCRWQCB 2010)

Several published studies describe mechanisms of heat transfer dependent on permeability of bed sediments, effects of sediment on stream channel morphology, and stream channel characteristics related to thermal refugia. Vaux (1968) demonstrated that hyporheic exchange is dependent on the topographic complexity of the bed surface and permeability of the sediments. Lisle (1982) reported a simplification of streambed complexity associated with aggradation at stream gauge sites in the North Coast Region following the 1964 flood. He observed that gauging sites went from a pool-like form prior to aggradation, to a riffle-like form with flat cross-sectional profiles following aggradation. Wondzell and Swanson (1999) similarly evaluated the effects of large events on channel form. They specifically evaluated changes in the hyporheic zone resulting from large flood events and demonstrated that simplification of stream channel geometry, including loss of step-pool sequences, decreases intra-gravel exchange rates.

More recently, researchers have quantified the reduction in surface stream temperatures attributable to hyporheic exchange. In a study of Deer Creek in northern California, Tompkins (2006) found that reduced daily maximum water temperatures in hyporheic seeps on the order of 3.5 ^{o}C (6.3 ^{o}F) created thermal refugia for salmonids. In a study similar to Tompkins', Loheide and Gorelick (2006) documented daily maximum temperature reductions on the order of 2 ^{o}C (3.8 ^{o}F) in study of a 1.7 km (1.1. mi) stream reach of Cottonwood Creek in Plumas County, California.

Temperature and sediment concerns are often addressed together through careful management of riparian areas. The establishment of riparian buffers for temperature protection is an effective and important management measure for the control of some types of sediment discharges (Rashin et al. 2006). Maintenance of a vegetated buffer provides a control on the discharge of sediment mobilized by surface erosion (Brandow et al. 2006). Also, the retention of mature trees (and their roots) along a streambank provides bank stability, reducing the discharge of sediment associated with streambank landslides, streambank erosion, and debris flows (Cafferata et al. 2005). Maintenance of a vegetated buffer along streams also can ensure a supply of large woody debris to the stream channel, which is critical for metering of sediment, channel forming processes, and fish habitat.

Activities with the potential to increase sediment delivery include road building and maintenance, timber harvest, property development, vegetation conversions, agriculture, and other activities that have the potential to disturb soils, concentrate runoff, and decrease hill slope and streambank stability.

5.2.3 The quality, quantity, location and timing of effluent, storm water, and agricultural return flow discharges

Discharges of waste such as wastewater effluent, cooling water, stormwater runoff, and irrigation return flows can elevate the temperature of receiving waterbodies through the direct discharge of warmer water.

Flood irrigation is a common irrigation practice in parts of the Klamath basin, including the Klamath Project area and the Shasta River watershed. When irrigation water is applied to a field in this manner, it generally flows across the field as a thin sheet or in shallow rivulets. As the irrigation water runs across the ground it absorbs heat. When irrigation flows return to a stream, they carry with them the increased heat load added as they passed through the irrigated lands. Temperature monitoring of tailwater returns in the Shasta Valley found the highest values of the 7-day average of maximum temperature ranged from 26.9 – 34.5 ^{o}C (80 -94 ^{o}F) at 7 sites (AquaTerra 2012). The net effect of direct thermal discharges is an increase in both daily average and maximum temperatures. The thermal impact of a direct discharge to a stream can be calculated using the mixing equation discussed in section 3.1, above.

5.2.4 The location, size, and operation of in-channel impoundments with the ability to alter the natural temperature regime

The water stored behind an in-channel impoundment (e.g., dam) functions as thermal mass, storing heat. Because larger volumes of water heat and cool slower than smaller volumes, the large volume of water behind an impoundment acts as a temperature buffer, reducing daily temperature variations downstream. Similarly, large volumes of water resist seasonal changes in temperature, and thus delay seasonal temperature changes, resulting in colder temperatures in the spring and warmer temperatures in the fall. In the Klamath River, these effects extend 190 miles downstream to the Pacific Ocean under certain conditions (Bartholow et al. 2005). On the Klamath River the effects are most pronounced immediately downstream of Iron Gate Dam, diminishing in the downstream direction.

The expected biological implications of the changes in diurnal temperature patterns caused by dams are mixed. The decreased diurnal temperature variations associated with dams lead to reduced peak temperatures, thereby reducing the most acutely harmful temperatures. Conversely, the increased daily low temperatures associated with dams could reduce the time available for fish to leave thermal refugia to feed. Also, higher daily low temperatures may lead to higher temperatures at the bottom of thermally stratified pools (Nielsen et al. 1994).

The analysis of the impacts of the four impoundments associated with the Klamath Hydropower Project on river temperatures conducted as part of the Klamath River temperature TMDL found that those effects were significant (NCRWQCB 2010). The seasonal temperature changes caused by the dams have biological implications. The results of the Klamath TMDL analysis are consistent with the findings of Bartholow et al. (2005), who evaluated the thermal effects of the Klamath River dams on downstream reaches and determined that the dams delay the seasonal temperature patterns by approximately 18 days on an annual basis.

The physical implication of an 18-day shift in the seasonal temperature pattern is that the river is cooler in the springtime when juvenile salmonids are migrating to

the ocean, and warmer in the fall when adults are migrating upstream and spawning, and when eggs are incubating in the gravels. Cooler temperatures are known to reduce juvenile salmonid growth rates; however this effect may be mitigated by the benefit gained by reduced incidence of stressfully high temperatures during outmigration. Warmer temperatures in the summer period may reduce the nocturnal feeding opportunities of juvenile salmonids that persist at thermal refugia, thereby reducing their ability to withstand stressfully high daytime temperatures (National Research Council of the National Academies 2004). Warmer temperatures in the fall may delay adult migration or lead to stressfully high temperatures when adults are present or eggs are incubating in gravels.

5.2.5 Actions with the potential to change stream channel geometry

A wider and shallower channel gains and loses heat more readily than a narrow and deep channel. This principal is true for any stream. A stream's width-to-depth ratio influences stream heating processes by determining the relative proportion of the wetted perimeter in contact with the atmosphere versus the streambed. Water in contact with the streambed exchanges heat via conduction. Conductive heat exchange with the streambed has a moderating influence, reducing daily temperature fluctuations. Water in contact with the atmosphere exchanges heat via evaporation, convection, solar radiation, and long-wave radiation. However, wide and shallow channels have a greater surface area per unit of volume in contact with the atmosphere than a narrower, deeper channel. Heat exchange from solar radiation far outweighs heat exchange from evaporation, convection, and long-wave radiation, unless the stream is significantly shaded. The net effect of changes in width-to-depth ratios is that streams that are wide and shallow heat and cool faster than streams that are narrow and deep (Poole and Berman 2001).

The effects of a wider and shallower channel are similar to the effects of increased solar loading, in part because channel widening results in increased solar loading. Both changes lead to increases in daily average and maximum temperatures, increased diurnal fluctuations, and may lead to decreased daily minimum temperatures.

The width-to-depth ratio of a stream can be altered through many avenues. Direct manipulation of the stream channel during construction or flood control maintenance activities can result in the removal of roughness elements such as boulders and large woody debris. Activities with potential to cause coarse sediment discharges can cause changes in streambed morphology downstream of the sediment inputs. Similarly, hydromodification associated with increases in impervious surfaces and stormwater routing can also change the geometry of a stream channel.

5.2.6 Activities with the potential to reduce instream flows or reduce specific sources of cold water, including cold water refugia.

Surface water diversions decrease the volume of water in the stream, and thereby alter a stream's response to heat inputs. When water is removed from a stream the

thermal mass and velocity of the water is decreased. Thermal mass refers to the ability of a body to resist changes in temperature. Basically, less water heats or cools faster than more water. Decreases in velocity increase the time required to travel a given distance, and thus increases the time heating and cooling processes can act on the water. These principles are true for any stream, and work in concert with other heat exchange processes to determine the overall temperature of a stream.

Groundwater withdrawals can also decrease the volume of water in a stream, depending on the situation. Where groundwater aquifers interact with streams groundwater withdrawals can either draw water from the stream or intercept groundwater that would have otherwise discharged to the stream (Winter et al. 1998). The Scott River temperature TMDL analysis identified the interaction of groundwater and surface water as a key factor determining stream temperatures of the mainstem Scott River. The Scott River is primarily a groundwater dominated stream from July-September (NCRWQCB 2005).

The increase in the rate of heating that accompanies a decrease in the volume of flow in a stream can have significant temperature effects. A decrease in thermal mass results in higher daily high stream temperatures and lower daily low stream temperatures, as well as higher daily average temperatures. Reduced velocities also result in higher daily average stream temperatures.

Direct diversion of surface water reduces stream flows and extraction of groundwater connected to surface waters may as well. Activities that reduce infiltration of precipitation and flood waters, such as construction of impervious surfaces and levees, can reduce groundwater inputs to surface waters (Winter et al. 1998).

Thermal refugia are typically identified as areas of cool water created by inflowing tributaries, springs, seeps, upwelling hyporheic flow, stratified pools, and/or groundwater in an otherwise warm stream channel offering refuge habitat to cold-water fish and other cold water aquatic species (NCRWQCB 2007). Thermal refugia are often the only environments in north coast streams that are habitable to salmonids during the hot summer months (Nielsen and others 1994, Watercourse Engineering 2006, Belchik 1997).

Thermal refugia are often formed in deep pools or pockets of water sheltered from mixing during low flow periods. Nielsen et al. (1994) demonstrated the relationship between pool volume and flow and pool stratification. Simply put, in order for a pool to stratify in the absence of physical features that separate cold water inputs from the main stream flow, the volume of the pool must be large relative to the flow, resulting in extremely low velocities. In these situations, the bottom temperature is determined by the daily low temperature. Activities that either raise the daily minimum temperature or decrease the volume of the pool can impact these stratified pools.

Thermal refugia also can form in areas of a stream separated from currents where cold water sources such as springs, tributaries, or intergravel flows enter the stream (Nielsen and others 1994, Belchik 1997). These refugial areas can be impacted in various ways by activities that discharge fine sediments. Fine sediments can fill the voids between substrate, thereby decreasing intergravel flow decreasing intergravel flow, reduce the volume or cause warming of cold tributary or spring flows, or reduce the topographic complexity of stream channels.

Morphological changes associated with increased sediment loads can also eliminate or result in a decreased volume of thermal refugia in a stream or river and impede access to thermal refugia provided by tributaries. Refugial volume can be reduced or eliminated when deep pools fill with sediment, when side channels are buried, or when cold tributary flows percolate into aggraded tributary deltas or gravel bars before entering the river. Similarly, access to refugial tributaries can be reduced or eliminated when sediment loads result in aggradation and cause a tributary to percolate before entering the mainstem and thus become disconnected from the mainstem or become too shallow for fish to swim. Aggradation has impacted the mouths of Hunter, Turwar, Independence, Walker, Oneil, Portuguese and Grider Creeks (Klamath River tributaries), as well as 14 of 17 small lower Klamath River tributaries surveyed by the Yurok Tribe (De La Fuente and Elder 1998, Kier Associates 1999). Finally, refugia can be eliminated when tributary temperatures increase beyond salmonid thresholds due to the other effects of increased sediment loads discussed above.

Activities that can lead to reduced numbers or volumes of thermal refugia include those that can alter the stream channel configuration, reduce pool volumes, reduce flows, or discharge sediment, such as construction, timber harvest, road building, irrigation, mining, and other activities with the potential to disturb soils, decrease slope stability, increase surface erosion, alter channel morphology, and reduce stream flows.

5.3 Actions to Achieve and Maintain Water Quality Objectives for Temperature

The following are actions identified in the proposed *Policy to Implement the Water Quality Objectives for Temperatures* (Policy). The actions are intended to achieve water quality objectives for temperature and implement temperature TMDLs, including EPA-established TMDLs. The Policy language is presented in bold for emphasis, with a discussion following.

5.3.1 Address Site Potential Shade Using Regulatory and Non-Regulatory Tools

Restore and maintain site potential effective shade conditions through nonpoint source control programs; individual permits and waivers, grants and loans, and enforcement actions; support of restoration projects; and coordination with other agencies with jurisdiction over controllable factors that influence water temperature, as appropriate.

This action directs Regional Water Board staff to consider all opportunities to restore and maintain riparian shade, including both regulatory and non-regulatory means. This direction incorporates the concept of shade as a controllable factor into the water pollution control plan, and in so doing strengthens the Regional Water Board's authority to address riparian shade when establishing waste discharge requirements, waivers, and/or prohibitions.

Nonpoint Source Permitting, Permits, and Waivers

The Regional Water Board has developed nonpoint source permitting programs to address water quality concerns associated with a range of activities. To date, permitting programs involving waste discharge requirements, waivers of waste discharge requirements, or a combination of both have been developed for private timber activities, USFS activities, dairy operations, implementation of the Scott and Shasta River TMDLs, and management of county roads. Regional Water Board staff are currently in the process of developing a permitting program to address water quality concerns associated with agricultural operations, a separate permitting program to address road improvement and related restoration activities in Mendocino County, and participating in a multi-regional effort to develop a framework for a permitting program addressing grazing-related water quality concerns.

An example of the incorporation of shade concerns in nonpoint source permitting is the *Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Federal Land Management Activities on National Forest System Lands in the North Coast Region* (USFS Waiver). The USFS Waiver establishes conditions designed to prevent water quality impacts associated with USFS management activities, such as those related to the management of riparian areas for the purposes of controlling sediment discharges and preserving riparian shade. The USFS Waiver conditions address temperature concerns by requiring the protection, maintenance, and enhancement of riparian conditions and shade.

Another example of the implementation of shade concerns is in the implementation of the *General Waste Discharge Requirements for Discharges Related to Timber Activities on Non-Federal Lands in the North Coast Region* (Timber GWDRs) and other permits of the North Coast Region's timber regulatory program[3]. Timber

[3] Other permits that comprise the North Coast Region's timber regulatory program include the *Categorical Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities On Non-Federal Lands in the North Coast Region* (Non-Federal Timber Waiver), *General*

harvest activities have the potential to impact water temperature, depending on how the activities are conducted. For timber harvest activities on private lands, the Regional Water Board incorporates the California Board of Forestry's Forest Practice Rules into water quality permits for ease of reference, for consistent terminology, and to avoid duplicative processes to the degree possible.

The California Department of Forestry and Fire Protection (CAL FIRE), as the lead agency in approving timber harvest activities on private lands, convenes a multi-agency team that includes CAL FIRE, the California Department of Fish and Wildlife, the California Regional Water Quality Control Boards, the California Geological Survey, and other agencies as needed, to conduct a review of a timber harvest plan (THP). Each agency may recommend incorporating mitigating measures into the THP to reduce adverse impacts of the operation on timberland resources, including the beneficial uses of water. Through this process, Regional Water Board staff have an opportunity to make specific THP recommendations and clarify Basin Plan requirements, if needed, so that the final THP is eligible for enrollment in the timber GWDRs or waivers.

Under the Forest Practice Rules, timber operations within designated watercourse and lake protection zones must adhere to canopy retention standards to address stream temperature issues, sediment and nutrient loading, and recruitment of large woody debris. Recent modifications to the Forest Practice Rules to address anadromous fish habitat (Anadromous Salmonid Protection rules) have resulted in canopy retention standards that are generally protective of shade and water temperatures in the areas where they apply. Compliance with the intrastate water quality objective for temperature may in some instances require additional canopy protections, particularly in areas outside the range of anadromy (e.g., upstream of dams, headwaters of streams and other planning watersheds above migration barriers, and coastal streams with no anadromous salmonid habitat that flow directly to the ocean) and in streams that support aquatic habitat other than fish (i.e., streams identified in the Forest Practice Rules as Class II streams greater than 1000 feet from a stream capable of supporting anadromous salmonids). In these areas the enhanced riparian protections of the Forest Practice Rules' Anadromous Salmonid Protection rules do not apply. The protective measures for watercourse and lake protection zones require that at least 50% of the overstory and 50 % of the understory vegetation be retained (the Rules also have additional requirements for retention of a minimum basal area, which can result in higher canopy levels). The Regional Water Board has found that the 50% canopy retention standard is consistent with site potential effective shade conditions in some, but not all situations, and thus does not ensure the site potential effective shade condition is met. To address this potential gap between temperature protection and Forest

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Waste Discharge Requirements for Discharges for Timber Operations on Non-Industrial Timber Management Plans (NTMPs) in the North Coast Region (NTMP General WDR), and WDRs for discharges related timber harvesting and related land management in the Bear Creek, Elk River, and Freshwater Creek watersheds.

Practice Rule requirements, Regional Water Board staff evaluate the proposed harvest in the field during pre-harvest field inspections with the forester and other members of the interdisciplinary review team, and following discussion with the interdisciplinary team, make recommendations to ensure adequate temperature protection, as needed.

The Timber GWDRs contain a provision that all water quality requirements must be met to qualify for enrollment in the Timber GWDRs. As defined, water quality requirements include water quality objectives (narrative or numeric), prohibitions, TMDL implementation plans, policies, or other requirements contained in a water quality control plan adopted by the Regional Water Board and approved by the State Water Board, and all other applicable plans or policies adopted by the Regional Water Board or State Water Board, including, but not limited to, the State Water Board Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality Waters in California. This proposed Policy would require that timber harvest plans be consistent with this Policy in order to qualify for enrollment in the Timber GWDRs. In application, this policy directs staff to continue implementing temperature load allocations through Timber GWDRs enrollments in areas subject to existing temperature TMDLs, including EPA-established temperature TMDLs. It also directs staff to implement similar shade controls through Timber GWDRs enrollments in areas listed as impaired for temperature, as appropriate, and region-wide, as appropriate and necessary, to prevent future impairments and ensure compliance with the intrastate water quality objective for temperature.

Grants and Loans and Support of Restoration Projects

The Regional Water Board administers programs that include loan and grant funding for construction of municipal sewage and water recycling facilities, remediation of underground storage tank releases, watershed protection and restoration projects, irrigation efficiency, and nonpoint source pollution control projects. These funds can be used for projects that preserve and/or enhance riparian shade, such as riparian fencing, alternative stock watering systems, riparian planting, beaver management, and bioengineered bank stabilization projects. California's Clean Water State Revolving Funds are typically used to fund municipal wastewater infrastructure. However, it's possible that these types of projects could involve aspects that relate to riparian shade also, such as projects involving the upgrading of treatment systems that are adjacent to riparian areas.

Enforcement Actions

The Regional Water Board often takes enforcement actions to address the impacts associated with unpermitted activities causing discharges of waste and associated impacts to riparian areas, including unpermitted removal or destruction of riparian vegetation associated with other discharges. In such cases, the Regional Water Board issues orders, such as a cleanup and abatement order, that require the remediation of impacts to waters of the state, including impacts to riparian vegetation. Remediation of such impacts typically involves the restoration of vegetation that has been removed or destroyed.

Coordination with Other Agencies with Jurisdiction Over Controllable Factors that Influence Water Temperature

The Regional Water Board has the authority to issue permits for the discharge of waste to waters of the state. Temperature impacts are sometimes caused by factors that are not associated with discharges of waste, but are instead caused by activities coming under the direct authority of other agencies. An example of this is the near stream activities that come under the land use planning authority of cities and counties. Cities and counties develop ordinances and define appropriate land uses through the adoption of land use plans and zoning. Sonoma County, for example, has established riparian setbacks in their general and area specific plans that call for restricted activities within certain defined distances from streams.

5.3.2 Implement Sediment Controls

Continue to implement the Sediment TMDL Implementation Policy as a means of addressing elevated water temperature associated with excess sediment discharges. Implement sediment controls consistent with the approach articulated in the Sediment TMDL Implementation Policy to address temperature concerns associated with sediment in areas not impaired by sediment.

This action directs staff to pursue the existing *Sediment TMDL Implementation Policy* (Sediment Policy) as a means of addressing sediment loads for the benefit of temperature conditions. The Sediment Policy directs staff to use existing authorities to strengthen regulatory controls of nonpoint source discharges of sediment. Implementation of that Sediment Policy also partially implements the intrastate water quality objective for temperature insofar as the control of sediment discharges partially addresses elevated water temperatures.

The Sediment Policy is very similar to this proposed policy and reads, in part:

> "The Sediment TMDL Implementation Policy states that the Regional Water Board shall address sediment waste discharges on a watershed-specific basis and directs staff to take the following actions to control sediment waste discharges:
>
> 1. Rely on the use of existing permitting and enforcement actions. These actions are consistent with the NPS Policy.
> 2. Rely on the use of existing prohibitions, including any future amendments.
> 3. Pursue non-regulatory actions, such as Memoranda of Understanding, with other agencies and organizations.
> 4. Work with local governments and non-profit organizations to develop sediment control strategies, such as grading ordinances.
> 5. Encourage organizations and individuals to control sediment waste discharges and conduct watershed restoration activities.
> 6. Focus on public outreach and education.
> 7. Develop a guidance document on sediment waste discharge control.
> 8. Develop a sediment TMDL implementation monitoring strategy." (Basin Plan, page 4-36)

The implementation of the Sediment Policy has been largely achieved to date through the same nonpoint source permitting programs identified above. For instance, the Timber GWDRs require the development of erosion control plans and mitigation of all controllable sediment discharge sites within the timber harvest plan area during the life of the plan (usually 5 years).

5.3.3 Address Temperature Concerns in Future Nonpoint Source Programs

Examine and address temperature impacts when developing permits or programs for nonpoint source activities. Consider and implement, where applicable, all available measures to prevent and control the elevation of water temperatures in permit or program development. Such measures shall include, but are not limited to, sediment Best Management Practices and cleanups, memoranda of understanding or agreement with other agencies, prohibitions against waste discharges, management of riparian areas to retain shade, and mitigation of tailwater and impoundments. Where appropriate, include monitoring requirements for incorporation into permits, programs, and other orders to confirm that management actions required to prevent or reduce elevated temperatures are implemented and effective.

This action directs staff to incorporate elements that address temperature concerns when developing nonpoint source control programs. Regional Water Board staff is currently in the process of developing a permitting program to address water quality concerns associated with cultivated agricultural operations, and participating in a multi-regional effort to develop a framework for a permitting program addressing grazing-related water quality concerns.

There is a wide range of practices that can be employed to address temperature impacts associated with nonpoint sources. These include the designation of riparian management zones that are managed differently than surrounding lands, as well as the avoidance of other factors like tailwater discharges and the removal of vegetation that provides shade to a waterbody. In many cases the development of a water quality management plan is a preferred framework for identifying areas that require special management considerations to prevent water quality impacts, as well as the management practices employed, and documentation of the effectiveness of the practices.

This action also directs Regional Water Board staff to incorporate monitoring requirements into permits to ensure that actions taken to address temperature concerns are effective. The types of monitoring that might accomplish this span a range of monitoring types. For instance, photo point monitoring could be used to verify that best management practices are effective at maintaining riparian vegetation. Similarly, instream temperature monitoring could be required to verify that required conditions of an NPDES permits are achieved.

5.3.4 Address Temperature Concerns in Individual Permits

Address factors that contribute to elevated water temperatures when issuing 401 certifications, NPDES permits, Waste Discharge Requirements, or Waivers of Waste Discharge Requirements, or Prohibitions.

This action envisions conditioning individual waste discharge requirements, waivers of waste discharge requirements, 401 water quality certifications, or prohibitions to address any factors that contribute to elevated water temperatures.

The Clean Water Act delegates the authority to issue permits for dredge and fill activities within waters of the US to the US Army Corps of Engineers (USACE) and USEPA. The authority to issue such permits is declared in section 404 of the Clean Water Act, and these permits are often called 404 permits. Section 401 of the Clean Water Act requires applicants for 404 permits to obtain certification from the state verifying that the activity will comply with state water quality standards. These certifications are often called 401 water quality certifications, or just 401 certifications.

The scope of the State's jurisdiction is more broad than the USACE and USEPA's dredge and fill permitting jurisdiction. The federal authority is limited to waterbodies (i.e.,streams, wetlands, and tidal areas) that are navigable, or have a clear nexus to a navigable waterway (e.g. a wetland that has a surface connection to a navigable stream). The State's authority applies to all waterbodies within the borders of the State. For this reason, the Regional Water Board often issues waste discharge requirements for some dredge and fill activities through a general waste discharge requirement permit for dredge and fill activities. However, the same concerns and considerations are addressed, regardless of the permit.

Regional Water Board staff routinely issue 401 certifications and dredge and fill permits for projects such as bridge maintenance and retrofitting, streambank restoration, road construction and maintenance, as well as one-time projects such as pipeline and communication line crossings, flood channel maintenance, and land developments in areas with wetlands. The Regional Water Board has also issued 401 certifications for unique projects such as the Trinity River Restoration Program and the Highway 101 Willits bypass.

The Regional Water Board also develops and administers Waste Discharge Requirements and Waivers of Waste Discharge Requirements for individual projects. These projects are often unique projects for which no general permit has been developed. These types of projects are often combined with a 401 certification when they involve dredge and fill activities.

The Regional Water Board issues National Pollutant Discharge Elimination System (NPDES) permits for point source discharges, such as wastewater treatment plants, industrial processing facilities, state highways, dairies and confined animal feeding operations, and other facilities that discharge effluent to surface waters. The

Regional Water Board also issues NPDES permits for stormwater discharges associated with construction sites, industrial sites, and municipal runoff.

The 401 certifications, NPDES permits, waste discharge requirements, or waivers of waste discharge requirements issued by the Regional Water Board set conditions to address concerns associated with temperature factors such as reductions in shade, changes in cross sectional configuration, temporary dewatering impacts, and/or sediment deliveries.

Prohibitions against discharges of waste, such as the prohibition against the discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material in relation to logging, construction, and associated activities, act to control discharges that may impact temperature conditions through the discharge of sediment and other settleable materials.

5.3.5 Address Temperature Concerns Using Other Tools

Use other regulatory, executive, and enforcement tools, as appropriate, to address elevated water temperatures and preserve existing cold water resources.

This action calls for approaches that can be employed to address temperature concerns that don't involve the development and administration of permitting processes. Other regulatory, executive, and enforcement tools include basin planning exercises, memoranda of understanding and/or agreement with tribes or other agencies, and enforcement orders, such as cleanup and abatement orders and cease and desist orders.

Other regulatory actions include those that arise from the Regional Water Board's basin planning authority, such as the establishment of beneficial uses and water quality objectives. For instance, the establishment of a riparian ecology beneficial use could be contemplated as an appropriate beneficial use that warrants incorporation into the Basin Plan. Similarly, the Board has the authority to "establish prohibitions that specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted" (Porter-Cologne, Section 13243).

Executive tools such as memoranda of understanding with states, tribes, or other agencies can be utilized to acknowledge common interests, establish procedures for coordination and collaboration in the exercise of authorities, and establish agreements relative to the administration of their authorities and programs for the benefit of water temperature and other water quality conditions.

5.3.6 Address Temperature Concerns Through Support of Restoration

Support and encourage restoration projects that are designed to eliminate, reduce, or mitigate existing sources of temperature impairments. Administer, encourage, and support the use of grant funds to facilitate projects that

address elevated water temperature concerns. Pursue non-regulatory actions with organizations, landowners and individuals to encourage the control of elevated water temperatures, watershed restoration, and protection activities.

Restoration is an important tool for achieving water quality conditions sufficient to protect and restore beneficial uses, and may be particularly necessary to address some temperature impairments. This action directs staff to encourage and promote restoration through the administration of grant funds and collaboration with organizations and individuals as a tool to achieve the water quality objectives for temperature. The Regional Water Board administers a number of grant programs that fund restoration, including the 319(h) and 205(j) grant programs, and sometimes proposition bond funds. However, most of the grant funded projects that address temperature concerns in the North Coast Region are funded through grant programs administered by other agencies, such as the California Department of Fish and Wildlife, US Fish and Wildlife Service, or Natural Resource Conservation Service. This action identifies the role the Regional Water Board can play in the promotion of individual projects funded through grant programs administered by the Regional Water Board, as well as those funded through other funding programs.

Some examples of restoration projects addressing temperature concerns that have been or could be funded through grants are the following:

- the planting of riparian vegetation in areas slow to recover from the legacy effects of past management activities;
- infrastructure, such as fences, stock watering systems, and shade structures to reduce impacts of livestock on riparian vegetation;
- projects that conserve water, resulting in reduced diversion of cold water from springs, streams, and aquifers in connection with surface waters;
- projects that lead to improved understanding of groundwater and surface water dynamics in areas where the interaction of these waters has been identified as a factor contributing to elevated water temperatures; and,
- water storage projects that result in reduced diversion of water during the drier months.

5.3.7 Coordinate with the Division of Water Rights in the Water Rights Permitting Process

Continue to coordinate with the Division of Water Rights by participating in the water right application and petition process, providing monitoring recommendations, joint inspections, submittal of data in support of 401 certifications related to water diversions and/or facilities regulated by the Federal Energy Regulatory Commission, and any other appropriate means to help ensure that the terms of water right permits and licenses are consistent with the water quality objectives for temperature.

This action directs staff to make use of the processes available for interacting with the State Water Resources Control Board's Division of Water Rights in all official capacities the Regional Water Board's authority provides. The State Water Board's Division of Water Rights (Division of Water Rights) issues water right permits for the diversion of surface waters, and Regional Water Board staff often work with Division of Water Rights staff to ensure Basin Plan requirements are reflected in water right permits and other water right orders. The *Policy for Maintaining Instream Flows in Northern California Coastal Streams* (May 4, 2010) specifically calls for involvement by Regional Water Boards to help ensure adequate consideration of water quality concerns. The Division of Water Rights also issues 401 water quality certifications for projects requiring a Federal Energy Regulatory Commission (FERC) license. Regional Water Board staff provides recommendations and identify water quality conditions that are necessary to ensure that the activity will comply with water quality standards. This action directs Regional Water Board staff to continue to work with the Division of Water Rights to ensure that temperature and other water quality concerns are identified and addressed in the water right permitting process in all waterbodies. The process in which the Regional Water Board staff and Division of Water Rights staff have agreed to coordinate on these issues has been established in an interagency memorandum.

5.3.8 Coordinate with the Division of Water Rights in the Development of Instream Flow Studies and Flow Objectives

Coordinate with the Division of Water Rights on the development of instream flow studies and flow objectives, as appropriate.

This action directs staff to coordinate with the Division of Water Rights on the development of instream flow studies. Instream flow studies are sometimes necessary to determine the dynamics of hydrologic systems, including the sources and losses of water, and to understand the amount and distribution of water necessary to support beneficial uses.

This action also directs staff to coordinate with the Division of Water Rights on the development of flow objectives. The development of flow objectives may be appropriate in cases where the instream flow requirements for support of beneficial uses are defined. For instance, a watershed hydrology objective that describes narrative goals for the timing, quantity, and distribution of water could be incorporated into the Basin Plan, as could a numeric flow objective for a particular watershed where specific flow related thresholds are understood.

5.3.9 Provide Other Agencies Guidance and Recommendations

Provide cities, counties, and state and federal agencies guidance and recommendations on compliance with the water quality objectives for temperature. Work with local governments to develop strategies to address the prevention, reduction, and mitigation of elevated water temperatures, including, but not limited to, riparian ordinances, general plans, and other management policies.

This action directs staff to communicate guidance and recommendations, such as comment letters or face-to-face meetings, with state, federal, and local government officials and planning staff, to advise and assist them in developing policies and plans that comply with and support the water quality objectives for temperature. Regional Water Board staff often submits water quality comments to cities and counties during the development of their ordinances and general plans. Section 13247 of the Porter-Cologne Water Quality Control Act states:

> "State offices, departments, and boards, in carrying out activities which may affect water quality, shall comply with water quality control plans approved or adopted by the state board unless otherwise directed or authorized by statute, in which case they shall indicate to the regional boards in writing their authority for not complying with such plans."

An example of the Regional Water Board providing guidance and recommendations to another state agency is the input Regional Water Board staff has provided the California Board of Forestry regarding revisions and implementation of the Forest Practice Rules. Regional Water Board staff regularly attend Board of Forestry meetings in which changes in the rules are contemplated, and have submitted comment letters on rule changes to ensure the Board of Forestry is aware of Basin Plan considerations. Similarly, Regional Water Board staff participated in Cal Fire's Section V Technical Advisory Committee that developed a guidance document for foresters wishing to make use of that relatively recent section of the Forest Practice Rules added as part of the Anadromous Salmonid Protection rule package, which involves timber operations within the riparian zone.

State guidelines require that local general plans should incorporate water quality policies from Basin Plans to the extent they are relevant. The planning and land use authorities entrusted to cities and counties include the authority to limit impacts from land uses to waters of the state and other natural resources. This action directs staff to continue to provide guidance and recommendations to cities and counties on compliance with the water quality objectives for temperature and work with local governments to develop strategies to address the prevention, reduction, and mitigation of elevated water temperatures, including, but not limited to, riparian ordinances, general plans, and other management policies. Regional Water Board staff have actively participated in meetings with the Sonoma County Permit and Resource Management Department regarding the development of the County's Riparian Zoning ordinance, and hope to have similar opportunities with other county planning departments.

5.3.10 Coordinate with Other State Agencies

Identify statewide policies under development with implications for water temperature, collaborate with State Water Board counterparts, and provide recommendations and guidance with respect to this policy.

This action directs staff to collaborate with State Water Board and other state agencies in the development of statewide policies that may have implications for water temperature. An example of such a policy is the Wetland and Riparian Area Protection Policy currently being developed by the State Board. Similarly, the State and Regional Water Boards are collaborating in a multi-regional effort to develop a framework for a permitting program addressing grazing-related water quality concerns.

5.3.11 Monitor Temperature Trends

Develop and implement a region-wide water temperature trend monitoring program to assist the Regional Water Board in determining whether this Policy is effectively reducing and preventing elevated temperatures over the long-term.

This action directs staff to develop a monitoring plan to track regional temperature trends to understand whether the actions identified in this Policy are effective at controlling stream temperatures. Section 7.0 is a description of the temperature monitoring strategy Regional Water Board staff are pursuing.

5.3.12 Develop and Maintain a Temperature Workplan

Develop and maintain a temperature implementation workplan consistent with the Policy to prioritize efforts, track progress, and identify specific action to address elevated water temperatures. The temperature implementation workplan shall describe actions that will be taken throughout the North Coast Region and set watershed priorities for addressing elevated water temperatures at a watershed-specific level. The temperature implementation workplan shall be presented to the Regional Water Board on a triennial basis.

This action directs staff to develop and maintain a temperature implementation workplan similar to the *Work Plan to Control Excess Sediment in Sediment Impaired Watershed* (NCRWQCB 2008), which identifies the actions and tasks Regional Water Board staff should take to control human-caused excess sediment in the sediment-impaired water bodies of the North Coast Region over a ten-year time frame. The temperature implementation workplan should identify both regional and watershed-specific tasks Regional Water Board staff intend to execute to control elevated temperatures in the North Coast Region. This action also mandates review of the work plan by the Regional Water Board every three years.