June 19, 2009

Board of Forestry and Fire Protection
Attn: Christopher Zimny
Regulations Coordinator
Sacramento, CA

Re: Comments on Proposed Threatened and Impaired Watershed Rules

Dear Mr. Zimny,

I am providing comments below on the proposed Threatened and Impaired (TI) Watershed Rules for the Center for Biological Diversity (the “Center”). The Center is a member based non-profit organization dedicated to the protection of native species and their habitats through applying sound science, policy and environmental law. Although there are a number of at-risk Pacific salmon species in the universe of TI watersheds, I focus on coho salmon (*Oncorhynchus kisutch*) here because they are the least tolerant of water pollution, their stock condition is relatively well known, and timber harvest is the most serious stressor to the species in northwestern California (QVIR 2006, 2008; NMFS 2008a, Higgins 2009). There is a clear and pervasive pattern of extirpation of population units throughout northwestern California by timber harvest and related land use and the TI rule amendments here will not stop their decline.

*My Qualifications*

I have been a consulting fisheries biologist with an office in Arcata, California since 1989 and my specialty is salmon and steelhead restoration. I authored fisheries elements for several large northern California fisheries and watershed restoration plans (Kier Associates, 1991; Pacific Watershed Associates, 1994; Mendocino Resource Conservation District, 1992) and co-authored the northwestern California status review of Pacific salmon species on behalf of the American Fisheries Society (AFS)(Higgins et al., 1992).

Over the past 20 years I have reviewed over 50 timber harvest plans and written comments on several Total Maximum Daily Load reports (NCRWQCB 2005, 2006, 2007, U.S. EPA 2007), that examine timber harvest as a pollution source. These comments cover the geographic area from Santa Cruz to Oregon. Recent relevant comments I have made include those on the Napa River TMDL (Higgins 2006b) and several proposed timber harvests for vineyard conversion there (Higgins 2006c, 2007a), the Bohemian Club Non-Industrial Timber Management Plan (Higgins 2007) and on a timber harvest plan (THP) in the Noyo River basin (Higgins 2009).
Other relevant publications related to timber harvest and impacts on salmon and steelhead populations include my review of the Simpson Timber Habitat Conservation Plan (Higgins, 2002), a dissenting report on the Pacific Lumber Company Freshwater Creek Watershed Analysis (Higgins, 2001), and my comments on the Jackson Demonstration State Forest Management Plan (Higgins, 2006a). All my THP related documents since 2000 are being provided for the record in addition to these comments.

Since 1994 I have also been working on a regional fisheries, water quality and watershed information database system, known as the Klamath Resource Information System or KRIS (www.krisweb.com). This custom program was originally devised to track restoration success in the Klamath and Trinity River basins, but has been applied to another dozen watersheds in northwestern California. The California Department of Forestry (CDF) funded KRIS projects in six northern California watersheds as part of the North Coast Watershed Assessment Planning effort. The Sonoma County Water Agency (SCWA) also funded regional KRIS projects (IFR, 2003) for several watersheds not covered by CDF projects in order to provide a seamless regional coverage for coho salmon recovery planning. I draw heavily on data from KRIS that overlaps with TI watersheds in these comments (see www.krisweb.com).

Since 2004 I have assisted the Klamath Basin Water Quality Work Group, which is comprised of the environmental departments of five federally recognized Indian tribes, in reviewing Clean Water Act (CWA) related documents. The Scott River and Klamath River TMDL comments I assisted with are most relevant to your TI rules because they are both waterbodies recognized as impaired under the CWA and harbor endangered salmonids, including coho salmon (QVIR 2006, 2007). I am currently assisting the National Marine Fisheries Service (NMFS) as a subcontractor with preparation of coho salmon recovery profiles for the Oregon watersheds within the southern Oregon/Northern California Coast (SONCC) planning area.

Overview

The Initial Statement of Reasons (CDF 2009) defines TI and the purpose of the proposed revised rules:

“The ‘Threatened or Impaired Watershed’ (T/I) rules is the common name used to describe the subset of California Forest Practice Rules (FPRs) intended to protect listed anadromous salmonid (salmon) species and their habitat in forest settings. The T/I rules regulate commercial timber harvesting on private land in watersheds where salmon species are designated as threatened or endangered species under the State or Federal Endangered Species Acts (TES). The rules also address timber harvesting and operational requirements for waterbodies listed under the federal Clean Water Act, section 303(d) as ‘impaired.’ The T/I rules were originally adopted in July 2000 and have been in place on an interim basis since that time.”

As noted above in my statement of qualifications, I have reviewed a number of timber harvests and vineyard conversions since the TI rules were first passed in 2000. I find essentially no change in practices; instead plans continue to go forward as if everything can be mitigated on site, when in fact all watersheds covered by TI rules are over prudent risk limits for disturbance from...
logging (Reeves et al. 1993) and the extent of road networks (USFS 1996). Problems with CFPRs noted by Ligon et al. (1999) and Dunne et al. (2001) regarding piecemeal analysis and lack of effective means to prevent cumulative watershed effects still persist under TI rules. Cumulative effects are flattening stream channels and expanding their width to depth ratio and this in turn raises water temperatures above suitable for coho salmon (Welsh et al. 2001). I will demonstrate this pattern with case studies below that extend from the Sonoma to Del Norte and Siskiyou counties.

When I first went before the Board of Forestry (BOF) in 1992 to present the Humboldt AFS paper on salmon and steelhead stocks at risk in northern California (Higgins et al. 1992), I expected that CDF and the timber industry would react appropriately. Instead I saw a pattern of elevated cut levels in coho watersheds spurred in part by potential restraints protection might impose. Those protections that would have caused such deprivation never arrived, including the TI rules of 2000. The amended TI rules proposed here represent an erosion of protections even though protections to date have largely failed.

Pacific salmon thrived in the northwestern California for millions of years despite constantly changing freshwater ecosystems due to patterns of landscape disturbance due to fire, floods, droughts, volcanic eruptions, glacial activity and other natural events. Historic disturbance tended to occur in patches at a sub-basin scale, while the rest of a watershed remained relatively intact and only a portion of any river system was impacted at any given time (Reeves et al. 1995). Salmon would have strayed from temporarily impaired sub-basins for decades or centuries into adjacent intact watersheds that retained healthy aquatic habitats (Williams et al. 2008). Once the impacted sub-basin recovered, fish from the intact basins would provide a source of colonists to rebuild that functional unit of the metapopulation. Under CFPR, even with TI restrictions, it is not uncommon for sub-basins to be 50% altered due to logging in the course of a few decades and road networks are far over levels known to increase sediment yield and alter hydrology. Intact functional patches of salmonid habitat are extremely limited or have been completely eliminated in many watersheds, such as the Russian and Gualala Rivers. This landscape pattern does not mimic the natural “patch” disturbance regime, and scientists have coined the term “press disturbance” to draw a distinction.

**Current Coho Salmon Habitat Conditions and Population Trends in Northwestern California TI Watersheds**

There are two coho salmon Evolutionarily Significant Units (ESU) recognized by the National Marine Fisheries Service (Good et al. 2005) in California and they are discussed separately below. The Central California Coast (CCC) covers from the southern extent of the range near Santa Cruz to below the Mattole River, while the SONCC ESU extends from there north to the Elk River in southern Oregon. Coho in the SONCC are listed as Threatened by both state and federal governments and the federal status was reaffirmed in 2005 (Good et al. 2005); CCC coho are listed as endangered.

**Factors Threatening Stocks with Extinction in Northwestern California** (Higgins et al. 1992) categorized extinction risk for Pacific salmon species from the Russian River north to Oregon and found eight populations of coho salmon to be at risk. Brown et al. (1994) in the paper
Historical Decline and Current Status of Coho Salmon in California noted that populations of coho salmon in California were at less than 5% of historic levels and that there were only seven streams with adult returns numbering in the hundreds (Figure 1). Even as of 1994, the population centers of coho were several hundred miles apart, making natural recovery through metapopulation function unlikely (Williams et al. 2008). Instead of protecting these watersheds to conserve gene resources and to maintain recovery options (Bradbury et al. 1995), all basins except Lagunitas Creek in Marin County and Prairie Creek in Redwood National and State Park have experienced continued high levels of logging.

Currently, both ESUs are showing indications of range fragmentation, weak year classes, and extremely low abundance. The most impacted watersheds now have populations that may have entered an “extinction vortex” (NMFS 2008a), where individuals are so rare that they may have trouble finding mates and stochastic events could easily cause complete extirpation (Rieman et al. 1993). The BOF and the timber industry often deflect blame for the loss of coho to other factors, such as ocean conditions. In fact ocean conditions since 1998 have been largely favorable for coho salmon production (Collison et al. 2003) and yet no population increases are apparent. This is a clear indication that freshwater habitat is constraining coho salmon recovery.

Central Coast ESU

Of 133 historical coho salmon streams in the CCC coho ESU for which recent data were available, 43-53% apparently no longer support coho salmon (Moyle et al. (2008)). Moyle et al. (2008) rated CCC coho salmon as category 1, very rare and highly vulnerable to extinction within the next 50 years. In fact there is a wave of extinction sweeping north from the southern extent of the coho range in Santa Cruz that has now progressed through Sonoma County. Late rainfall in Santa Cruz and San Mateo County has prevented entry of coho salmon in several recent years and Dr. Jerry Smith (personal communication) has found coho to be nearly absent in Scott, Waddell and Pescadero Creeks over a complete three year life cycle. CDFG (2002) acknowledges the need to list Central Coast ESU coho under the California ESA and surveys conducted annually from 2000-2002 indicated widespread absence (Figure 2). Streams with coho
in only one or two years indicate weak or missing coho “year classes” that are interpreted by the California Department of Fish and Game (CDFG) as jeopardy under CESA (ESA Consulting 2008). Of the CCC coho population, CDFG (2002) stated: “Extant populations in this region appear to be small. Small population size along with large-scale fragmentation and collapse of range observed in data for this area indicate that metapopulation structure may be severely compromised and remaining populations may face greatly increased threats of extinction because of it.”

CDFG (2002) concluded that “coho salmon in the Central Coast Coho ESU are in serious danger of extinction throughout all or a significant portion of their range” and characterized the Russian Gualala River populations as “extirpated or nearly so.” Figure 3 is a summary chart of CDFG presence/absence coho salmon survey data from 2000-2002 showing the highest rate of coho extirpation in Sonoma County Coastal watersheds and the Russian River, but still substantial fragmentation in distribution in Mendocino County as well.

Napa River: Coho salmon have been extirpated from the Napa River and conversion of timberlands to vineyards has contributed to such extensive habitat decline that steelhead are on the verge of extirpation (Higgins 2006b, 2006c, 2007a).

Russian River: The recent NMFS (2008a) Biological Opinion (BO) for large scale water users in the Russian River includes information on the viability of Russian River coho, including loss of genetic diversity that threatens their future existence:

Figure 1. The map above shows the coho salmon populations in the hundreds in all of northwestern California as of 1994, according to Brown et al. (1994).
Figure 2. This map shows the CDFG coho salmon presence/absence survey results for the years 2000-2002. Red = no coho found in all three years, orange = absent in at least one year and green = present all years. Only Green Valley Creek had coho all three years in the entire Russian River basin.

Genetic analyses of coho salmon sampled from Russian River tributaries are consistent with what would be expected for a population with such extremely reduced abundance……This evidence suggests an acute loss of genetic diversity for the Russian River coho salmon population.
Based on its decline in abundance, restricted and fragmented distribution, and lack of genetic diversity, the Russian River population of coho salmon is likely in an extinction vortex, where the population has been reduced to a point where demographic instability and inbreeding lead to further declines in numbers, which in turn, feedback into further declines towards extinction.

The only way that coho salmon can be restored in the Russian River is if lower river tributaries such as Austin, Freezeout, Sheephouse, Dutch Bill and Green Valley Creeks are recovered to functional coho salmon conditions (Reeves et al. 1995). Current aquatic conditions in lower Russian River tributaries are clearly impaired with regard to coho salmon as indicated by low pool frequency, shallow pool depth and water temperatures too warm to support them (Higgins 2007b). Timber harvest is contributing to cumulative watershed effects in these basins and there needs to be a cessation of harvest in at least some of these basins to allow some patches of functional habitat or refugia to be established (Reeves et al. 1995). Instead timber harvests are still routinely conducted (Higgins 2007b).

**Gualala River**: The Gualala River watershed lies within both Mendocino and Sonoma counties and CDFG (2001) characterized its coho population as extirpated or nearly so. Clear-cut logging

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**Coho Juvenile Presence and Absence in Streams by Region, 2000-2002**

<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>Present in All Years Surveyed</th>
<th>Present in Some Years Surveyed</th>
<th>Never Found in Years Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eel River (Mendo Co. only)</td>
<td>27</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>North Mendocino Coast</td>
<td>5</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Central Mendocino Coast</td>
<td>43</td>
<td>37</td>
<td>10</td>
</tr>
<tr>
<td>Southern Mendocino Coast</td>
<td>17</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Sonoma Coast</td>
<td>1</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Russian River</td>
<td>2</td>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>Western Marin</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 3. This chart shows a summary of the presence/absence of coho salmon juveniles in streams examined by CDFG in the years 2000-2002. The numbers shown on the chart bars indicate the number of streams in each region in which surveys always, never, or sometimes found coho. Chart from KRIS Garcia (IFR 2003).
in 80% of the Little North Fork Gualala and harvest rates over 50% in surrounding sub-basins (Figure 4) and subsequent erosion has lead to highly aggraded channel conditions in all Gualala River tributaries (Figure 5) (Higgins 2004a, 2004b, 2007d). The sediment evulsions in the Little North Fork (Figure 5) have caused significant increase in width to depth ratio that increases water temperatures. High bedload movement due to sediment over-supply is also likely causing mortality of eggs (Nawa et al. 1990). Despite planting of coho salmon in the North Fork from 1995-1998, no continuing coho salmon productivity has been established. Channel response to logging in the Little North Fork was a substantial loss of pools and loss of coho was the biological response (Figure 6). Cumulative effects related to logging are the primary stressor on the Gualala River ecosystem and CFPR and TI rules are failing (Higgins 2004a, 2004b, 2007d). For a complete description of cumulative watershed mechanisms derived from data collected in the Gualala River watershed, see Higgins (2007d). For more confirming information see www.krisweb.com/krisgualala/krisdb/html/krisweb/analysis/hypothesis.htm.

Figure 4. Lower Gualala River tributary Rockpile Creek with clear cuts in the riparian zone and in the unstable inner gorge. The riparian buffer appears to provide partial shade, but is not sufficiently wide to restrict warm airflow that further heats a stream that already far exceeds suitable conditions for coho salmon. Photo from KRIS Gualala.

Garcia River: The exception to coho decline in the CCC may be in the Garcia River, where the TMDL (U.S. EPA 1998a) is being implemented, timber harvest levels have been reduced, and extensive decommissioning of roads and landings has taken place to lessen erosion and flood damage risk. Habitat trends are positive with pool depths increasing and water temperature decreasing (www.krisweb.com/krisgarcia/krisdb/html/krisweb/analysis/hypothesis.htm). Although coho salmon resurgence to viability is not yet apparent, chum salmon have been seen.
spawning in the lower Garcia River and Chinook salmon spawning is occurring for the first time since the 1950’s (Craig Bell Personal Communication).

Figure 5. Highly aggraded stream channel of the Little NF Gualala River just upstream of the North Fork. Pools are filled and small gravels are too unstable for coho spawning. KRIS Gualala.

![Figure 5](image1.png)

Figure 6. CDFG electrofishing surveys in the Little NF Gualala from 1988 to 1999 show that coho salmon were absent in all years except 1988 indicating that conditions became unsuitable as a result of excess sediment contributions to the stream channel.

![Figure 6](image2.png)
**Noyo River:** The only cluster of basins with consistent presence on the Mendocino Coast is in the vicinity of Jackson Demonstration State forest, where forest age is older and land use management less intense than on private land watersheds that surround it (Higgins 2006). Although Brown et al. (1994) recognized the Noyo River as an important population and one that was still viable, the return to the Noyo River at the CDFG trap was only 13 coho salmon, with three males, three females, and seven one year old males known as jacks (Alan Grass personal communication). This indicates a weak year class of coho in the Noyo River, which is equivalent to jeopardy under CESA (ESA Consulting 2008, Higgins 2009). This indicates that the Mendocino coastal population is now at very high risk and may be approaching the status of the Russian and Gualala populations and falling into an extinction vortex. The Willits Redwood THP (THP 1-08-116 MEN) in the upper Noyo River shows the pattern and practice of CDF ignoring CESA requirements for mitigation to protect coho and the ineffectiveness of the TI rules.

**Ten Mile River:** The Ten Mile River basin to the north of the Noyo River is another classic case-study of cumulative effects eliminating coho salmon. The Ten Mile River was a strong hold for the species and had never had extensive stock transfer or hatchery operation for culturing coho salmon. The South Fork was particularly prime coho habitat after substantial watershed rest from prior logging, but 80% clear cut logging (Figure 7) between 1993-1999 and high road densities caused increased erosion, loss of pools, increased water temperature and loss of coho salmon (see [www.krisweb.com/kristenmile/krisdb/html/krisweb/analysis/hypothesis.htm](http://www.krisweb.com/kristenmile/krisdb/html/krisweb/analysis/hypothesis.htm)).

![Figure 7. Timber harvest under CFPR from 1993-1999 allowed 80% of the SF Ten Mile watershed to be logged and road densities were 7-10 mi./sq. mi. Map based on data from CDF from KRIS Ten Mile.](image-url)
Matthews and Associates (2000) found that logging from 1993-1999 under CFPR had caused far fewer landslides than prior logging waves, but that surface erosion and fill failures on road systems still lead to substantial excess sediment contributions.

**Southern Oregon Northern California Coastal (SONCC) Coho Salmon ESU**

Moyle et al. (2008) rated SONCC coho salmon as category 2, in danger of extinction within the next 50-100 years and as indicated below there are no healthy populations or refugia.

**Mattole River:** Coho salmon are at very low levels in the Mattole River and the adult population has fallen below 500 fish for nearly 20 years (Figure 8), which is a critically low level (Gilpin and Soule (1986)). Logging in the North Fork on steep unstable terrain has unleashed sediment into the estuary that further degrades coho salmon habitat and threatens Chinook salmon as well (Higgins 1998). BLM (2004) has stopped all logging in their holdings and created the King Range National Recreation Area, and streams on the west side of the Mattole River drainage, such as Bear Creek, are improving with regard to suitability for coho salmon.

**Lower Eel River/Van Duzen River:** Clear cut logging by Pacific Lumber Company (PL) caused loss of coho salmon in the lower Eel River and Van Duzen River tributaries (Higgins 1998, Higgins 2008b). Pacific Watershed Associates (1998) found that 80% of sediment in Bear Creek, a lower Eel River tributary, came off clear cuts from the previous 15 years. Torrent runout distances from landslides were much greater because there was little large wood in landslide material and the depth of sediment was 8-15 feet all the way to the mouth of the creek (Figure 9)(PWA 1998). Stream temperatures rose in response to the change in width to depth ratio caused by the aggradation to levels that no longer support coho salmon (Higgins 1998).

**Humboldt Bay Tributaries:** PL logging since 1988 in the Elk River has created a press disturbance and greatly diminished coho salmon production in what was formerly one of the north coast’s population centers (Brown et al. 1994). Freshwater Creek is the most well studied of northern California coho salmon watersheds and their decline in response to PL logging is well documented (Higgins 2001). Logging levels between 1988 and 2000 were as high as 50-80% in Freshwater Creek sub-basins which have road densities ranging from 6-8 miles of road per square mile of watershed (mi./mi.²) when 2.5 mi./mi.² is the prudent risk limit that would meet functional criteria for coho and other Pacific salmon species (NMFS 1995, 1996). This widespread disturbance on weak sandstone bedrock geology in combination with timber harvest resulted in major erosion that filled pools, increased fines sediment in spawning gravels, decreased aquatic insect diversity and caused coho salmon to be lost from some tributaries like Graham Gulch (Figures 10 & 11)(Higgins 2001).

Graham Gulch shows signs of both major sediment evulsions but likely also changes in hydrology. Decreased base flows in response to hydrologic changes like high road density may be playing a role in loss of summer surface flows (Jones and Grant 1996, Montgomery and Dietrich 1993), but it may be more owing to the amount of over burden that has resulted from recent land use. When a stream is buried many feet deep in sediment, its flows are mostly underground during summer and fall months prior to the onset of winter rains. Winter flows are flashy with rapid peaks and mainstem Freshwater Creek remains highly turbid for months on
Figure 8. Adult escapement of Chinook and coho salmon in the Mattole River drainage indicate that coho populations are at critically low levels and have been for 20 years. Data from Mattole Salmon Group.

Figure 9. Bear Creek after debris torrents off PL clear cuts on steep slopes triggered by January 1997 storm. Photo by Pat Higgins from KRIS Coho.
Figure 10. Graham Gulch, tributary of Freshwater Creek, shown in February 2002 during high flows with extremely high turbidity apparent. Photo by Pat Higgins. KRIS Humboldt Bay.

Figure 11. Graham Gulch at the same location as the photo above with loss of surface flow due to several feet of aggradation and possibly decreased base flows due to widespread logging disturbance. Photo from KRIS Coho.

end (Higgins 2001)(Figure 10), which restricts coho salmon and steelhead juvenile feeding and growth (Sigler et al. 1984).
Mad River: Simpson Timber Company (now Green Diamond) has been equally injurious to coho salmon through its logging practices and road building that have elevated cumulative effects risk and caused loss of coho salmon in some sub-basins they manage (Higgins 2002, 2008). Coho salmon have been lost from Canon Creek on the Mad River as a result of sediment evulsions, which was formerly an index stream for the species for the Pacific Fisheries Management Council. The last stronghold of coho in the Mad River is in Lindsay Creek where active logging is still occurring and threatening this last vital population unit with extirpation (Higgins 2008).

Redwood Creek: The mainstem of Redwood Creek is severely aggraded and coho and summer steelhead are at very low levels in the watershed above Prairie Creek (Higgins 2002). The mainstem of lower Redwood Creek is so aggraded that it loses surface flow in summer (Figure 12). Landowners in Redwood Creek, including Green Diamond, have operated a downstream migrant trap that shows Chinook salmon and steelhead production is recovering in the upper Redwood Creek watershed but the lack of coho salmon in these traps shows that habitat is not fully recovered. Also, it is likely that the continued high rate of harvest on unstable terrain poses significant continuing high risk of future waves of sediment and recurrence of aggradation. Filling of the estuary is a major constraint on Chinook salmon recovery (U.S. EPA 1998b).

Figure 12. Redwood Creek at its junction with Prairie Creek, with which it converges at the far left of photo. Aggradation from logging and road failures causes the creek to lose surface flows and yet logging continues in this TI watershed. Photo by Pat Higgins in October 2003.

Lower Klamath Tributaries: Rankel (1978) found that Terwer Creek and Blue Creek were the last major producers of Chinook salmon in the Lower Klamath Basin and recommended they be protected. Instead the Terwer Creek watershed was 80% clear cut (Figure 13) and erosion from disturbed slopes buried lower stream reaches making them not only unsuitable for salmon but so aggraded that it loses surface flow (Figure 14). Voight and Gale (1998) note that 14 of 17 Lower Comments on Proposed Threatened and Impaired Watershed Rules June 19, 2009, Center for Biological Diversity (Patrick Higgins) Page 14 of 35
Figure 13. Terwer Creek watershed from the air in 1990, including areas that had burned and been salvage logged. Photo by Pat Higgins from KRIS V 3.0.

Figure 14. Lower Terwer Creek running underground in 1992 after 80% logging on private industrial timberland. The stream bed is likely buried by 10-15 feet of over-burden due to accumulated debris torrents. Photo by Pat Higgins, KRIS Klamath-Trinity V 3.0.
Klamath Basin tributaries lack surface flow at their point of convergence with the mainstem because the over-burden of bedload buries the original stream bed so deeply (Kier Associates 1991, 1999).

Coats and Miller (1981) pointed out the regulatory dilemma in Terwer Creek, where either logging would have to be curtailed or cumulative effects damage endured, long before coho salmon were listed under ESA. Watersheds and stream conditions similar to Terwer Creek prevail in Hunter Creek and Wilson Creek, which is a Pacific Ocean tributary to north of the Klamath, that are similarly managed by Green Diamond Resources (Higgins 2002). U.S. Fish and Wildlife Service (1990) operated downstream migrant traps in Lower Klamath basin tributaries and found fish communities dominated by warmwater species (Figure 15) as opposed to salmonids, which were the main species prior to disturbance from logging. Kier Associates (1999) found that Yurok Tribe efforts to re-establish Chinook salmon in Hunter Creek were being confounded by poor habitat conditions resulting from sediment over-supply related to logging. Moyle et al (2008) consider Blue Creek refugia because its headwaters are on federal land and forest lands are intact. However, logging on private industrial timberlands in lower Blue Creek are extensive, including in riparian zones and on unstable inner gorge areas (Figure 16).

![Figure 15. The downstream migrant trap results from Hunter Creek show extremely low numbers of salmonids and a shift in fish community structure to non-salmonids as a result of habitat loss. Data from USFWS (1990).](image)
Interior Klamath Basin Tributaries (Scott/Middle Klamath): Logging on private land in the interior Klamath River Basin is also causing loss of coho salmon (Kier Associates 1991, 1999). Specifically, there are acute problems related to logging on private land in the Scott River watershed (QVIR 2006) and Middle Klamath Basin tributaries with private land holdings like Beaver and Horse Creeks (Kier Associates 1991, 1999, QVIR 2007). Although Six Rivers National Forest has decreased logging rates and decommissioned roads, Klamath National Forest has been actively logging and contributes to cumulative effects risk substantially (Kier Associates 1999). The January 1997 storm caused the scour of 435 miles of stream channels on KNF (de la Fuente and Elder 1998) and many landslides were initiated by timber harvest, landings or road segments that crossed unstable slopes (Figure 17) (Kier Associates 2005). Creeks in the lower Scott River like Kelsey and Middle Creeks and Thomkins Gulch lost riparian cover and became too warm to support coho salmon, although their mouths had formerly served as refugia.

Additional problems in interior basins are unstable soils, like decomposed granite, and potential for rain on snow events (Harr et al. 1975, Jones and Grant 1996). Decomposed granite soils ravel and gully once disturbed resulting in sand levels in the mainstem Scott River stream substrate of over 80% (QVIR 2005) and very high levels in Beaver and Horse Creeks as well (Kier Associates 1991, 1999).

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Coho salmon in the Scott River have only one strong year class and two weak ones, which means that the species meets the definition of jeopardy under CESA (QVIR 2008), yet logging continues. Use of Landsat imagery from different periods allows comparison between years of vegetation (Fischer 2003) and 1994 to 1998 “change scene detection” data show major loss of canopy in French Creek and other Westside Scott River tributaries on private land (Figure 18)(QVIR 2005). This not only contributes to temperature problems, but also depletes the large wood supply so necessary for pool formation and coho salmon habitat.

Continued timber harvest in the Middle Klamath Basin on private land threatens coho salmon refugia at the mouths of streams (Belchik 2003, Watercourse Engineering 2004, QVIR 2006). These cold water islands at tributary junctures are vital to survival of juvenile salmonids (QVIR 2007), particularly since summer mainstem Klamath Water temperature and water quality conditions are sometimes highly stressful or lethal. The U.S. EPA (2003) states that such refugia are of critical import when large rivers are out of compliance with water quality standards and resolution of pollution problems is likely to take along time.

**Specific Comments on Proposed Threatened and Impaired Watershed Rules**

The proposed Threatened and Impaired Watershed Rules (TIWR) do not conform to recognized best science on land management and preservation and restoration of Pacific salmon species (FEMAT 1993, Spence et al. 1996). Most actions appear geared toward allowing more harvest and would thus include an increased level of take. The largest problem, however, is not the sufficiency of each proposed rule revision, but rather the lack of ability to deal with cumulative
Figure 18. Vegetation change derived by comparing 1994 and 1998 Landsat images shows substantial decrease in trees in the riparian zone and canopy of reaches of lower French Creek. Data are from CDF and USFS Spatial Analysis Lab (Fischer 2003).

watershed effects (Ligon et al. 1999, Dunne et al. 2001, Collison et al. 2003). It doesn’t matter what specific restrictions are or what mitigations are applied because interaction between different disturbed landscape patches creates peak flows and sediment yield far above what would be expected from site impacts alone (Frissell 1992, Reeves et al. 1993, 1995). Options for amending TIWR are grouped below for efficiency since many pertain to the same subjects and only vary slightly.

Options 1-19 Proposed Riparian Harvest Changes – All Reduce Protection: The CFPR continue to use shade maintenance as a way to control water temperature, but ambient air temperature over the stream drives maximum water temperature and shade is third in influence following relative humidity (Bartholow et al 1989, Essig 1999). FEMAT (1993) called for protection of the riparian zone (no cut) out to two site potential tree heights or to the edge of the inner gorge. Spence et al. (1996) note that the absolute minimum buffer width for maintaining cool air flow over the stream is one site potential tree height, which would be 180-240 feet in Douglas fir or redwood forest streams. CDF staff and NOAA show that overstory canopy under Options 1 and 2 could be lower by 15-30%, if the 80% Angular Canopy Density (ACD) is used for the inner zone requirement for Class I WLPZ’s. Therefore, these rules would cause further degradation, including further depletion of large woody debris, which is a major on-going problem with CFPR (Ligon et al. 1999).

Option 3 deals with Stable Operating Surfaces: “In both the proposed definition and the Optional Amendment 3, the Board's intent is that hauling on a Stable Operating Surface would typically be permitted with minor puddles (such as those created by road watering for dust
abatement during the dry season). However, when the road system has significant ponding that does not drain or evaporate in a reasonable time period, this would not be a characteristic of a stable operating surface.” This option is meant to deal with roads that cross wetlands or springs, but the amendment does not state that such locations must be avoided during road layout and construction. This amendment deals with one symptom of major hydrologic perturbation related to roads while TI rules dodge the major questions of limits to road density, roads crossing unstable slopes, or limiting the number and type of stream crossings.

Options 4, 5, 6, 7, 9, 11, 12 and 13 all decrease riparian stocking, canopy closure and the potential to recruit large wood to streams and have the same deficiencies as Options 1 & 2 above and should therefore also be rejected. Stream side timber harvests have already depleted riparian zones (Figures 4, 5, 14, 16) (Ligon et al. 1999) and their ability to recruit large wood may be hampered for more than a century in the future (Spence et al. 1996). Option 5 appears driven by the desire to get more harvest of riparian trees in interior basins where problems with high ambient air temperatures should actually require greater riparian protection. CDFG found that Option 6 is likely to further decrease large wood recruitment to streams and, therefore, counter productive to protection and restoration of Pacific salmon species.

Although Option 8 increases the amount of basal area to be retained in the 100 foot inner band of Class I riparian zones, in addition to the 80% overstory requirement, any further logging within these zones should be disallowed. This retention standard is still well under what is needed to restore fully functional riparian conditions (FEMAT 1993). Option 11 proposes to lessen riparian protection outside the range of the coho salmon, but the same buffering should be maintained to protect other native fishes and amphibians (Spence et al. 1996).

Options 15-19 deal with Class III streams or those that are intermittent. CFPRs and the TIWR continue to afford these sensitive headwater streams insufficient protection when in fact there should be no timber harvest within one site potential tree height (FEMAT 1993) or at least 100 feet. May and Greswell (2003) described how major amounts of large wood found in streams in the Coast Range of southern Oregon came from landslides originating in headwater areas (Class III streams), which is similar to the findings of Reeves et al (2003). The Bear Creek case study (PWA 1998) shows clearly that, when trees are harvested off steep unstable headwalls or in inner gorges, landslides are triggered. Because trees have been removed due to logging, there is not a matrix of large wood entrained to meter sediment and provide large wood around which new pools can be scoured. PWA (1998) found that instead of hanging up in log jams, the debris torrent 8-15 feet deep extended all the way to the Eel River.

While logging in Class IIIs has been thought not to increase water temperatures because of lack of flow in summer, Brosofske et al. (1997) found that clear cutting in headwater areas may cause an elevation in ground water temperatures that then contribute to downstream warming.

Options 21-25 are concerned with erosion control, but once again the meaningful questions are not posed and the real problems of cumulative effects avoided.
What Reform of CFPR and TI Rules is Needed to Restore Coho Salmon

The CFPR and TI rules fail because they do not acknowledge watershed processes and how salmon watersheds work. The BOF failure to limit rates of watershed disturbance has precipitated a major change in the timing and amount of sediment, large wood, and water contributed to stream systems (Reeves et al. 1995). Streams now bear little resemblance to the streams with which Pacific salmon species co-evolved and this habitat modification is recognized as causing diminished species diversity in coastal Oregon (Reeves et al. 1993) and fragmentation of the distribution of coho salmon in California as demonstrated above. All TI watersheds are over cumulative effects thresholds and have lost or are on the verge of losing the ability to maintain coho salmon, and it is clear that there has been a pervasive and unsustainable level of “take” under the Endangered Species Act (ESA) and the California Endangered Species Act (CESA) (Higgins 2008). The proposed TI rules, while better in certain respects than anything the Board has previously offered (e.g., these rules at least finally acknowledge the need for Class II and Class III restrictions), still fail to address the watershed level problems and fail to account for cumulative impacts; consequently, “take” of listed salmonids, especially coho, will continue. This does not meet the intent of CESA nor does it comply with what NMFS (In Review) recommends pursuant to the ESA.

Road Densities, Near-Stream Roads and Road Stream Crossings: Jones and Grant (1996) point out that watershed hydrology can recovery rather quickly from timber effects, but that hydrologic perturbations from road networks can persist for decades. Hagans et al. (1986) estimated that 50 to 80% of the sediment that enters northwestern California streams stems from road-related erosion. Klein (2003) found a strong correlation of road density with turbidity levels that would limit juvenile salmonid growth (Figure 19).

U.S. Forest Service (1996) studies in the interior Columbia River basin found that bull trout were not found in basins with road densities greater than 1.7 mi/mi². They ranked risk road density of greater than 4.7 mi/mi² as extremely high (Figure 20). National Marine Fisheries Service (1996) guidelines for salmon habitat characterize watersheds with road densities greater than 3 mi/mi² as “not properly functioning” while “properly functioning condition” was defined as less than or equal to 2 mi/mi² with no or few stream side roads. NMFS (1995) set the target for road density in the Columbia River Basin as 2.5 mi./mi.² to attain properly functioning watershed condition for sensitive fish species and CFPR and TI rules would need to achieve this standard to re-establish more normal sediment and hydrologic regimes compatible with coho recovery.

Road densities in TI watersheds typically range from 4-10 mi./mi.² and estimates are conservative because maps on which they are based do not include temporary roads, abandoned roads, skid roads or landings. There should be no new road construction for timber harvest in TI watersheds and an aggressive road decommissioning program should be initiated with any rule package, with a priority given to streamside roads or those that cross unstable slopes. Harr and Nichols (1993) found that road decommissioning prevented stream channel damage by comparing response to a large storm event in basins with and without such treatments. To avoid damaging multiple crossing failures that yield catastrophic amounts of sediment (Figure 17)(de la Fuente and elder 1998), TI rules should mandate that road-stream crossings be reduced to a
Figure 19. Regression showing strong correlation of turbidity and road densities in NW CA. Taken from Klein (2003).

Figure 20. Road density categories from the USFS (1996) rating cumulative effects risk.
target of no more than 2 per mile of stream (Armentrout et al. 1999). Crossings with high risk of failure and stream capture should be the priority for removal.

**Prudent Risk Limits to Timber Harvest:** Ligon et al. (1999) and Dunne et al. (2001) both concluded that failure to set prudent risk limits for timber harvest was one of the most serious shortcomings of CFPR with regard to protecting salmon and steelhead. This could be done by the BOF requiring watershed rest or limiting timber harvest to less than a prudent risk threshold of 25% of a sub-basin’s area logged in 30 years (Reeves et al. (1993). Reeves et al. (1993) found that watersheds on the Oregon coast harvested more than that amount had substantial negative cumulative effects that were manifest in 10-47% loss of pools and substantial reduction of large wood as well as diminished Pacific salmon diversity. This is similar to the findings of Klein (2003) relative to logging and turbidity in northwestern California. He found that there was a logarithmic increase in turbidity with each increase of percent of inventory harvested (POI). Turbidity levels meet beneficial use levels when harvest rates are 1% POI or less, but over 2% POI (50% harvested in 25 years) levels would limit juvenile salmonid growth, which is equivalent to 10% of a watershed per decade or 25-30% over a 25-30 year period.

**Riparian Protections:** Ample scientific evidence exists on salmonids and riparian zones (FEMAT 1993, Spence et al. 1996, Dong et al. 1998) (Figure 21). There should be no entry into riparian zones on Class I streams for at least two site potential tree heights and Class II streams for at least one site potential tree height. Lack of protection for intermittent headwater streams (Class III) is perhaps the biggest problem with CFPRs and TI rules and there should be an at least 100 foot no cut buffer in these areas.

![Figure 21. Riparian protection of a Class II stream in the Yager Creek watershed with lack of protection afforded Class III streams (red arrows). KRIS Coho.](image)

**Prevention of Logging or Road Building on Unstable Slopes:** The Shallow Landslide Stability Model (Dietrich et al. 1998) can act as a screen in THP planning so that steep unstable slopes subject to debris torrents can be avoided. Kier Associates (2005) found that 80% of debris torrents triggered in the lower Westside Scott River basin came from portions of the landscape that fell into high risk and extreme risk SHALSTAB categories. Logging on these areas with Comments on Proposed Threatened and Impaired Watershed Rules June 19, 2009, Center for Biological Diversity (Patrick Higgins) Page 23 of 35
high potential for failure accelerates landsliding due to loss of root strength (Ziemer 1981) and depletion of large wood in these areas deprives downstream reaches of wood supply needed for supporting coho salmon. In worst case scenarios, logging in inner gorges causes failures where all the material is contributed to the stream (Figure 22), which results in streambed damage well downstream (Figure 23). New CFPR and TI rules need to restrict logging and road building on steep unstable slopes indicated as high or extreme risk by the SHALSTAB model.

Figure 22. Inner gorge failure in Jordan Creek, Lower Eel River basin, where PL had logged an inner gorge area. The resulting failure caused massive aggradation in downstream reaches. Photo by Doug Thron from KRIS Coho.

Unstable Soils: Highly active tectonic processes shear coastal soils creating impervious layers that can act as failure plains. Once disturbed and compacted, these clay soils tend to provide a source of chronic fine sediment that causes elevated turbidity noted by Klein (2003). TI watershed protections should include identification and avoidance of such areas.

In interior basins, decomposed granite (DG) is the most erosive of soil type and once disturbed it tends to gully (Figure 24) and cause major sediment over-supply to stream channels (Figure 25). DG soils have low nutrients and moisture holding capacity after clear cuts that can prevent regeneration. This soil type is pervasive in the linear formation from Shasta Bolly Mt. east of Redding that trends north across the Upper Trinity, Scott River and then through Middle Klamath tributaries like Horse and Beaver Creeks near Mt. Ashland. No widespread disturbance or road building should be allowed on DG soils within TI watersheds.
Figure 23. Jordan Creek in Humboldt Redwoods State Park cannot support coho salmon due to sedimentation from logging activity and slope failures upstream. Note boy on bar (red arrow) for scale indicating excess bed load more than 10 feet deep.

Figure 24. Crossing at Phillips Gulch has washed away a substantial amount of fill material. The culvert appears undersized to handle flood flows which has triggered this problem. Just east of Trinity Dam Blvd. 4/99. Photo courtesy of the Trinity County Resource Conservation District. KRIS V 3.0.

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Lack of Refugia a Major Problem: There are almost no intact coho salmon watersheds in northwestern California with suitable conditions and healthy populations that could serve as a source of colonists in rebuilding regional populations. Watersheds like the Noyo River, Humboldt Bay tributaries and lower Blue Creek that were formerly recognized as major coho salmon producers (Brown et al. 1994) were not protected but have rather been extensively logged. Protected federal lands are often too steep to have streams of optimal gradient; therefore, refugia must be established in coastal basins or coho salmon will not recover (Reeves et al. 1995). Good candidates are the Lower Russian River, Big Salmon Creek, Albion River, Noyo River, JDSF coastal tributaries, SF Eel River, selected Humboldt Bay tributaries, Little River (Humboldt Co.), Redwood Creek, lower Blue Creek, Horse and Beaver Creeks and selected Scott River tributaries.

CDF’s Failure to Protect Blocks Restoration Opportunity: Bradbury et al. (1995) point out that preservation can take place without restoration but that restoration of Pacific salmon species cannot take place without habitat protection. Coho salmon can only survive and be recovered if freshwater habitat conditions are suitable and trends are improving. CDF has data at its disposal.
that could be used for such habitat trend monitoring, including data they paid to assimilate in KRIS systems, but it chooses not to. When conditions are found to be non-supportive of coho salmon, cessation of anthropogenic stress is needed (Kauffman et al. 1999).

Timber Harvest Practices Compatible with Recovery Are Possible: The Parker Ranch within the North Fork Ten Mile River basin shows the direction California logging should take to avoid cumulative effects: use of high lead, full suspension cable logging, reducing road networks and road bed size, and selectively harvesting to maintain optimal microclimate and forest growth (www.krisweb.com/kristenmile/krisdb/webbuilder/nf_p130.htm).

**Timing of Restoration Habitat Recovery and Potential for Coho Salmon Extinction**

If prompt action is not taken to reverse the decline in freshwater habitat quality for coho salmon before ocean productivity cycles become less favorable (Hare et al. 1999) and on-land climatic cycles become drier sometime between 2015-2025, then it is highly likely that coho salmon will be extirpated even in the northern part of their range within the State (Collison et al. 2003).

Sincerely,

[Signature]

Patrick Higgins
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VIA EMAIL

Board of Forestry and Fire Protection
Attn: Christopher Zimny
board.public.comments@fire.ca.gov

Board of Forestry and Fire Protection
Attn: George Gentry, Executive Officer
george.gentry@fire.ca.gov

Re: Threatened or Impaired Watershed Rules 2009

“We are willing to think that what we need is a balance between the requirements of human economies and the ‘needs’ of the natural world. It is as if we are negotiating a trade agreement with the animals and trees unlucky enough to share space with us. What do you need? we ask them. What are your minimum requirements? We need to know the minimum because we’re not likely to leave you more than that.”

– Curtis White

Dear Board Members:

These comments are submitted on behalf of the Center for Biological Diversity (the “Center” or “CBD”) regarding the Board of Forestry’s proposed Threatened or Impaired Watershed Rules, 2009. CBD is a non-profit, public interest, conservation organization dedicated to the protection of native species and their habitats through applying sound science, policy and environmental law. CBD has over 40,000 members, many of whom reside in California.

The history of this proposed rulemaking, and the current status of salmonids in California, makes clear that the Board of Forestry has, for a decade now, avoided instituting the measures necessary to adequately protect California’s salmonids from the negative impacts of logging activities. Consequently, uncompromised action is absolutely necessary at this juncture in time. Fortunately, there is nothing precluding the Board from passing regulations that provide the conservation measures that salmonids need. As recently explained by the Attorney General’s Office in a January 5, 2009, letter to the Board of Forestry (emphasis added):

[T]he Board is required … to provide for the protection of [soil, air, fish and wildlife and water] resources when it adopts forest practice rules…. [T]he plain intent of the
Legislature in enacting the FPA was to require the Board to view the forests of the state as a complete working ecosystem, and not only as a producer of high quality timber, but also as forest lands valuable in their own right as a public resource.

Section 4562.7 of the Public Resources Code further requires the Board to adopt regulations to protect the beneficial uses of streams, and to control timber operations that result or threaten to result in unreasonable effects on these beneficial uses. Likewise, section 4562.5 requires the Board to adopt regulations to protect, among other things, soil resources and water quality during timber operations. Thus, the protection of California's watersheds and soils has been an important goal of the FPA since its enactment in 1973.

The explicit language of the FPA requires that the Board balance timber production and protection and restoration of forest resources. However, the FPA does not require that this balance be affirmatively struck in favor of timber production or otherwise constrain the weight the Board may give to protection and restoration of other natural resource values provided by timberlands in the rules and regulations promulgated by the Board. Nor do CEQA, CESA or any other statute otherwise constrain the Board’s discretion in this regard. Indeed, if anything, both CEQA and CESA assure that forest resources, including imperiled species and their habitat, be protected during timber operations and thus balance the Board’s authority to weigh too heavily in favor of timber production.

In short, neither the Forest Practice Act, nor any other law, limits the Board’s ability to take the necessary action to protect and restore California’s salmonid populations. In fact, federal and state laws (e.g., the Endangered Species Act, Clean Water Act, Porter-Cologne Act, and California Endangered Species Act) make plain that public resources such as the salmon at issue here are to be unequivocally conserved. Moreover, it is important to keep in mind that the question to be answered is, “In light of the science, and in light of the fact that many salmonids are at extinction’s door, and in light of the fact that a significant portion of salmonid habitat is already severely degraded, what should we do to confidently protect salmonids from logging activities, and what should we do to ensure that salmonid watersheds begin, and continue, to recover?” In other words, rather than attempting to do the bare minimum, the Board should be seeking to adopt prescriptions that we are confident will help achieve recovery of listed salmonids – as just discussed, the Board does indeed have the authority to go well beyond the bare minimum in furtherance of its duty to protect California’s soil, air, fish, wildlife and water resources.

1 CBD is aware that the timber industry is not the sole cause of the dire situation that salmonids currently face. Agriculture (as it is practiced in large part in California) is likewise a contributor to the problem (such as the recent take of salmonids by wineries in the Russian River area, and the heavy use of pesticides throughout California), as are dams and non-agricultural water diversions. However, that is no reason to ignore the timber industry’s contribution to the problem.

2 It is critical that any rulemaking account for the current situation – ignoring the existing baseline would allow logging to occur in areas that instead must be rested. Unfortunately, the current proposed rules fail to address baseline issues just as they do not address the problems associated with cumulative impacts. If there is to be timely recovery of salmonids in California, such issues must be dealt with immediately.
Salmonid Background

Of the 21 kinds of anadromous salmonids found in California, 13 are in extreme danger of extinction (Moyle et al. 2008). The following is a brief discussion of the current status of salmonids in California.³ While not all of the below are listed under the ESA or CESA, nonetheless, many of these unlisted entities are at risk of extinction, and therefore, the Board should be mindful of these unlisted salmonids when making its decisions. It is far better to address all salmonids now rather than try to play catch up after they are listed.

Klamath Mountains Province Steelhead Trout (*Oncorhynchus mykiss*)

**Regulatory status**: The Klamath Mountain Province ("KMP") steelhead ESU consists of more abundant winter run and less abundant summer run steelhead trout. Although NMFS determined in 2002 that the KMP steelhead ESU was not warranted for ESA listing, Moyle et al. (2008) rated KMP summer steelhead as category 2, in danger of extinction within the next 50-100 years. KMP steelhead are recognized as a U.S. Forest Service Sensitive Species and are a Species of Special Concern of CDFG.

**Population trend**: The area occupied by KMP summer steelhead is much diminished from historic distribution and populations are very small and isolated. KMP summer steelhead populations have been reduced to levels far below historic levels and only 2-3 populations are large enough now to expect persistence for more than 10-25 years under present conditions. Most of the smaller populations are likely to disappear in the near future. KMP summer steelhead have been extirpated from the upper mainstem Trinity River. The KMP summer steelhead in the New River, a tributary to the Trinity River, is the largest summer steelhead population in California. The estimated average abundance of summer steelhead in the New River for 1979-2006 was only 647 adult fish. The estimated abundance was 2,108 fish in 2003, averaging 977 fish from 2004-2006.

**Logging threats**: Logging, with its associated roads and legacy effects, has increased erosion on steep hillsides, greatly increasing sediment loads in the rivers. High sediment loads cause deep pools to fill with gravel, embed spawning gravels in fine materials, and create shallower runs and riffles. All this decreases the amount of adult holding habitat and increases the vulnerability of the fish. Such practices, by increasing the rate of run-off, may also decrease summer flows, raising water temperatures to levels that may be stressful or even lethal.

Northern California Coast Steelhead Trout (*Oncorhynchus mykiss*)

**Range**: California coastal river basins from Redwood Creek (Humboldt County) southward to the Gualala River (Mendocino County).

Regulatory status: The entire ESU, which includes winter and summer steelhead, was listed as Threatened under the Federal Endangered Species Act on June 7, 2000 (NMFS 2000), a status that was reaffirmed on January 5, 2006 (NMFS 2006). NCC winter and summer steelhead are considered to be Sensitive Species by the U.S. Forest Service. NCC summer steelhead are also considered a Species of Special Concern by the California Department of Fish and Game. Moyle et al. (2008) rated NCC summer steelhead as category 2, in danger of extinction within the next 50-100 years; and recommended that NCC winter steelhead should be officially recognized as threatened under the California Endangered Species Act by the Fish and Game Commission.

Population trend: The current abundance of this species is quite low relative to historical estimates. Close to 200,000 NCC winter steelhead once spawned in the ESU rivers combined. Optimistically, annual winter spawning returns today range from 25,000 - 50,000 fish. A majority of NCC summer steelhead populations have declined precipitously since initial recognition of these fishes’ presence in occupied watersheds 30 to 40 years ago. Extirpation of most remaining summer steelhead populations is a serious threat with a majority of populations declining to extremely low populations since the 1980s. There are likely less than 1,000 spawning summer steelhead annually in this ESU.

Logging threats: Listing of this ESU under the Endangered Species Act was influenced by the failure of the State of California to follow guidelines agreed upon in a 1998 NMFS/California Memorandum of Agreement (MOA), particularly improvements to the California Forest Practices Act. The potential direct and cumulative negative effects of logging on steelhead are well documented.

A significant proportion of the NCC steelhead landscape is industrial timberlands, both private and public, which have already undergone one or more cycles of tree removal. Direct impacts to steelhead from logging include increased sedimentation and stream temperatures, reduced canopy cover, destruction of instream habitat, and altered flow timing and volume. The channel of the Eel River and its tributaries have become shallower, braided, and less defined. These changes in the aquatic ecosystem have reduced the ability of adults to reproduce, juveniles to forage, and migrants to safely pass to the ocean, as well as having indirect effects, such as reducing the productivity of aquatic invertebrates that are the principal food for the fish. An additional problem has been “salvage logging” where large dead trees are removed after a fire, enhancing the erosion following a fire by increased road building and reducing availability of trees to fall into streams and create steelhead habitat.

The scattered distribution of NCC summer steelhead suggests that stochastic events can have drastic consequences to local populations. Natural disturbance can be synergistic with the decades of poor watershed management, mainly in association with logging, which has occurred in many of the summer steelhead watersheds. The potential for further mass wasting along Redwood Creek, Mad, Eel, Van Duzen, and Mattole Rivers is high, because logging is still occurring on steep slopes and recent fires may be contributing to soil instability (aggravated by road building for salvage logging). These activities intensify peak flows and accumulation of gravels in stream beds, thus reducing the amount of suitable habitat for summer steelhead potentially below amounts necessary for viable populations. It is likely that effects of the 1952 and 1964 floods were exacerbated by land use practices in almost all drainages containing NCC
summer steelhead. These floods deposited enormous amounts of gravel into pools that originated from landslides and mass wasting, especially from areas with steep slopes that had been logged. The floods not only filled in pools, but widened stream beds and eliminated riparian vegetation that served as cover and kept streams cooler. The gravel accumulated from the 1964 flood is gradually being scoured out of the pools, but much of it still remains.

Currently, some timber owners along California’s coast have or are developing Habitat Conservation Plans (HCP) for listed species, including NCC steelhead. There is a general lack of quantitative monitoring in these HCPs to evaluate the effects of harvest rates, road densities, sediment, and other factors on NCC steelhead and other salmonids.

**California Central Valley Steelhead Trout** *(Oncorhynchus mykiss)*

*Range*: Below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries.

*Regulatory status*: The ESU was first listed as a threatened species under the ESA by NMFS in 1998 and was reevaluated and confirmed in 2005.

*Population trend*: Between 1 to 2 million steelhead may have once spawned in the Central Valley. Estimates on the loss of habitat for Central Valley salmonids ranges from 80 to 95 percent. In the early 1990s the ESU population estimate was about 10,000 adult fish. From 1998–2000 an average of 3,628 female steelhead spawned naturally in the entire Central Valley. An idea of the precipitous decline of steelhead in this ESU can be obtained by looking at returns to the upper Sacramento River, which are based mainly on counts from fish ladders and hatchery returns, from an average of 6,574 fish in 1967-1991 to an average of 1,282 from 1992 to present. A continuing population decline is evident in Red Bluff Diversion Dam counts and a decline in the proportion of wild fish in the ESU is continuing. The same trend is likely happening throughout the Sacramento-San Joaquin system.

**Central California Coast Steelhead Trout** *(Oncorhynchus mykiss)*

*Range*: All naturally spawned anadromous populations below natural and manmade impassable barriers from the Russian River (Sonoma County) to Soquel Creek (Santa Cruz County) inclusive and tributaries of San Francisco and San Pablo bays.

*Regulatory status*: CCC steelhead were listed as a threatened species on August 18, 1997; their threatened status was reaffirmed on January 5, 2006 (NMFS 2006).

*Population trend*: Steelhead numbers in this ESU are considerably lower than historic estimates throughout the region. During the early 1960s, CDFG (CDFG 1965) estimated 94,000 steelhead spawned in this ESU, with the majority of spawning occurring in the Russian River (50,000) and San Lorenzo River (19,000). The Russian River was probably once the third largest steelhead river in California. Steelhead abundance in the Russian River declined from an estimated 50,000 in the 1960s to 1,750-7,000 in the 1990s (Busby et al. 1996; Good et al. 2005), indicating a potential decline of at least 89%; and the San Lorenzo run declined to less than 150 fish by 1994.
Current estimates are an approximate average of 14,100 adult steelhead per year in the entire ESU (NMFS 2006).

Logging threats: Degradation of habitat in most watersheds and estuaries supporting populations is a significant threat to CCC steelhead, some through logging and attendant road building. Numerous tributaries and the mainstem Russian River are currently listed as impaired water bodies under the Clean Water Act due to high levels of sedimentation, aggravated water temperatures, and generally poor water quality. Sedimentation problems due in part to logging practices have led to the CWA listing of San Mateo County coastal steelhead creeks (Pomponio and Pescadero Creeks).

South-Central California Coast Steelhead Trout (*Oncorhynchus mykiss*)

Range: All naturally spawned anadromous populations below natural and manmade impassable barriers from the Pajaro River (inclusive) to, but not including the Santa Maria River.

Regulatory status: SCC steelhead were listed as a threatened species by NMFS in 1997. They are considered to be a Sensitive Species by the U.S. Forest Service and a Species of Special Concern by the California Department of Fish and Game.

Population trend: Historically, annual runs in the ESU totaled more than 27,000 adults (NMFS 2007). In the mid-1960s, the CDFG (1965) estimated that the ESU-wide run size was about 17,750 adults. The total number of SCC steelhead spawners throughout their range in a fairly wet year is now considerably less than 5,000 fish, probably more on the order of 2,000 spawners. Recent estimates exist for five river systems (Pajaro, Salinas, Carmel, Little Sur, and Big Sur), indicating runs of fewer than 500 adults where previous runs had been on the order of 4,750 adults (CDFG 1965). In the Carmel River, estimates of adult spawners were 20,000 fish in the 1920s; 2,000-4,000 fish in 1988; and a mean of 611 fish from 1962-2002; steelhead declined in this river 22% per year over the interval 1963 to 1993. Most remaining populations probably contain less than 100 spawners. Moyle et al. (2008) rated SCC steelhead as category 2, in danger of extinction within the next 50-100 years, and concluded that a majority (possibly all) of SCC steelhead populations are likely to be extinct within 50 years without serious intervention.

Southern Steelhead Trout (*Oncorhynchus mykiss*)

Range: All naturally spawned anadromous populations below natural and manmade impassable barriers in streams from the Santa Maria River, San Luis Obispo County, California, (inclusive) to the U.S.-Mexico Border.

Regulatory status: Southern steelhead were listed as an endangered species by NMFS in 1997 and endangered status was reaffirmed on January 5, 2006. They are considered a Species of Special Concern by the California Department of Fish and Game.

Population trend: The historical run size for the ESU (Busby et al. 1996) was roughly estimated to be at least 32,000–46,000 fish in the four river systems comprising the Santa Ynez, Ventura, and Santa Clara rivers and Malibu Creek. Recent run sizes for the same four systems were

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roughly estimated to be less than 500 adults total. Except for the small population in San Mateo Creek in northern San Diego County, the anadromous form of the species appears to be completely extirpated from all river systems between the Santa Monica Mountains and the Mexican border; and extirpated from 4 of the 8 large river systems that harbored steelhead populations in the past. Moyle et al. (2008) rated Southern steelhead as category 2, in danger of extinction within the next 50-100 years.

**Southern Oregon/Northern California Coast Coho Salmon** (*Oncorhynchus kisutch*)

*Range:* All naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California.

*Regulatory status:* SONCC coho are listed as Threatened by both state and federal governments. The federal status was reaffirmed in 2005.

*Population trend:* Statewide coho spawning escapement in the 1940s ranged between 200,000 and 500,000 fish. By the early to mid-1960s, escapement in the ESU was estimated to have declined to just 43,000 fish; Wahle and Pearson (1987) estimated that escapement declined to about 12,400 fish within the SONCC coho salmon ESU; for the late 1980s, Brown et al. (1994) estimated wild and naturalized coho salmon populations at 7,080 for the California portion of the SONCC coho salmon ESU. Coho salmon are still present in less than half of their historical streams in California. Most populations are isolated and function independently and are less than 100 fish. Moyle et al. (2008) rated SONCC coho salmon as category 2, in danger of extinction within the next 50-100 years.

*Logging threats:* Logging is one of the principal uses of both public and private land in the range of SONCC coho. It is most likely the single biggest cause of coho decline overall because it began in the 19th century with the logging of key coho watersheds at lower elevations and then gradually moved upslope and inland. Historic logging practices that have left a legacy of altered streambeds include the construction of splash dams. These dams were temporary dams constructed to back up water to float logs and then to wash them downstream when a dam was deliberately breached. The damming was usually preceded by channel clearing to allow unobstructed washing of logs to the mills, usually on or near the estuaries. This practice essentially scoured out coho habitat and deprived the fish of essential cover in the form of fallen trees (large woody debris). For many years, fisheries agencies continued the practice of “debris” removal on the assumption that debris jams prevented upstream migrations of spawning fish. These ‘legacy effects’ still compromise the ability of many streams to support large numbers of coho salmon.

While logging today is much more regulated than in the past (at least since the 1970s), it is still having multiple, cumulative effects on coho streams. Removal of trees reduces shade, increases water temperatures, and reduces the amount of large woody debris that falls into the streams which provide critical habitat for rearing salmonids. Another detrimental effect of logging is the creation of thousands of miles of temporary roads, which create large-scale instability of soils on the steep slopes that characterize coastal northern California. The result has been the erosion of huge quantities of sediment into streams, burying or otherwise rendering unsuitable a great deal...
of coho habitat. Sediment deposition and channel alteration was particularly severe as the result of the large floods of 1955 and 1964, from which the SONCC salmon basins have still not recovered.

Central California Coast Coho Salmon (*Oncorhynchus kisutch*)

*Range:* All naturally spawned populations of coho salmon from Punta Gorda in northern California south to and including the San Lorenzo River in central California, as well as populations in tributaries to San Francisco Bay.

*Regulatory status:* CCC coho are listed as Endangered by both state and federal governments. The federal status was reaffirmed in 2005.

*Population trend:* Coho salmon spawning escapement was estimated to have declined to about 56,100 fish in the CCC coho ESU by the mid-1960s; to 18,050 fish by the mid-1980s; and 6,160 fish during the late 1980s. Brown et al. (1994) considered 1,000-4,000 fish to be a realistic assessment of the total number of naturally spawned adults returning to CCC streams each year. Presently, there are probably somewhere between 500 and 3,000 wild coho salmon spawning in the CCC region each year. A significant proportion of these fish are found in just one stream system, Lagunitas Creek. Almost all of the remaining streams have coho populations of fewer than 100 individuals during strong cohort years. Of 133 historical coho salmon streams in the CCC coho ESU for which recent data were available, 43-53% apparently no longer support coho salmon. Moyle et al. (2008) rated CCC coho salmon as category 1, very rare and highly vulnerable to extinction within the next 50 years.

*Logging threats:* In CCC coho streams, the most severe damage was done by a long legacy of logging, starting in the 19th century, that caused massive erosion, removed riparian vegetation and woody debris from channels, caused stream temperatures to increase, filled pools with silt and gravel, altered stream channels, and degraded water quality. The redwood forests were logged off almost completely before 1900. On the Mendocino Coast, the first wave of redwood logging occurred in the late 1800s and the practices employed severely modified coho habitats. Splash dams were commonly used to get logs from the harvest site down to ports at the mouths of rivers and often crib dams were common on the larger streams. Crib dams impounded water upstream so that logs could be floated downstream, or so that water could be released to flush logs that had been dragged into the channel below the dams. Often streams would have multiple crib or splash dams on them and they were frequently left in place for many years, preventing upstream migration by salmon. In the Santa Cruz Mountains, virtually all of the redwood forests, with the exception of the headwaters of the San Lorenzo (Big Basin State Park), a small grove near Felton, and some groves in the headwaters of Pescadero Creek, were gone before 1900 (B. Spence, NMFS, pers. comm.). Although splash damming was apparently not used on the San Lorenzo River, mill pond dams were built on most of the major tributaries that would have been the likely coho habitat, resulting in early extirpation from the river.

It is hard to overestimate the importance of loss of large woody debris as the result of historical logging practices. The streams in the Santa Cruz Mountains and Mendocino Coast contain little of the low-gradient, wide-valley streams that tend to be the most productive habitat for coho.
Thus the role of large wood in these steeper streams was, in all likelihood, absolutely essential for providing refuge during high flow events in winter, because there were fewer opportunities for off-channel habitat refuges. Lack of habitat structure is clearly a major problem facing CCC coho, especially in the winter months when refuges from high flows are needed (e.g., Stillwater Sciences 2008). Even in state parks in the region, which often have 100-year old riparian forests, large in-channel wood remains extremely scarce and is largely present as the result of enhancement projects (e.g., Ferguson 2005).

**Klamath Mountains Province Chinook Salmon** (*Oncorhynchus tshawytscha*)

*Range:* The Klamath and Trinity basins.

*Regulatory status:* The KMP chinook salmon ESU was determined to not warrant listing under the Endangered Species Act on March 9, 1998. KMP fall and spring run chinook are U.S. Forest Service Sensitive Species. KMP spring run chinook are a CDFG Species of Special Concern and qualified to be added to the state and federal lists of threatened or endangered fish (Moyle et al. 1995).

*Population trend:* Fall run chinook were estimated at 300,000 to 400,000 fish annually for the Klamath River system alone during the 1920s. Total inriver escapement into the KMP fall run chinook ESU ranged from 34,425 to 245,542 fish with an average 5-year geometric mean of 112,317 fish between 1978 and 2006. KMP spring run chinook salmon populations once likely totaled more than 100,000 fish. Spring run have been extirpated form the Scott and Shasta Rivers, and along the middle Klamath, are extirpated from their historic habitat except in the Salmon River and Wooley Creek, where they are nearly extinct (NRC 2004). The only viable wild population of KMP spring run chinook salmon is in the Salmon River - the 2005 adult count in this river was 90 fish, the lowest on record, but in 2007 the number reached 841 fish. Other populations are either small and intermittent or heavily influenced by hatchery fish, so may not be self-sustaining and are likely to be extirpated in the near future. Moyle et al. (2008) rated KMP spring run chinook salmon as category 2, in danger of extinction within the next 50-100 years.

*Logging threats:* The majority of spawning and rearing habitat for KMP Chinook salmon is surrounded by public lands in Klamath-Trinity National Forest, which have been heavily logged, roaded, and mined. As a result, the Klamath River, including spawning areas of chinook, is regarded as impaired because of its sediment loads. In addition, elevated water temperatures have been identified as a factor limiting anadromous salmonids in the Klamath River basin, as the result of multiple land use factors combined with climate change. Logging and its associated road building are a pervasive negative influence on aquatic habitats in the Klamath and Trinity River basins (NRC 2004). The steep and unstable slopes of the region make them particularly prone to erosion following tree removal, pouring large amounts of sediment into the streams, imbedding spawning areas and filling in pools needed for holding over the summer. Thus, the low numbers of spring chinook salmon currently using the heavily-logged South Fork Trinity River may be a result of the catastrophic 1964 flood, which triggered landslides that filled in holding pools and covered spawning beds. Other logging effects include elimination of large trees that historically fell into the river and were used for cover by the salmon and loss of shade.
(especially on tributaries), increasing water temperatures. The altered forests have also become more prone to large-scale, damaging fires. For example, over 50% of the Salmon River watershed, the main refuge for KMP spring Chinook, has been severely burned in the past 100 years (NRC 2004)

**Southern Oregon/Northern California Coastal Chinook Salmon** (*Oncorhynchus tshawytscha*)

*Range:* All naturally spawned populations from Cape Blanco, OR to the Klamath River, and coastal tributaries of the Klamath River up to the Trinity River confluence

*Regulatory status:* This ESU was determined to not warrant listing under the Endangered Species Act on September 16, 1999 by NMFS, although it is considered a Sensitive Species by the U.S. Forest Service, Pacific Southwest Region.

*Population trend:* SONCC Chinook in California are currently limited to a few small Lower Klamath tributaries, Blue Creek, and the Smith River although the abundance of these populations seems stable. Spring run Chinook have virtually disappeared from the SONCC ESU in California.

*Logging threats:* Although portions of the Blue Creek and other lower Klamath watersheds are not managed as industrial timberlands and although a majority of the Smith River is protected as a Wild and Scenic River, upslope land practices and road building likely have impacted the SONCC Chinook populations (USFWS 1979). As elsewhere in the region, landslides from road construction and clear-cutting on young coastal geologic formations cause chronic siltation and reduce the ability of spawning areas to support fish. Lower Klamath River tributaries have reduced populations as a result of land use practices, especially logging.

**California Coastal Chinook Salmon** (*Oncorhynchus tshawytscha*)

*Range:* All naturally spawned populations from rivers and streams south of the Klamath River, from Redwood Creek (Humboldt County) in the north to the Russian River in the south, inclusive. Chinook salmon found occasionally in coastal watersheds south of the Russian River are also considered to be in this ESU.

*Regulatory status:* The ESU was initially listed as Threatened under the federal Endangered Species Act on September 16, 1999, but this was rescinded in 2002; the ESU was again listed as Threatened on June 28, 2005. This ESU has no official status with the California Department of Fish and Game, though Moyle et al. (2008) conclude that it deserves to be officially recognized as Threatened under the California Endangered Species Act.

*Population trend:* CCC chinook are clearly much less abundant in the ESU than they were historically. Moyle et al. (2008) assumed that in ‘good’ years, historic runs were on the order of 600,000 fish in the ESU, perhaps dropping to 30,000-50,000 in ‘bad’ years. Present numbers seem to total about 5,000-20,000 fish annually. Moyle et al. (2008) rated CCC chinook as category 2, in danger of extinction within the next 50-100 years.

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Logging threats: CC Chinook life history requires intact and interacting riparian, freshwater and estuarine ecosystems to support critical growth during the freshwater and estuarine portions of their life cycle. Historic and current land use practices related to logging and road construction continue to increase the vulnerability of CC Chinook to extirpation within all watersheds in this ESU, but especially in the smaller watersheds. In general, Chinook salmon have disappeared from or are imperiled in these watersheds due to alteration of spawning, incubation, and rearing habitats, mainly by sedimentation. The biggest blows to their habitats occurred in 1955 and 1964, when record rainfall acting on hillsides denuded by years of logging, grazing, and road building caused large-scale erosion as huge floods ripped through the basins. “The result was massive landslides, which filled streambeds and pools with loose gravels throughout the drainages. Enormous flows greatly widened stream channels and eliminated most riparian vegetation. Habitat for anadromous fish was greatly reduced when sections of stream subsequently became too warm and shallow for juveniles during the summer (Moyle 2002, p. 57).”

Recovery after such massive changes would have been difficult in the best of times, but many of the activities that created the problem, especially logging and road building continued with few restrictions. Continued erosion from abandoned logging areas and rural residential roads has created chronic sediment loads far above natural levels. This causes coarse substrate to become imbedded in fine sediment, which makes redd construction by spawning Chinook difficult and creates conditions unfavorable for embryo survival (Opperman et al. 2005). Large amounts of sediment reduce oxygen and metabolite exchange within redds and entomb embryos. Large-scale sedimentation combined with loss of riparian tree cover (from floods, logging, and other factors) in combination reduce stream habitat complexity, simplifying aquatic food webs and reducing food for juveniles. Increased sediment has also been shown to reduce juvenile survival by impacting feeding success through increased turbidity, reducing prey visibility, and irritation of gills. These factors can also create widened, shallow channels, in which temperatures are too high and depths too low to support Chinook salmon juveniles.

Central Valley Spring Run Chinook Salmon (*Oncorhynchus tshawytscha*)

Range: All naturally spawned populations in the Sacramento River and its tributaries

Regulatory status: Spring run chinook are currently listed by both state and federal governments as threatened.

Population trend: CV spring run chinook have been extirpated from the vast majority of their historic range. Historic run sizes in the Sacramento and San Joaquin river basins were probably in the range of 1 million fish per year (Yoshiyama et al. 1998). Roughly 95% of spring run chinook salmon spawning and rearing habitat has been lost in the Central Valley. Not counting Feather River hatchery salmon, total production (escapement plus catch in fisheries) has averaged about 16,000 fish since 1992, although escapement has been less than 1,000 fish in some years. Moyle et al. (2008) rated CV spring run chinook as category 2, in danger of extinction within the next 50-100 years.
Logging threats: Logging has been, and continues to be, an important economic activity in the watersheds surrounding the current spring-run streams. While forestry practices have generally been fairly benign in the Deer and Mill creek watersheds and have improved in recent years, there have been historic impacts to streams from logging and its associated road-building, resulting in erosion, landslides, and loss of riparian vegetation.

Central Valley Late Fall Run Chinook Salmon (*Oncorhynchus tshawytscha*)

**Range:** In the Sacramento River and tributaries

**Regulatory status:** Late fall run chinook are considered to be a species of special concern by the California Department of Fish and Game and the National Marine Fisheries Service, although the latter agency lumps them with the fall run ESU in this category.

**Population trend:** The historic abundance of late fall chinook is not known. From 1967-1976 the run of late fall run chinook over Red Bluff Diversion Dam averaged about 22,000 fish; from 1982-1991 about 9,700 fish; from 1992-2007 about 20,700 fish, with a wide range in annual numbers. Moyle et al. (2008) rated CV late fall run chinook as category 2, in danger of extinction within the next 50-100 years.

Sacramento River Winter Run Chinook Salmon (*Oncorhynchus tshawytscha*)

**Range:** All naturally spawned populations in the Sacramento River and its tributaries

**Regulatory status:**, as reflected in their listing as an endangered species by both state and federal governments. In 1990 winter run chinook were listed as threatened; they were subsequently reclassified as endangered in 1994 (NMFS 1997) a status that was reconfirmed in 2005, and were listed as endangered by the State of California as well. Moyle et al. (2008) concluded that winter Chinook salmon have a high likelihood of extinction within the next 50 years.

**Population trend:** This ESU has only a single population that has been displaced from its historical spawning habitat into an artificial habitat created and maintained by a dam. There were up to 200,000 spawners per year in this ESU historically (NOAA 2005). There were nearly 100,000 winter run chinook in the ESU in the late 1960s; just below 10,000 fish from 2000-2002; and from 2004-2006 numbers averaged around 27,000 fish. Moyle et al. (2008) rated Sacramento River winter run chinook as category 2, in danger of extinction within the next 50-100 years.

Pink Salmon (*Oncorhynchus gorbuscha*)

**Range:** Possible remnant runs in the lower reaches of the Ten Mile, Garcia and Russian Rivers, as well as Redwood and Prairie Creeks.

**Regulatory status:** Pink salmon are considered by Moyle (2002) and Augerot and Foley (2005) as extirpated from California, except for occasional strays. However, reports of a spawning run...
in the Garcia River and the presence of juveniles in multiple years in the Redwood Creek drainage suggest that small populations may still exist and have been overlooked.

**Population trend:** California is the southern edge of the pink salmon range so they have never been common here and present only in odd years. There were pink salmon runs in the Ten Mile River, Garcia River, and Russian River in the 1930s. Moyle et al. (2008) consider it highly likely they will disappear completely from California streams in the reasonable future, although it is possible that populations have periodically gone extinct and then become re-established when pink salmon are abundant in more northern waters.

**Logging threats:** The tendency of pink salmon to spawn only short distances upriver from the ocean makes them extremely vulnerable to the general degradation of estuaries and the lower reaches of coastal rivers in California as the result of logging.

**Chum Salmon** (*Oncorhynchus keta*)

**Range:** California south into central California, as far as the San Lorenzo River.

**Regulatory status:** Johnson et al. (1997, p 164) reported chum salmon as being extinct in California although Moyle et al. (2008) think there is enough evidence to indicate that at least three very small self-sustaining populations (in Smith, Klamath, and Trinity rivers) still exist in the state, which are all threatened with extinction.

**Population trend:** Historically, chum salmon were reported to be present in most streams north of San Francisco Bay. Historically there were small spawning runs in the Sacramento and Klamath (Trinity) rivers (Mills et al. 1997) and fish were commonly observed in other coastal rivers as well. There are small remnant spawning runs in the South Fork Trinity River, Klamath, and Smith Rivers, and irregularly in northern Bay Area tributaries and Marin County coastal creeks.

**The Board and CAL FIRE’s ESA Obligations**

The purpose of the ESA is very straightforward – to conserve the ecosystems on which endangered and threatened species depend and to recover species so that they no longer require the protections of the Act. 16 U.S.C. § 1531(b); 16 U.S.C. § 1532(3) (defining “conservation” as “the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary”). “The ESA was enacted not merely to forestall the extinction of species (i.e., promote species survival), but to allow a species to recover to the point where it may be delisted.” *Gifford Pinchot Task Force v. U.S. Fish & Wildlife Service*, 378 F3d 1059, 1069 (9th Cir. 2004). Moreover, the ESA requires the use of the “the best available science,” and seeks to err on the side of conservation of the species at issue. *Brower v. Evans*, 257 F.3d 1058, 1070 (9th Cir. 2001) (“with best available data standard Congress required agency to consider the scientific information presently available and intended to give the benefit of the doubt to the species”).

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Here, the ESA represents a starting point. Put another way, any set of rules that fails to ensure “no take” of listed salmonids, and fails to address the recovery needs of salmonids, will not be meaningful. Thus, the Board should use its powers to set a new framework as we move into the next decade. And that framework should be one that seeks to err confidently on behalf of not only protecting salmonids and water quality, but also promoting the recovery of salmonids and watersheds.

Should the Board fail to adopt strong regulations, many THPs will be at risk of violating the ESA. Section 9 of the ESA specifically prohibits the “take” of an endangered species, 16 U.S.C. § 1538(a)(1)(B), a term broadly defined to include harassing, harming, pursuing, wounding or killing such species. 16 U.S.C. § 1532(19). The term “harm” is further defined to include “significant habitat modification or degradation where it … injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.” 50 C.F.R. §17.3. “Harass” includes any “act or omission which creates the likelihood of injury to wildlife by annoying it to such and extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.” Id. The ESA’s legislative history supports “the broadest possible” reading of “take.” Babbitt v. Sweet Home Chapter of Communities for a Great Oregon, 515 U.S. 687, 704-05 (1995). “Take” includes direct as well as indirect harm and need not be purposeful. Id. at 704; see also National Wildlife Federation v. Burlington Northern Railroad, 23 F.3d 1508, 1512 (9th Cir. 1994).

The take prohibition applies to any “person,” 16 U.S.C. § 1538(a)(1), including state agencies, 16 U.S.C. § 1532(13). The ESA further makes it unlawful for any person, including state agencies, to “cause to be committed” the take of a species. 16 U.S.C. § 1538(g). Courts have repeatedly held that government regulations (e.g., the Forest Practice Rules) authorizing third parties to engage in harmful actions can constitute an illegal taking under Section 9 of the ESA. See Strahan v. Coxe, 127 F.3d 155, 158, 163-64 (1st Cir. 1997), cert. denied, 525 U.S. 830 (1998) (state agency caused takings of the endangered right whale because it “licensed commercial fishing operations to use gillnets and lobster pots in specifically the manner that is likely to result in violation of [the ESA]”); Defenders of Wildlife v. Administrator, Envtl. Protection Agency, 882 F.2d 1294, 1300-01 (8th Cir. 1989) (federal agency caused takes of endangered black-footed ferret through its “decision to register pesticides” even though other persons actually distributed or used the pesticides); Loggerhead Turtle v. City Council of Volusia County, 148 F.3d 1231, 1253 (11th Cir. 1998) (county’s inadequate regulation of beachfront artificial light sources may constitute a taking of turtles in violation of the ESA). As recently discussed in Animal Prot. Inst. v. Holsten,

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4 NMFS has defined harm to include “land-use activities in riparian areas and areas susceptible to mass wasting and surface erosion, which may disturb soil and increase sediment delivered to streams, such as logging, grazing, farming, and road construction.” Endangered and Threatened Wildlife and Plants; Definition of “Harm”, 64 Fed. Reg. 60727, 60730 (November 8, 1999).

5 16 § 1532(13): “The term ‘person’ means an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the Federal Government, of any State, municipality, or political subdivision of a State, or any other entity subject to the jurisdiction of the United States.”
[T]he First Circuit held that the state of Massachusetts, through its licensing scheme of commercial fishing, was liable under the ESA for the incidental taking of Northern Right whales. *Strahan v. Coxe*, 127 F.3d 155, 163 (1st Cir. 1997) *cert. denied*, 525 U.S. 830, 119 S. Ct. 81, 142 L. Ed. 2d 63 (1998). The court found that ‘a governmental third party pursuant to whose authority an actor directly exacts a taking of an endangered species may be deemed to have violated the provisions of the ESA.’ *Id.* The state had argued that the [ESA] was not intended to prohibit state licensure activity because such activity cannot be the proximate cause of the taking. *Id.* The court rejected the state’s position, noting ‘[w]e do not believe . . . that an interpretation of ‘cause’ that includes the ‘indirect causation’ of a taking by the [state] through its licensing scheme falls without the normal boundaries.’ *Id.* See also, *Seattle Audubon Society v. Sutherland*, No. 06-1608MJP, 2007 U.S. Dist. LEXIS 39044, 2007 WL 1577756 at *2 (W.D. Wash. 2007) (by regulating logging on private lands, the State has injected itself into a position in which it may be the proximate cause of an ESA take); *Pacific Rivers Council v. Oregon Forest Indus. Council*, No. 02-243-BR, 2002 U.S. Dist. LEXIS 28121, 2002 WL 32356431 at *11 (D. Ore Dec. 23, 2002) (finding that state forester’s authorization of logging operations that are likely to result in a take is itself a cause of a take).

541 F. Supp. 2d 1073, 1078-1079 (D. Minn. 2008).

The ESA authorizes private enforcement of the take prohibition through a broad citizen suit provision. “[A]ny person may commence a civil suit on his own behalf to enjoin any person, including … any … governmental instrumentality or agency … who is alleged to be in violation of any provision of [the ESA].” U.S.C. § 1540(g). A plaintiff can seek to enjoin both present activities that constitute an ongoing take and future activities that are reasonably likely to result in take. *See National Wildlife Federation v. Burlington Northern Railroad*, 23 F.3d 1508, 1511 (9th Cir. 1994).

The ESA provides that the Secretary of the Interior may permit the take of endangered and threatened species under very limited circumstances. Section 10(a)(1)(B) states that the Secretary may allow “any taking otherwise prohibited by [section 9(a)(1)(B) of the ESA] if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.” 16 U.S.C. § 1539(a)(1)(B). One form of a take permit is referred to as a Habitat Conservation Plan (“HCP”), which can be obtained by any private party pursuant to section 10 of the ESA. An HCP must contain specific measures to “conserve” (i.e. provide for the recovery of) the species. 16 U.S.C. § 1539(a)(2)(A). The ESA and its implementing regulations also require all HCPs to include the following: (1) a complete description of the activity sought to be authorized; (2) names of the species sought to be covered by the permit, including the number, age and sex of the species, if known; (3) the impact which will likely result from such taking; (4) what steps the applicant will take to monitor, minimize, and mitigate those impacts; (5) the funding that will be available to implement such monitoring, minimization, and mitigation activities; (6) the procedures to be used to deal with unforeseen circumstances; and (7) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized. 16 U.S.C. § 1539(a)(2); 50 C.F.R. §§ 17.22, 17.32. An HCP must also demonstrate that “the taking will not appreciably reduce the likelihood of the survival and recovery of the species in

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Together, section 9 and 10 of the ESA mandate that “take” of any individual of any listed species be avoided without a proper permit. Moreover, in order to obtain a permit and avert section 9 liability, section 10 of the ESA requires that a) a party demonstrate that its activities will help promote the recovery of the species, and b) a party demonstrate it will not appreciably reduce the likelihood of the survival and recovery of the species. Again, this means that for the Forest Practice Rules to have any meaning, those rules must ensure that logging and its associated activities do not cause the “take” of any listed salmonid, and do not undermine the recovery of any listed salmonid.

The Board and CAL FIRE’s CESA Obligations

California’s Endangered Species Act, CESA, like the federal ESA, demands more than lip service to species protection. Both the state legislature and state courts have made clear that California “has been at the forefront of enacting legislation to protect endangered and rare animals. . . . [L]aws providing for the conservation of natural resources such as the CESA are of great remedial and public importance and thus should be construed liberally.” California Forestry Assn. v. California Fish & Game Comm., 156 Cal. App. 4th 1535, 1540, 1546 (Cal. App. 3d Dist. 2007). Moreover, species protection should not be seen as a burden to people or property; rather, as CESA itself states, conservation of wildlife is fundamental to society’s well being: “these species of fish, wildlife, and plants are of ecological, educational, historical, recreational, esthetic, economic, and scientific value to the people of [California], and the conservation, protection, and enhancement of these species and their habitat is of statewide concern.” CFGC § 2051. As recently stated by the AG’s Office:

Besides the requirements of the FPA itself and CEQA, the California Endangered Species Act (CESA), Fish and Game Code section 2050 et seq., prohibits any “person” from “taking” any fish, wildlife or plant species that is listed as endangered or threatened, or designated as a candidate for listing, under that statute. (Fish & G. Code, §§ 2080, 2085.) . . . The take prohibition applies to otherwise lawful activities that are the indirect and unintentional, as well as the direct and deliberate, cause of death of individual members of the species. (See e.g. Dept. of Fish and Game v. Anderson-Cottonwood Irrig. Dist. (1992) 8 Cal.App.4th 1554, 1563-1564 [holding that irrigation district’s killing of endangered Sacramento River winter-run chinook salmon fry through otherwise legal diversions and pumping activities was a prohibited taking under CESA].)

State agencies have a heightened obligation under CESA to protect state-listed species under that statute. Section 2052 of the Fish and Game Code provides that “it is the policy of this state to conserve, protect, restore and enhance any endangered species or any threatened species and its habitat.” Section 2055 of the Fish and Game Code further states that “it is the policy of this state that all state agencies, boards and commissions shall seek to conserve endangered species and threatened species and shall utilize their authority in furtherance of the purposes of this chapter.”

In addition, section 2053 of CESA states that “it is the policy of the state that state agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of
habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy.” Given the current situation in many salmonid watersheds, absent strict restrictions, there can be little doubt that jeopardy and adverse modification of habitat will occur. Thus, if CESA’s provisions are to be adequately adhered to, strong action is necessary.

**Threatened or Impaired Watersheds Rulemaking History**

In 1997, in the listing notice for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit (ESU) of Coho Salmon, the National Marine Fisheries Service noted that

Forestry has degraded habitat through the removal and disturbance of natural vegetation, disturbance and compaction of soils, construction of roads and installation of culverts. Timber harvest activities can result in sediment delivered to streams through mass wasting and surface erosion that can elevate the level of fine sediments in spawning gravels and fill the substrate interstices inhabited by invertebrates. Where logging in the riparian areas occurs, inputs of leaf litter, terrestrial insects, and large woody debris to the stream are reduced. Loss of large woody debris, combined with alteration of hydrology and sediment transport, reduces complexity of stream micro- and macrohabitats and causes loss of pools and channel sinuosity (Spence et al. 1996).

Eighteen water bodies in northern California, including eight within the range of the Southern Oregon/Northern California Coast ESU, have been designated as impaired by the Environmental Protection Agency (EPA) under section 303(d) of the Federal Clean Water Act (CWA). These eight river basins include the Mattole, Eel, Van Duzen, Mad, Shasta, Scott, Klamath, and Trinity Rivers. The primary factors for listing these river basins as impaired are excessive sediment load and elevated water temperatures.

Although individual management activities by themselves may not cause significant harm to salmonid habitats, incrementally and collectively, they may degrade habitat and cause long-term declines in fish abundance (Bisson et al., 1992). Changes in sediment dynamics, streamflow, and water temperature are not just local problems restricted to a particular reach of a stream, but problems that can have adverse cumulative effects throughout the entire downstream basin (Sedell and Swanson, 1984; Grant, 1988). For example, increased erosion in headwaters, combined with reduced sediment storage capacity in small streams, from loss of stable instream large woody debris (LWD), can overwhelm larger streams with sediment (Bisson et al., 1992). Likewise, increased water temperature in headwater streams may not harm salmonids there but can contribute to downstream warming (Bisson et al., 1987; Bjornn and Reiser, 1991).

The most pervasive cumulative effect of past forest practices on habitats for anadromous salmonids has been an overall reduction in habitat complexity (Bisson et al., 1992), from loss of multiple habitat components. Habitat complexity has
declined principally because of reduced size and frequency of pools due to filling with sediment and loss of LWD (Reeves et al., 1993; Ralph et al., 1994). However, there has also been a significant loss of off-channel rearing habitats (e.g., side channels, riverine ponds, backwater sloughs) important for juvenile salmon production, particularly coho salmon (Peterson, 1982). Cumulative habitat simplification has caused a widespread reduction in salmonid diversity throughout California.

3 years later, however, instead of swift action to benefit salmonids, the Board of Forestry chose to largely continue with business as usual, and consequently, another ESU was added to the list of threatened and endangered species (Endangered and Threatened Species: Threatened Status for One Steelhead Evolutionarily Significant Unit (ESU) in California, 65 Fed. Reg. 36074 (June 7, 2000)):

In accordance with the NMFS/California MOA, a scientific review panel was established by the State to review the California FPRs, including their implementation and enforcement. The scientific review panel completed its review and provided the State’s Board of Forestry (BOF) with its findings and recommendations in June 1999. In its findings, the review panel concluded that California’s FPRs, including their implementation through the existing timber harvest plan process, do not ensure protection of anadromous salmonid habitat and populations. To address these shortcomings, and as specified in the NMFS/California MOA, the California Resources Agency and CalEPA jointly presented the BOF with a proposed rule change package in July 1999. Following several months of public review, the Board of Forestry took no action on the package in October 1999, thereby precluding any possibility of implementing improvements in California’s FPRs by January 1, 2000, as the State committed to do in the NMFS/California MOA.

Timber harvest activities have been documented to result in adverse effects on streams and stream side zones including the loss of large woody debris, increased sedimentation, loss of riparian vegetation, and the loss of habitat complexity and connectivity (NMFS, 1996).

The vast majority of freshwater habitat in the northern California steelhead ESU (approximately 81 percent of total land) is on non-Federal lands, with the majority being privately owned. For the major river basins in this ESU (i.e., Redwood Creek, Mad River, Eel River, Mattole River, Ten Mile River, Noyo River, Big River, Albion River, Navarro River, Garcia River, and Gualala River), private forest lands average about 75 percent of the total acreage, with a range of 42 percent (Eel River) to 94 (Gualala River) percent.

NMFS reviewed the California FPRs in conjunction with its determination to not list the Northern California steelhead ESU in 1998. That review concluded that
although the FPRs mandate protection of sensitive resources such as anadromous salmonids, the FPRs and their implementation and enforcement do not accomplish this objective. Specific problems with the FPRs include: (1) protective provisions that are not supported by scientific literature; (2) provisions that are scientifically inadequate to protect salmonids including steelhead; (3) inadequate and ineffective cumulative effects analyses; (4) dependence upon registered professional foresters (RPFs) that may not possess the necessary level of multi-disciplinary technical expertise to develop THPs protective of salmonids; (5) dependence by CDF on other State agencies to review and comment on THPs; (6) failure of CDF to incorporate recommendations from other agencies; and (7) inadequate enforcement due to staffing limitations. NMFS further concluded that until a comprehensive scientific peer review process was implemented and appropriate changes to the FPRs and the THP approval process were made, properly functioning habitat conditions would not exist on non-Federal lands in the northern California steelhead ESU.

The California State Legislature, under Senate Bill 621, gave special authority to the BOF to adopt new rules twice during the year 2000 for the specific purpose of revising the State's FPRs to meet ESA requirements for salmon. Public review and revisions of the BOF’s FPR package continued from January 2000 to March 2000, during which time NMFS, California Legislature, the California Department of Forestry, the California Department of Fish and Game, the North Coast Water Quality Control Board, environmental groups and others strongly urged the Board to adopt the package in its entirety as a necessary first step in protecting anadromous salmonid habitat.

NMFS believes the interim rule changes adopted by the Board of Forestry constitute a good first step in addressing many concerns raised during the FPR review process; however, they are currently inadequate to protect anadromous salmonids, including steelhead, and their habitat. Specifically, the interim rule changes are inadequate because they do not address: (1) site-specific variation and long-term riparian functions; (2) non-fishbearing perennial streams and ephemeral streams that carry water during the winter months; (3) rate of timber harvest in a watershed; (4) all other winter operations and wet weather road and skid trail planning; (5) road planning, construction, maintenance and decommissioning; (6) loss of riparian function and chronic sediment inputs from streamside roads; (7) unstable areas except for inner gorges; (8) timber harvest plan preparation, review, implementation, enforcement and technical validity; (9) harvest plan exemptions and (10) watershed analysis, cumulative effects, adaptive management and monitoring. The adopted rules lack these, and other, critical elements recommended by the scientific review panel as necessary to avoid, minimize and/or mitigate adverse cumulative watershed impacts on salmonid populations.

Another nine years later, while some minor changes have been made to the FPRs to address salmonids, the same overall problems persist. As discussed in a 2008 letter from NMFS to the BOF:

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The ranges of SONCC and CCC coho salmon overlap with large tracts of forestlands subject to California's Forest Practice Rules. Approximately 80% of the current CCC coho salmon populations are persisting in these forestlands. NMFS believes the threats posed by timber harvest and conversion activities (not covered by an Endangered Species Act section 10(a)(1)(B) permit) authorized by California Department of Forestry and Fire Protection (CalFire) under rules developed by the BOF have, and will continue to, harm coho salmon. Accordingly, the BOF and CalFire have been notified through presentations by NMFS and in letters that the current status of coho salmon populations (particularly CCC coho salmon) is critically low and additional protections should be considered during timber harvest reviews and BOF rule-making.

August 4, 2008, letter from NMFS to BOF.

The Draft Rules Are Inadequate

As a result of the history described above, we are now in a situation where many watersheds are severely degraded, and salmonids are closer to extinction rather than recovering. Therefore, half measures, even well intentioned half measures, will not solve the problem, and it is up to the Board to acknowledge the severity of the situation and act accordingly. We cannot have our cake and eat it too; if we want salmonids to recover, then we must temporarily stop or severely limit logging in heavily degraded watersheds, and must elsewhere impose restrictions that we can confidently say will very likely, and very quickly, lead to positive riparian habitat conditions. As already explained, the ESA and CESA require as much, and this Board’s authority allows, indeed demands, as much.

With the Draft Rules, if we set aside the fact that almost all of the options that have been proposed would undermine salmonid conservation, the Center would otherwise agree that the proposed rulemaking has good intentions. Minus the options, the rules will indeed, in certain respects, increase protections for salmonids; however, that simply reflects the fact that the current rules are woefully deficient, not that the new rules solve the problems that currently face salmonids. Unfortunately, in many respects the Draft Rules fall short of the measures needed to adequately conserve salmonids, and in some instances provide measures that are worse than the currently inadequate rules.

First, the Draft Rules fail to address the current baseline, and therefore fail to address the fact that many watersheds should be rested (in whole or in part) in order to allow them to recover

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6 As stated in the T/I Questions and Answers: “Options are contained in the proposed rules that 1) reduce the Class I and Class II-Large watercourse ‘Inner Zones’ to postharvest overstory canopy less than 80%, 2) eliminate the ‘outer zone’ in coho ESU, and 3) eliminate “standard” Class II “core zones”... [T]hese options are less consistent with the Board’s science literature review and represent a higher risk to environmental impacts to listed salmonids compared the T/I proposal without the Options.”

7 TMDLs for 303(d) list watersheds in California account for both sediment and temperature problems and are a stark reminder of the need to adequately acknowledge the baseline conditions in salmonid watersheds and to fully address cumulative impacts. In short, in order to protect water quality and promote salmonid conservation, there will be areas where sediment and temperature impacts require the temporary cessation of logging.
from the serious degradation they have suffered. In other words, the proposed rules, in many areas, will preclude the recovery that is necessary in the short term for salmonids to rebound because the proposed rules will allow logging to continue in heavily degraded areas when in fact those areas need to be off limits or much more heavily prescribed if recovery is to occur in a meaningful timeframe. Therefore, draft rules should incorporate the data that exists regarding California’s watersheds (see comments of Patrick Higgins on behalf of CBD), and use that data to prohibit logging, in whole or in part, in order to allow impaired watersheds (or sub-basins) to recover. The fact of the matter is that many salmonids are at extreme risk of extinction; therefore, until trends are positive, further degradation in heavily impaired watersheds makes no sense and would violate the ESA and CESA’s intent and their conservation mandates.

Second, the Draft Rules cannot be confidently relied on to achieve salmonid protection. Thus far, as evidenced by the deleterious options that have been proposed, the process has leaned heavily in favor of business as usual logging activities. There are no options that seek greater protections, only options that seek to undermine protections, which makes no sense given the current state of salmonids in California. As pointed out over 10 years ago:

From a policy point of view, riparian buffer strips are important because they are a demonstrably successful means of protecting instream ecosystems (Davies and Nelson 1994, Erman and others 1977, Murphy and others 1986). Their importance stems from an awkward truth about aquatic ecosystems: these systems are complicated. It has become clear over the past several decades that the more an aquatic ecosystem is studied, the more is discovered about previously unrecognized critical habitat needs. Thirty years ago we did not understand the importance of large woody debris; 20 years ago we were ignorant of the need for off-channel rearing and refuge habitat for salmonids. We can thus assume that we do not yet know everything about the habitat and ecosystem characteristics needed for the survival of coho salmon and other aquatic species. Given this level of uncertainty, it is necessary to maintain a habitat system that functions similarly to that in which a species evolved if that species is to be sustained. If a riparian buffer strip is wide enough to ensure that a channel system does not receive biological and physical signals that upslope conditions have changed, the aquatic system is likely to be capable of providing the habitat and resources required to sustain its full complement of species.

The Forest Ecosystem Management Assessment Team report (FEMAT 1993) describes the need for this ecosystem-based strategy for species conservation: any species-specific strategy aimed at defining explicit standards for habitat elements would be insufficient for protecting even the targeted species. To succeed, any strategy must strive to maintain and restore ecosystem health at watershed and landscape scales. FEMAT thus advocated the establishment of riparian reserves to help sustain the proper functioning of processes that influence habitat, and thus to provide for both known and as-yet-unknown habitat requirements for coho and other aquatic species.

How wide a buffer is wide enough? In this case, preliminary results suggest that a one-tree-height width of uncut forest that is allowed to sustain appropriate fall rates would include 96 percent of the potential woody debris sources for the channel system. Combining the pattern of source trees with the distribution of triggering tree-fall distances indicates that an
additional 0.1-treeheight’s width would be needed to preserve the fall rate of trigger-trees that is needed to sustain the 96 percent input rate (fig. 4). Beyond this, an uncut fringe-zone of 3 to 4 tree-height’s width would be necessary to ensure that the fall rate within the core zone is within a factor of 2 of background rates (fig. 6). Thus, a total no-cut zone of at least 4 to 5 tree-heights’ width would appear to be necessary if woody debris inputs are to be maintained at rates similar to those for undisturbed forested channels.

Reid and Hilton, *Buffering the Buffer*, USDA Forest Service Gen. Tech. Rep. PSW-GTR-168. 1998; see also Spence et al (1996) (overall goal should be to restore the riparian zone, not to maintain timber production). FEMAT 1993 makes plain that Class I, Class II, and Class III watercourses should all have much greater protections than are currently being proposed by the Board in order to confidently protect and restore salmonids (the chart on the next page highlights the issue; this chart was extracted from the CDFG Recovery Strategy for California Coho Salmon).

The Center is aware that some scientists believe minimum standards are adequate. The Center’s point, however, is that we should not be seeking the bare minimum in circumstances such as these – we are dealing with species on the verge of extinction, and therefore bare minimums should be ignored in favor of prescriptions that will better, and more confidently, provide the habitat that salmonids need. Bare minimums are likewise inappropriate in light of the fact that we are dealing in many situations with watersheds or sub-basins that are severely degraded – even very small negative impacts in those areas are significant because they further deteriorate an already depleted region therefore pushing salmonids one step closer to extinction when just the opposite is called for. *See Nat’l Wildlife Fed’n v. Nat’l Marine Fisheries Serv.*, 524 F.3d 917, 930 (9th Cir. Or. 2008) (“Under this approach, a listed species could be gradually destroyed, so long as each step on the path to destruction is sufficiently modest. This type of slow slide into oblivion is one of the very ills the ESA seeks to prevent.”). Moreover, it is the previous attempts to only impose bare minimums that have landed us in the dire situation we currently face. Therefore, in light of the ESA and CESA’s intent that we err on the side of conservation, the Board should not cherry-pick the science that seeks to establish the bare minimum of standards. If anything, the Board should cherry-pick the science that would require the strictest standards because that will more confidently achieve conservation of the species. As stated in *California Forestry Assn. v. California Fish & Game Comm.*, the point of CESA is to achieve “the conserv[ation], protect[ion], restor[ation], and enhance[ment] [of] any endangered species or any threatened species.” 156 Cal. App. 4th at 1545 (internal quotations and citations omitted). Erring on behalf of industry, by cherry-picking the least protective measures, directly contradicts that.

The Draft Rules are particularly troublesome in that they allow for increased logging for Class I watercourses as compared to the current rules (which are already acknowledged to be inadequate). Simply because there will be no even aged management adjacent to a WLPZ is no reason to reduce protections for species that need their habitat to improve as quickly as possible. This is especially so in coho habitat. Moreover, the changes will allow more, not less, road building in the riparian zone and that makes absolutely no sense given that roads are a major contributor to habitat destruction and deterioration. Similarly, the proposed rules would worsen the situation in flood prone areas (“FPA”). Again, we are dealing with threatened and
### TABLE 3-4: Comparison of watercourse protection standards

<table>
<thead>
<tr>
<th>Management Application</th>
<th>California Forest Practice Rules (FPR) Prior To July 1, 2000</th>
<th>FPRS; Protection In Watersheds With Threatened Or Impaired Values</th>
<th>Forest Ecosystem Management Assessment Team (FEMAT) July 1993&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLASS I WATERCOURSE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watercourse and Lake Protection Zone (from the hillslope edge of channel zone)</td>
<td>1. to 75’ for &lt;30% slopes 2. to 100’ for 30-50% 3. to 150’ for &gt;50% Widths may be reduced if cable or helicopter system is used</td>
<td>1. 150’ minimum 2. No Emergency Notice or Exemption operations allowed within the WLPZ</td>
<td>To top of inner gorge, outer edges of 100-year flood plain, outer edge of riparian vegetation, or to distance equal to height of two site potential trees, or 300 feet, whichever is greatest</td>
</tr>
<tr>
<td>WLPZ retention</td>
<td>1. 50% overstory canopy 2. 50% understory canopy 3. Retained overstory canopy must be at least 25% existing overstory canopy 4. Retention of at least 75% surface cover</td>
<td>1. Inner band (0-75’): 85% overstory canopy 2. Outer band (75-150’): 65% overstory canopy 3. Retained overstory canopy must be at least 25% overstory canopy 4. Retention of at least 75% surface cover</td>
<td>Removed from timber base; no timber harvest</td>
</tr>
<tr>
<td>Large wood debris retention</td>
<td>Two living conifers/acre, and 50’ tall, within 50’ of Class I and II watercourses.</td>
<td>The 10 largest trees (dead or alive) per 330’ of stream, within 50’ of the watercourse transition line.</td>
<td>No harvest zones in Riparian Reserves; salvage allowed only if required to attain Aquatic Conservation Strategy (ACS) objectives</td>
</tr>
<tr>
<td>Inner gorge special treatment (special zone established where the slope &gt;55%)</td>
<td>None</td>
<td>None</td>
<td>Included in Riparian Reserve; no harvest</td>
</tr>
<tr>
<td><strong>CLASS II WATERCOURSE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WLPZ</td>
<td>1. to 50’ for &lt;30% slopes 2. to 75’ for slopes 30-50% 3. to 100’ for &gt;50% slopes</td>
<td>1. to 50’ for &lt;30% slopes 2. to 75’ for slopes 30-50% 3. to 100’ for &gt;50% slopes 4. No Emergency Notice or Exemption operations allowed within the WLPZ</td>
<td>Permanently flowing non-fish bearing streams – measure from edge of active stream channel; use distance from top of inner gorge, outer edge of 100-year flood plain, outer edges of riparian vegetation, distance of one site potential tree, or 150 feet, whichever is greatest</td>
</tr>
<tr>
<td>WLPZ retention</td>
<td>1. 50% total canopy 2. Overstory canopy must be at least 25% existing overstory conifer 3. At least 75% surface cover</td>
<td>1. 50% total canopy 2. Overstory canopy must be at least 25% existing overstory conifer 3. At least 75% surface cover</td>
<td>Removed from timber base, no timber harvest</td>
</tr>
<tr>
<td>Large woody debris retention</td>
<td>None</td>
<td>None</td>
<td>No harvest zones in Riparian Reserves; salvage allowed only if required to attain ACS objectives</td>
</tr>
<tr>
<td>Inner gorge special treatment</td>
<td>None</td>
<td>None</td>
<td>Included in Riparian Reserve; no harvest</td>
</tr>
<tr>
<td><strong>CLASS III WATERCOURSE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WLPZ</td>
<td>Established at the discretion of the Registered Professional Forester or California Department of Forestry and Fire Protection (CDF)</td>
<td>Established at the discretion of the Registered Professional Forester or CDF</td>
<td>Definable channel and evidence of annual scour or deposition; includes extent of unstable, potentially unstable areas, top of inner gorge, distance equal to site potential tree height or 50’, whichever is greatest</td>
</tr>
<tr>
<td>WLPZ retention</td>
<td>1. No canopy retention required. 2. 0-30% slope: 25’ equipment limitation zone (ELZ) 3. &gt;30% slope: 50’ ELZ 4. 50% understory vegetation 5. Trees in channel zone</td>
<td>1. No canopy retention required 2. 0-30% slope: 25’ ELZ 3. &gt;30% slope: 50’ ELZ 4. 50% understory vegetation 5. Trees in channel zone</td>
<td>No harvest</td>
</tr>
<tr>
<td>LWD retention</td>
<td>None</td>
<td>None</td>
<td>No harvest zones in Riparian Reserves; salvage allowed only if required to attain ACS objectives</td>
</tr>
<tr>
<td>Inner gorge special treatment</td>
<td>None</td>
<td>None</td>
<td>Included in Riparian Reserve; no harvest</td>
</tr>
</tbody>
</table>

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<sup>a</sup> Title 14 of the California Code of Regulations (14 CCR): §§ 895.1 Definitions 898(a) Feasibility Alternatives 914.8 [934.8, 954.8] Tractor Road Watercourse Crossing 916 [936, 956](e) Intent of Watercourse and Lake Protection 916.2 [936.2, 956.2](d) Protection of Beneficial Uses of Water and Riparian Functions 916.9 [936.9, 956.9](y) Protection and Restoration in Watersheds with Threatened or Impaired Values 916.11 [936.11, 956.11](b) Effectiveness and Implementation Monitoring 916.12 [936.12, 956.12](f) Section 303(d) Listed Watersheds 923.3 [943.3, 963.3](h) Watercourse Crossings 923.9 [943.9, 963.9](g) Roads and Landings in Watersheds with Threatened and Impaired Values
endangered species, and as acknowledged in the ISOR, “FPAs have been identified in science literature as containing critical habitat for anadromous species.”8 Therefore, in order to allow for proper protection of salmonids and recovery of these areas that are critical to the well being of the fish, the most prudent rule would be one that prohibits most logging in the entire FPA – it is time to improve FPAs, not allow their further degradation (and this is true regardless of how “minor” some assert the degradation will be – degradation is still degradation, and we should be moving in the opposite direction). Moreover, FPAs should have an Outer Zone non-cut area in order to protect the FPA, and that should be so regardless of whether there will be even aged management adjacent.

Likewise, the Draft Rules are deficient in failing to impose a no cut zone for Class III watercourses (merely limiting equipment is grossly inadequate) and for only imposing a 15-30 foot no-cut zone for Class 2 waters. This continued failure to adequately acknowledge the importance of headwater areas will undermine salmonid recovery and contribute to further take of the species. As acknowledged in the ISOR,

Long-term conservation of salmonids requires protecting not only the immediate functions that riparian vegetation provides, but the ecological conditions within the riparian zone needed to maintain natural vegetation communities (e.g. soil productivity, microclimate) as well (Spence et al. 1996). Although riparian buffers alone are insufficient to ensure healthy salmonid communities, there is consensus in the scientific community that protection of riparian ecosystems should be central to all salmonid conservation efforts on both public and private lands (FEMAT 1993; Murphy et al. 1995).

Everest and Reeves (2007) point out that full recovery of riparian structure and function from modified forest management practices may require a century or more, allowing riparian vegetation to recover sufficiently to again contribute large wood and bank stability to aquatic systems. In the meantime, ESA listings of more salmonid stocks and other aquatic species may occur, and additional extinctions are possible. Moyle et al. (2008) predict that most or all coho salmon populations in coastal streams in both the Central California Coast and Southern Oregon/Northern California Coastal Evolutionary Significant Units (ESU) will be extinct within 25-50 years. This underlines the extreme importance of maintaining and restoring suitable habitats for threatened salmonid species in California and the Pacific Northwest, and for minimizing adverse effects from land and water management practices (DFG 2009).

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8 CDFG has likewise pointed out that the FPA is important because “First, the floodplain is extremely important as habitat to other riparian-dependent species …. Second, floodplains provide winter refuge habitat for juvenile anadromous salmonids during high flows. Backwaters, old scour channels, and the vegetated floodplain surface greatly reduce water velocities during even the highest floods. Third, floodplains supply and store LWD [large woody debris]. … Finally, the floodplain provides hydraulic roughness that buffers potentially radical changes in channel morphology.” For that reason, DFG proposed prohibiting harvest in the FPA with the following exception, “timber harvesting that is directed to improve salmonid habitat through the limited use of the selection or commercial thinning silvicultural methods with review and comment by DFG.”

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This means that riparian areas in Class I, Class II, and Class III watercourses deserve the most conservative of protections if we are to confidently protect and restore salmonids. Similar points were made in a July 2007 letter from the California Regional Water Quality Control Board (North Coast Region) to the BOF:

The 2002 coho status review by the DFG stated that “coho salmon abundance in California, including hatchery stocks, could be six to 15 percent of their abundance during the 1940s, and has experienced a decline of at least 70% since the 1960s.” This precipitous decline in coho salmon clearly indicates a need for widespread and effective protection to avoid a complete collapse of the species.

The effects of upstream disturbance on coho habitat must be recognized and protected to have a realistic chance of restoring coho salmon populations. Water that enters a coho habitat needs to be cool, sediment inputs controlled, and large wood inputs enhanced as an integral part of any and all projects near the streamzone.

Class II watercourses are vulnerable to impacts by any sediment and temperature increases, which may cause direct impacts to coho salmon. Impacts to coho salmon habitat also come from activities in Class III watercourses and areas outside of the WLPZs and EEZs of watercourses. “Salmonids are often impacted by forestry activities on streams which do not support runs of listed salmonids because many of these streams drain into streams with listed salmonids. Moreover, intermittent or seasonal streams also are important to properly functioning aquatic system and forestry activities often destroy the ability of these streams to reduce siltation by removing trees that stabilize the associated hillslopes and by reducing the natural production of large woody debris.” (Joe Blum, NMFS; Declaration in U.S. District Court ,June 2, 2000).

The BOFFP has an opportunity to provide additional protection to streams that are essential to maintaining metapopulations of coho salmon. There is broad scientific agreement that recovery of the species depends on reestablishment of watercourses and metapopulations. DFG also stated in their 2002 status review that “coho salmon populations have been individually and cumulatively depleted or extirpated and the natural linkages between them have been fragmented or severed.” Do not limit protections to fragmented stream systems, which will likely lead to a more difficult recovery process in the future as many important populations will be lost and streams that could provide straying populations to recolonize, will not be within reach, since straying occurs within a limited distance of the natal stream.

In short, we are in a situation that demands swift and significant effort on behalf of salmonids and draft rules should reflect that fact instead of seeking to err on behalf of business as usual.

Additionally, the Draft Rules, in many instances, lack teeth. If a requirement uses “should” instead of “shall,” the requirement is meaningless from an enforcement standpoint. For instance, the Draft Rules state that

Best Management Practices in the Inner and Outer Zones: When timber
operations are considered pursuant to 14 CCR §§ 916.3 [936.3, 956.3], subsection (c) and 916.4 [936.4, 956.4], subsection (d), the following Best Management Practices should be considered for inclusion in the Plan by the RPF and by the Director

“Should be considered” must be changed to “shall be used” for the BMPs to have any real meaning. The same is true of the following (this is not an exhaustive list):

Heavy equipment should be limited to slopes less than 35% with low or moderate EHRs;

Harvesting prescriptions should focus on practices that use thinning from below.

Best Management Practices in the Inner Zone A and B of flood prone areas. When timber operations are considered pursuant to 14 CCR § 916.3 [936.3, 956.3], subsection (c) and 916.4 [936.4, 956.4], subsection (d), the following Best Management Practices should be considered for inclusion in the Plan by the RPF and by the Director when timber operations are conducted in the Inner Zones of the flood prone area.

Minimize Yarding and Skidding: Skid trails, yarding corridors, falling activities, and log yarding, should not alter the natural drainage or flow patterns. EEZ of 30 feet should be applied near side channels and areas of ponding. Very limited, pre-flagged, pre-approved prior to falling skid trails shall be used and abandoned so as to minimize risk of becoming new secondary channels by flood flows. Minimize or exclude, to the extent feasible, tractor skidding/crossings over, through, or along secondary channels (protection of overflow channels is a key element). Locate tractor roads on high ground areas to the greatest extent possible. When feasible, use feller bunchers which do not drag/skid logs through the zone, minimize turning of equipment which would result in increased depth of ground surface depressions, and utilize mechanized harvesting equipment which delims harvested trees on the pathway over which equipment would travel. Cable yarding corridors should be located at wide intervals consistent with practices that use lateral yarding. Full suspension should be used when possible.

A detailed description of the site-specific measure(s) or nonstandard operational provision(s) proposed. The description should address at a minimum the relationships between the riparian stand characteristics and ecological functions, the relative importance of the beneficial functions of the riparian zone to the watercourse, the cost effectiveness of the measure(s) or provision(s), and the predicted consequences.

In addition to “should” language, language such as “to the greatest extent possible” and “when feasible” must be eliminated as that language likewise allows for too much discretion and provides little room for meaningful enforcement. At the very least, when language like “to the greatest extent possible” is used, it must be accompanied by a
statement that requires the THP to explain in detail why it was impossible to use a particular approach.

Also, while the proposed Draft Rules do not currently give special treatment to the Southern Subdistrict, a proposal put forward by Big Creek Lumber that would do so should be rejected. Quite simply, there is no good reason to provide the Southern Subdistrict with special consideration. As explained in the ISOR, “review of science literature did not provide specific information for this region to make a clear assessment that the Southern Subdistrict has different riparian function needs from the other portions of the coho ESU, warranting a unique set of rules.” Moreover, the very company pushing for more lenient standards in the Southern Subdistrict clearly does not have the interests of salmonids in mind. Big Creek Lumber Company’s true colors are evident in the fact that they are actively pursuing the delisting of coho in their region. In other words, their desires are clear – more logging, less protections. Regardless, the fact of the matter is that salmonids in the Southern Subdistrict are at extreme risk of extinction and the science regarding riparian buffers is just as applicable in the Southern Subdistrict as it is elsewhere. Therefore, if anything, more, not less protection is what is called for in the Southern Subdistrict.

Finally, the Draft Rules fail to incorporate cumulative impacts.9 Logging has negative consequences, and thus, even if the Rules as proposed (minus the deleterious options) are adhered to, the cumulative nature of the negative impacts can result in take of listed salmonids. Therefore, draft rules must address cumulative impacts in order to avoid situations where widespread logging in a watershed leads to harmful impacts to salmon despite the fact that well intentioned rules were adhered to. Current cumulative impacts analysis is inadequate because it fails to acknowledge the baseline situation and fails to acknowledge that negative impacts cannot all be mitigated away to insignificance; indeed, the current state of affairs in salmonid watersheds clearly shows that to be the case.10 Again, logging is not benign, and therefore, a proper cumulative impacts rule would require that when certain thresholds are met, logging in given areas must cease, and those areas rested for a time, in order to conserve salmonids.

In sum, the proposed Draft Rules, while well intentioned, repeat history by failing to provide the necessary measures that will both protect and help restore the watersheds that California’s salmonids depend upon. Therefore, the Center encourages the Board, if it wishes to comply with the ESA and CESA, to institute a rule package that accounts for the current baseline, imposes restrictions that confidently err on behalf of salmonids, and adequately addresses cumulative impacts.

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9 The Center is aware that this rule proposal effort did not review cumulative effects. Nonetheless, this failure, especially when coupled with the failure to adequately acknowledge watershed baselines, is a serious shortcoming; inadequate and improper cumulative effects analyses in the past are largely to blame for the current status of salmonids in California.

10 As acknowledged in the T/I Questions and Answers: “Currently, coho salmon numbers in California are at historic lows. NOAA Fisheries reported in February 2008 that coastal coho populations plunged 73% compared with the previous spawning season, and in April is said extinction may be close at hand…Moyle et al state that CCC are in a state of collapse…”

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Future Take of Salmonids is Reasonably Foreseeable and May be Enjoined Under the ESA

Unless the Board approves strong rules on behalf of salmonids, it is reasonably foreseeable that future activities permitted by CAL FIRE will result in additional prohibited take of salmonids. Activities authorized by CAL FIRE that are reasonably likely to result in prohibited take of salmonids may be enjoined under the ESA. See United States v. Town of Plymouth, 6 F.Supp.2d 81, 91 (D.Mass. 1998) (preliminary injunction issued against township which authorized off-road vehicles on a beach that was habitat for threatened piping plovers); Defenders of Wildlife v. Administrator, Envtl. Protection Agency, 668 F.Supp. at 1356-1357, aff’d 882 F.3d 1294 (enjoining the EPA from continuing its registration of strychnine until it could do so without illegally taking protected species of wildlife).

This process began over a decade ago and there is no reason for it to once again result in the continued take of listed species. On the contrary, it is painfully obvious that if we care about salmon, swift and uncompromising action is called for. Therefore, CBD encourages the Board to take not just a much bigger step forward in terms of salmonid protection, but a step in an entirely new direction – instead of continuing to seek the bare minimum, it is time to use the Board’s powers to provide the conservation measures that fully acknowledge the gravity of the situation.

Sincerely,

Justin Augustine
Center for Biological Diversity