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Dear Mr. Rowney,

I am commenting on the *Jackson Demonstration State Forest Management Plan* (JDSF Plan) and the associated *Environmental Impact Statement* (EIS). I am a consulting fisheries biologist with extensive knowledge of the watersheds surrounding Jackson Demonstration State Forest (JDSF), having recently completed a project on the Noyo and Ten Mile rivers for the California Department of Forestry (CDF). These CD and Internet compendiums of information are known as KRIS projects. The acronym, KRIS, refers to the software system, the Klamath Resource Information System. Under the same contract with CDF, we are currently in the final stages of completing KRIS Big River. Much of the data displayed below to support arguments regarding the JDSF Plan come from these projects. Full projects on the web can be viewed at www.krisweb.com. I have included KRIS Noyo, KRIS Ten Mile and KRIS Big River Draft CD's to provide the full data and context for all three basins. Contents of these projects should help you to revise the JDSF Plan and achieve its adaptive management goals.

My comments will focus on fisheries issues, particularly the inadequacy of endangered species and status information for coho salmon (Oncorhynchus kisutch) and steelhead trout (O. mykiss). I helped write a status review of Pacific salmon species several years ago for northwestern California on behalf of the American Fisheries Society (Higgins et al., 1992). I am also commenting on sediment yield, roads, water temperature and riparian conditions, sensitive amphibians, restoration, timber harvest and cumulative watershed effects are also offered. The JDSF Plan and associated EIR are fundamentally flawed according CEQA standards for addressing threatened and endangered salmonids, cumulative effects and several other of the subjects discussed herein. I reference and cite from a number of documents that were not used in the Plan. These documents are also available on companion KRIS CD's I am submitting.

The Status of Coho Salmon and Steelhead Not Properly Addressed

The JDSF Plan and EIS does not offer credible information about the status of coho salmon and steelhead in and around JDSF. The Plan and EIS state that "Overall, based on out-migrant trapping data it appears that salmonid habitat in the planning watersheds is near current carrying capacity." Downstream migrant trapping data come from some of the better streams in the Forest and are not representative of all JDSF streams. Recent fisheries and habitat typing data available for JDSF and the surrounding Big River, Noyo River and coastal basins show that most fish communities are dominated by steelhead and habitat conditions are extremely poor for salmonid spawning and that rearing in privately held watersheds and only fair on JDSF (CDFG, 1995-1999; Georgia Pacific, 1994-1998).

Coho Salmon: The JDSF Plan EIS makes the following statement about the status of coho:

> " Fish populations can be extirpated from watercourses and watersheds if conditions degrade to a point the stocks are no longer self-sustainable. However, nearly two-thirds of the entire land base within the JDSF was clear-cut and burned prior to the introduction of the modern FPRs. Historic activities included massive broadcast burning, road construction and log skidding in watercourses, splash damming, stream clearing, and complete removal of riparian canopy. No effort was made to protect fish stocks at that time and populations did suffer…..This indicates fish populations were able to maintain viability, albeit at low numbers, through that unregulated logging period. The potential effects to fish populations and aquatic communities from each alternative are significantly less than pre-modern FPR operations."

This cavalier attitude toward maintaining coho salmon in the Forest sums up the " benign neglect" attitude of JDSF toward coho recovery. This discussion fails to note the extensive current logging damage, or almost homogeneous disturbance on other lands surrounding JDSF and regionally. If coho were lost from the JDSF in earlier periods, there would have been sources of coho colonists from nearby watersheds to replenish it once the streams recovered. Today, the JDSF fish represent the most significant gene resources within hundreds of miles which, if lost, would confound coho recovery. This means that mis-management of JDSF could in fact cause not just a Taking, but Jeopardy, to coho salmon under the Federal Endangered Species Act.

Higgins et al. (1992) noted the Noyo and Big River coho salmon populations as "stocks of concern" based on declining freshwater habitat conditions. Brown et al. (1994) in *Historical Decline and Current Status of Coho Salmon in California* clearly indicated that California coho salmon were in need of protection under the Endangered Species Act. They noted that one of the last of seven adult coho populations in the hundreds was in the Noyo River (Figure 1).

The remaining coho salmon populations that number in the hundreds are critical to conservation and restoration of the species because they represent the last significant gene resources. These populations provide a source of colonists for streams that are currently damaged as they recover in the future. The current population centers, according to Brown et al. (1994), are several hundred miles from one another (Figure 1). The distance between healthy donor stocks makes natural recovery of coho up and down the California coast unlikely. Artificial culture could be used to supplement natural replenishment mechanisms in restored watersheds. However, even hatchery-based recovery requires healthy donor stocks with sufficient numbers of individuals so that egg taking would not jeopardize the population of origin.

The National Marine Fisheries Service (NMFS, 2001) *Status Review Update for Coho Salmon (Oncorhynchus kisutch) from the Central California Coast and the California portion of the Southern Oregon/Northern California Coasts Evolutionarily Significant Unit* found that:

> "The Central California Coast ESU is presently in danger of extinction. The condition of coho salmon populations in this ESU is worse than indicated by previous reviews."

The recently released California Department of Fish and Game (CDFG, 2002) *Status Review of Coho Salmon North of San Francisco* characterized the coho meta population including the JDSF area as follows:

> "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. For this reason, the Department concludes that coho salmon in the Central Coast Coho ESU are in serious danger of extinction throughout all or a significant portion of their range."

The JDSF Plan does not address or acknowledge the conditions described in these reviews. Nor does the plan use information in the KRIS Noyo that shows a major decline of coho salmon in the basin between the 1960's and the 1990's. The KRIS project used historical memos from CDFG indicating coho distribution and relative abundance and compared them to more recently collected fisheries data. The results of these comparisons are shown as Figures 2 and 3 below. In the 1960's, coho salmon dominated many of the tributaries of the Noyo River watershed (Figure 2), including the eastern portion of the watershed, except in reaches with steep gradient where steelhead were more numerous. By the 1990's, eastern Noyo sub-basins lacked coho or retained them at remnant levels by the 1990's (Figure 3), while the western Noyo watershed tributaries were dominated by steelhead, with coho still present but sub-dominant. The exception is Bear Gulch in JDSF, which was still dominated by coho, according to the most recent electrofishing samples.

The KRIS Big River project, which includes small coastal streams flowing from JDSF, shows that coho salmon are at similarly low levels in the Big River basin (Figure 4).. According to the last fisheries surveys available for Caspar and Hare creeks and Russian

Gulch, are some of the last local streams that are still dominated by coho salmon. All three are on JDSF.

Figure 1 - Appended

Figure 2-3 - - Appended

The review of Burns (1972) and Valentine and Jamison (1994) in the JDSF Plan and EIS failed to note that the fish community structure of the Little North Fork Noyo River has shifted. When sampled by Burns from 1966-1968, it was dominated by coho salmon. When sampled in the 1990's (Valentine and Jamison, 1994), the Little North Fork was dominated by steelhead (Figure 5). The change in fish community structure followed intensive logging (>80%) from 1985-2000. Manning (1999) found that the Little North Fork Noyo had the lowest productivity of the eight northwestern California coho salmon streams he was monitoring with downstream migrant traps. He also found it the lowest in production of coho juveniles, when ranked against the entire universe of streams Pacific Northwest wide for which he had data. The population shift in the Little North Fork is similar to that found by Reeves et al. (1992) on the Oregon coast, where watersheds logged in over 25% of their area tended to loose salmonid species diversity (see Cumulative Effects discussions below).

Stocks of coho are also plummeting in adjacent watersheds in response to intensive land use. NMFS (2001) noted that coho were absent from 80% of tributaries to the Ten Mile River that formerly harbored them, with particular decline noted in the South Fork Ten Mile River. The Ten Mile River is adjacent to the Noyo River watershed to the north and east. The SF Ten Mile sub-basin was harvested in 76% of its watershed area between 1990 and 1999 and road densities increased to 5-10 miles per square mile (GMA, 2000). The decline of the coho in the Ten Mile River is troubling because the NMFS *Coho Status Review* (Weitcamp et al., 1996) regarded it as an important wild population, without history of hatchery introduction. Brown and Moyle (1991) noted that many smaller Mendocino coastal streams had also lost coho.

Rieman et al. (1993) point out that: "When habitat disruption is spread among all populations, all populations are more likely to decline during unfavorable periods in the regional environment (for example, drought). Severe or prolonged conditions increase the potential for regional extinction." Coho salmon populations in watersheds surrounding JDSF face high risk of loss due to unstable watershed conditions. Jackson Demonstration State Forest has some of the last patches of viable coho salmon habitat on the entire Mendocino Coast and constitutes a refugia (Bradbury et al. (1996). It is of the utmost importance for regional recovery of coho that priority be given to erosion control and that no further damage to aquatic habitat take place, especially before other watershed areas have had a chance to recover (see Restoration).

Figure 2 and 3 - Appended

CDFG (2000) noted significant problems for coho salmon spawner access in South Fork Noyo River tributaries during low flow conditions caused by the Noyo Egg Collecting Station (ECS) weir and other impediments. “The coho salmon that did make it past the station were then blocked from passage by the water collection facilities (summer dams) on Parlin Creek and on the South Fork Noyo River at the Parlin Camp” (CDFG, 2000). The situation with summer dams and water extraction should get attention in the JDSF Plan.

Steelhead: The California Department of Fish and Game has a Steelhead Program with an office in Fort Bragg and studies have been carried out for the Noyo River during the last several years. None of this information appears in the references of the JDSF Plan. Gallagher at al. (2000) have noted that steelhead carrying capacity in the Noyo River basin has been greatly diminished, with the adult population estimated as 300-400 fish. This is down an order of magnitude from former estimates (Taylor, 1978), when approximately 6000 adult steelhead returned to the Noyo River. The extremely low return of adult steelhead suggests serious problems with freshwater habitat in the Noyo River watershed. The alteration of freshwater habitat has likely restricted survival of older age steelhead juveniles, which are the most likely to recruit into the adult population (see below).

Coho and Steelhead Habitat Suitability: The JDSF Plan does not properly use or reference available habitat typing data showing that habitat suitability is limited in Noyo tributaries on private land and less than optimal in JDSF (CDFG, 1995-1999; Georgia Pacific 1994-1996). Although the JDSF Plan refers to Knopp (1993), it fails to acknowledge the significance of that report, particularly with regard to local conditions on private land and JDSF and the implications for fish habitat. Water temperatures also exceed suitable levels for coho salmon in some areas of JDSF and the potential linkage to riparian management is not reflected in the JDSF Plan.

Murphy et al. (1984) found that natural pool frequencies in unmanaged streams ranged between 39-67%. Many streams on private lands in the Noyo Basin have pool frequencies less than 20% (Figure 6). JDSF streams have a higher pool frequencies, showing more advanced recovery but still less than optimal conditions (Figure 7). I have personally walked the North Fork South Fork Noyo and Brandon Gulch and found long reaches of bedrock channel, little large wood, and a lack of spawning gravels. This stream has sufficiently cool temperatures to harbor coho salmon, but insufficient habitat complexity (see Restoration). CDFG (2000) also found this reach to have little spawning activity.

Figure 4 and 5 - - Appended

Brown et al. (1994) stated that coho needed pools over a meter (39'') in depth and Reeves (1989) found that steelhead need pools three feet in depth to support rearing of yearling and older juvenile steelhead. In smaller Noyo and Big River tributaries there are few pools greater than three feet in depth (CDFG, 1995-1999; GP, 1994-1996), while larger tributaries with greater depth exceed optimal water temperatures. JDSF has both superior pool frequency and depth compared to other tributaries on private lands.

While the JDSF Plan and EIS mention the volume of sediment in pools, known as V*, the significance of the results of the Knopp (1993) study are not properly discussed. Knopp (1993) found that intensively managed watersheds had significantly higher V* values than those with no history of management or ones with 40-50 years of watershed rest. V* is the ratio of sediment to the volume of sediment and water in a pool, and is roughly equal to the percentage of a pool filled with sediment. Pools in heavily managed watersheds sometimes exceeded 0.40 (or 40% filled), while intact or recovered watersheds had V* scores of 0.21 (21% filled). Results from Knopp (1993) show that streams on industrial timber lands have pools that are filled in and that JDSF streams are more advanced in recovery from past logging damage (Figure 8). Data on pool frequency and depth as well as the amount of sediment in pools indicate that JDSF streams are refugia, when compared to the current conditions of streams in Mendocino County.

Welsh et al. (2000) measured water temperatures in streams in the Mattole watershed and found that coho were absent when water temperatures exceeded 16.8 C (62.3 F) maximum floating weekly average, which he termed MWAT. Hines and Ambrose (1998) also found a similar response by coho salmon to water temperature in Mendocino County watersheds, including the Noyo and Big rivers. While the JDSF Plan and EIS do take note of voluminous water temperature data available for the Forest, they do not mention that some JDSF managed streams are too hot for coho in some years.

In 1996 and 1998, Parlin Creek was within the temperature range recognized to support coho, but it exceeded the reference of 16.8 C maximum floating weekly average in 1997 (Figure 9). This indicates that riparian retention and steps to advance thermal recovery in this stream should be a priority. Figure 10 shows South Fork Noyo River temperatures in 1997 and references optimal growth for salmonids (Armor, 1990), which is 10-15 degrees C (50-61 F). When minimum temperatures exceed optimal growth and enter stressful ranges, the MWAT has risen above 16.8 C and the stream is too warm for coho. The mainstem South Fork formerly harbored coho juveniles and should do so in the future. This should be a permanent monitoring location for adaptive management to see if temperatures decline as JDSF management progresses (see Monitoring and Adaptive Management).

The JDSF Plan fails to note widespread problems with elevated water temperatures throughout the Noyo and Big River basins, where most mainstem sites are too warm to support coho salmon juveniles or for steelhead growth and survival (KRIS Noyo and KRIS Big River Draft). The preponderance of cool water temperatures at JDSF sites, given the condition of streams on private land, is another supporting argument for JDSF as a refugia.

Figures 8-9 - - Appended

Riparian Conditions

The JDSF Plan refers to canopy instead of discussing riparian health and function (Chen, 1991). Science associated with the Northwest Forest Plan (FEMAT, 1993) indicates that the zone of riparian influence is two site potential tree heights or more (Figure 11). In fact water temperature buffering, in the form of cool air temperatures and high humidity over the stream, rapidly deteriorates under one site potential tree height protection, which in redwood country is 200 feet or more (Spence et al. (1996). Consequently, the riparian buffers and management plans are fundamentally flawed. The JDSF Plan ignores best science on this issue to continues to promote harvest of large trees in riparian zones.

It is very surprising that the JDSF Plan did not use the study of the Noyo, Big River and smaller coastal tributaries in JDSF carried out by the Forest and Resource Assessment Program (FRAP) division of CDF (Keithley, 1999). Keithley (1999) used trees 24" in diameter to represent conifers that could provide lasting large wood and channel forming processes, if contributed to streams. He found that in the study area "Overall, the riparian forests were shown to be dominated by younger seral stage trees". Consequently, potential large wood recruitment and other riparian functions are impaired in most of the watersheds surrounding JDSF, with conditions in the Forest representing the best conditions (Figure 12). This graphic again depicts why JDSF should be formally recognized as a refugia and management emphasis shifted to protect and restore riparian zones and adjacent streams to conditions that are optimal for coho salmon, steelhead trout and other sensitive aquatic species.

Data show that some reaches of JDSF streams sometimes exceed water temperatures suitable for coho salmon. More studies should be done to enhance understanding of the relationships between water temperature and riparian conditions before extensive harvests take place (see Monitoring and Adaptive Management). Protections offered in the JDSF Plan for riparian zones are currently those offered under the California Forest Practice Rules. Given the recent recognition that these rules do not protect salmon and steelhead (Ligon et al., 1999), the proposed silvicultural methods are not appropriate. Ephemeral streams (Class III) are one of the most important places in the stream system for supply of large wood and ground water and can be a major source of sediment if disturbed (PWA, 1999). There should be no harvest within one site potential tree height of Class III streams unless it is full suspension cable operations which would release existing larger conifers to accelerate recovery of the riparian to late seral conditions. Class I and Class II streams should be afforded protection to two site potential tree heights or 400 feet on both sides of the stream according to needs described in FEMAT (1993).

Sediment Impacts in the Noyo and Big River Basins and JDSF Management

The JDSF Plan fails to properly acknowledge of the impairment of the Noyo and Big rivers with regard to sediment. The U.S. Environmental Protection Agency (EPA) Total Maximum Daily Load (TMDL) reports for the Noyo and Big River (EPA 1999, 2001), are not acknowledged or referenced by the JDSF Plan.

Figure 10-11 - - Appended

Figure 12 - - Appended

Excellent reports are available regarding sediment budget and erosion sources related to the TMDL in both basins (Graham Matthews and Associates, 1999 and 2001). The JDSF Plan did not use the best available scientific information for assessment of sediment problems and cumulative watershed effects.

It is good to see that JDSF plans to abandon 50-100 miles of road during the next five to ten years to decrease sediment yields. We hope that this means the roads will be decommissioned with crossings pulled, road beds ripped and seeded, inboard ditches filled and all hanging fill pulled back from the roads edge. The Plan does not address recommendations in Cedarholm et al. (1983) and NMFS (1996) that maximum road densities should not exceed 2.5 miles per square mile in order to maintain properly functioning watershed condition. Graham Matthews and Associates (1999) found road densities of 6.67 miles per square mile in the Noyo River watershed with some sub-basins like the Little North Fork as high as 10 mi/sq mi (Figure 13). No roads should be constructed in streamside locations and all existing roads in these locations should be removed or measures taken to completely mitigate surface erosion problems. See discussions below (Restoration) on road decommissioning prioritization and coho recovery on JDSF.

Timber Harvest

The JDSF Plan is insufficient with regard to discussions of timber harvest. There is no mention of prudent limits to logging for maintaining fish habitat diversity and salmonid species diversity. Reeves et al. (1992) studied the last eight basins on the Oregon Coast that were less than 25% timber harvested and compared them to adjacent watersheds with higher timber harvest levels. They found that streams draining watersheds cut in over 25% of their area were usually dominated by one salmonid species, while basins with less disturbance maintained several species. Reeves et al. (1992) traced the root cause to channel simplification associated with pools filling in and large wood depletion. The lack of recognition of limits to timber harvest in California Forest Practice Rules was identified as a major problem for protection of anadromous fish resources by two recent major studies (Ligon et al., 1999; Dunne et al., 2001). The use of FPR rules as sufficient for protection of coho and steelhead in the JDSF Plan ignores these studies.

Timber harvesting has been extensive in recent periods and is recognized as contributing sediment to the Noyo and Big rivers (GMA, 1999 and 2000). The rate of timber harvest increased substantially since 1985 in the Noyo River, when compared with periods for the last 70 years (Figure 14). The Noyo River basin has undergone extensive timber harvest, according to CDF's own data, between 1986 and 1999 with some sub-basins more than 80% harvested in this period (Figure 15). The extensive timber removal adjacent to JDSF is also evident in the Big River basin, with extensive clearcut logging in areas just to the south of the Forest (Figure 16).

The EPA Land Cover data derived from 1994 Landsat imagery shows the dramatic difference between JDSF and adjacent private land holdings (Figure 17). While JDSF shows up as evergreen forest, seral stages in adjacent areas recently clearcut show up as mixed forest, hardwoods and shrubland. Change scene detection using 1994 and 1998

Figure 13-14 - - Appended

Figure 15-16 - - Appended

Landsat imagery has been checked by CDF FRAP and can be used to identify landscape changes such as those associated with timber harvest. Figure 18 shows that timber harvest within JDSF was quite rapid in some basins, like Parlin Creek, with the harvest area in just four years approaching the prudent limit for timber harvest of 25%.

Deficiencies in protection of riparian areas from timber harvest are discussed above. Given the recognized sediment over-supply of the Noyo River (EPA, 1999; GMA, 1999), no timber harvest should take place in inner gorge areas unless similar restrictions are imposed as described for Class III streams above (Riparian). Welsh (personal communication) and Brosofske et al. (1999) note that timber harvest can affect ground water temperature, which in turn effects the temperature of surface flows. This relationship argues for selective logging, not patch clear cuts.

Cumulative Effects

The JDSF Plan does not sufficiently address cumulative watershed effects regarding forests, timber harvest impacts, roads and erosion and major effects like the loss of the coho salmon. Page 122 of the EIS states that sediment from logging operations will be fully mitigated and; therefore, sediment contributions will be insignificant. This is the same fundamental de-constructionist logic that has crippled cumulative effects analysis under the Forest Practice Rules (Dunne et al., 2001). The Science Panel Report (Ligon et al., 1999) points out:

> "the primary deficiency of the [Forest Practice Rules] is the lack of a watershed analysis approach capable of assessing cumulative effects attributable to other non-forestry activities on a watershed scale. As currently applied (the rules) do not provide the necessary cumulative effects assessment at the appropriate temporal and spatial scales."

The University of California has recently funded an important study entitled: *A scientific basis for the prediction of cumulative watershed effects* (Dunn et al. (2001), which should have been used as a guideline to develop the cumulative effects section in the JDSF Plan. Instead the Cumulative Impacts section is less than a page long. Although the Plan promises basin-wide context discussions for fisheries and wildlife which will fulfill cumulative effects analysis requirements, such discussions are not found in the JDSF Plan.

Dunne et al. (2001) explain that large land surface disturbances, such as the recent extensive timber harvests surrounding and within JDSF, cause effects which are sometimes hard to quantify but known to occur:

> "Generally speaking, the larger the proportion of the land surface that is disturbed at any time, and the larger the proportion of the land that is sensitive to severe disturbance, the larger is the downstream impact. These land-surface and channel

Figure 17-18 - - Appended

changes can: increase runoff, degrade water quality, and alter channel and riparian conditions to make them less favorable for a large number of species that are valued by society. The impacts are typically most severe along channels immediately downstream of land surface disturbances and at the junctions of tributaries, where the effects of disturbances on many upstream sites can interact."

There are no credible discussions in the JDSF Plan or the EIS of existing and potential cumulative effects as described by Dunne et al (2001). The JDSF Plan says it can't consider wider watershed areas because "private ownerships have differing management objectives." In fact Dunne et al. (2001) suggest use of remote sensing tools in such exercises, which were readily available to JDSF planners.

The JDSF Plan and EIS notes that the City of Fort Bragg periodically must draw its water through Ranney collectors because of excessive turbidity. It goes on to say that things are improving, but fails to correlate past waves of land use to periodic water quality degradation and to acknowledge that JDSF plays a role in maintaining the quality of the Fort Bragg water supply.

There is no substantive discussion of a huge cumulative effect; the virtual loss of coho salmon as a result of land use practices. The extremely intensive timber management since 1985 in the Noyo River Basin and surrounding watersheds such as Pudding Creek, Ten Mile River and Big River have caused the disappearance or diminution of coho salmon in these areas, making the habitat on JDSF critical for the survival of the species regionally.

Restoration

The JDSF Plan tiers the importance of restoration below commodity outputs, when restoration objectives could really be perfectly compatible with a different approach to silviculture (see Forestry). Bradbury et al. (1996) *Handbook for Prioritizing Watershed Protection and Restoration to Aid Recovery of Pacific Salmon* is the definitive treatise on the hierarchy of restoration and should have been a key reference. Instead the JDSF Plan offers no effective strategy for recovering coho and steelhead, saying only that JDSF will continue to study the fish and do good things for them.

From a review of efforts to develop a regionally comprehensive restoration strategy (FEMAT 1993, Bradbury et al. 1995, Pacific Rivers Council 1996, Spence et al. 1997), one can identify the basic elements of any restoration strategy:

- <u>Protect refuge areas</u>: At both a regional and local watershed level, the best remaining habitats that support native salmonids should be a priority for protection and any necessary restoration treatment. Such refugia are critical for the recovery of populations because they provide source areas for recolonization.

- <u>Think process over structure</u>**:** Effective restoration treatments address the underlying processes of ecosystem deterioration and do not merely modify damaged areas to achieve short-term goals.

- Protect source areas**:** As a function of cumulative watershed effects, headwater areas can influence aquatic habitat conditions along an entire river course, and are therefore a priority for protection and restoration.

- Diffuse time bombs**:** Many habitats exist downstream from disturbed slopes that have not yet expressed their potential impact. Priority areas for recovery are those which are above prime habitat or refugia where erosion will inevitably be triggered by a major storm or catastrophic event.

The highest priority restoration targets should be the South Fork Noyo River (including Parlin Creek), Caspar and Hare creeks and Russian Gulch. These areas are known to be the last, healthiest habitats for coho salmon upon which the restoration of the species regionally rely. Watersheds should have rest from timber harvest unless JDSF converts to restoration forestry techniques as described below (Forestry). Streamside roads should be decommissioned or re-engineered to minimize surface erosion, potential crossing failure and associated gully erosion.

Keithley (1999) used riparian condition, gradient and watershed disturbance in gauging the restoration potential of sub-basins in the Noyo and Big river basins as well as adjacent coastal tributaries. Figure 19 shows a map of potential sediment yield and riparian conditions, which Keithley (1999) saw as suitability for restoration. Areas with good riparian and lower sediment yield are recommended for higher priority and fall on JDSF.

Some northwestern Big River sub-basins still maintain viable coho juvenile populations (NMFS, 2002), while tributaries in JDSF like Chamberlain Creek and James Creeks are not known to harbor them. The recent acquisition of some of the western portion of the Big River basin by the Mendocino Land Trust makes this an ideal time to try to restore the entire lower Big River, including JDSF.

Sensitive Amphibians

Amphibian species may be better indicators of stream health than coho salmon and steelhead. Sensitive species like the tailed frog (Ascaphus truei) have very exacting habitat requirements and do not travel extensively during the course of their lives (Welsh and Ollivier, 1998). Their viability has been linked to the presence of healthy riparian canopies, cold water and clean coarse streambed substrates (Welsh and Ollivier, 1998). Tailed frogs are known to occur in JDSF (Macedo, 1999) and they are also recognized in the JDSF Plan as a Sensitive Species. Discussions are lacking, however, on the habitat needs of this sensitive amphibian species and how timber harvest in riparian zones or upland areas will help protect them.

Tailed frogs have water temperature tolerance similar to coho salmon. Their eggs are destroyed at 18.5 degrees C (Brown, 1975), so streams that support this species must maintain a cold-water thermal regime similar to that required by coho salmon (Welsh et al., 2000). Even partial removal of stream canopy can increase water temperatures and decrease relative humidity along the stream corridor, which can make these areas unsuitable for tailed frogs (Bury and Corn, 1988).

Figure 19-20 - - - Appended

The need for protection of tailed frogs is another reason that riparian harvests in JDSF need further study. The liberal CFPR harvest guidelines on Class II and Class III streams may directly affect frogs through canopy reduction and warming or through detrimental sediment contributions from headwaters. If tailed frogs are protected in upstream areas, it virtually assures that coho salmon habitat will be suitable in reaches below.

Forestry

While I am not a forester, I have seen examples of selection silviculture very near JDSF that could be applied to the Forest. This approach would end controversy, advance forest health, allow salmon and steelhead recovery and provide a high and stable flow of timber.

The Parker Ranch on the North Fork Ten Mile River offers an example of how JDSF could be managed for timber and restoration simultaneously. Full suspension cable systems are used almost exclusively, resulting in little ground disturbance and just 15 foot-wide cable corridors. I saw a steep, landslide prone ridge about one third of a mile long which had 20% of the young trees removed but only thin sky-line corridors were visible (Figure 20). Had this slope been cut with even aged management, a major risk of landsliding would have resulted.

Logging roads are only one truck wide and traffic is radio coordinated. The forester checks for erosion along roads during winter storms following operations. These roads are covered in duff and vegetation within a few years after harvest. Slash from timber operations are spread out over the timber harvest site and mixed with dirt. This increasessoil microbes and fungi and adds to filter capacity. The Parker Ranch runs summer eco-tours on horseback in areas shortly after harvest.

The growth of young conifers on the Parker Ranch are somewhat stunted due to competition like those on JDSF. The planned logging will take place over 60 years with four entries. The growth increment increases on the order of 2.5% after thinning with suspension cable logging. The basal diameters of the trees will continue to increase as the thinning from below occurs until at 60 years many trees will be 24-36 inches in diameter or more.

JDSF should abandon demonstrating outmoded timber harvest practices and begin to demonstrate restoration forestry. The low impact techniques described above would win back the confidence of local people concerned with the health of JDSF and the protection of its fisheries and wildlife. This mode of operation would obviate the need for herbicides and be more compatible with restoration objectives. Finally, adopting this mode of operation would end the legal and political gridlock, which has stopped timber flow out of JDSF.

Monitoring/Adaptive Management

It is laudable that the JDSF Plan commits the Forest to a course of adaptive management, whereby scientific data will be used to gauge success of management and objectives modified if results suggest that strategies are not working. The monitoring plans advanced, however, are not crisply focused on critical ecosystem functions and other beneficial uses, such as Fort Bragg's water supply. Walters (1996) noted that many entities world wide claim to be practicing adaptive management but that few had properly working examples. He further warned that unless the management actions were sufficiently different than previous activities, it would be difficult to discern between normal environmental fluctuations and those associated with management. The JDSF Plan runs this risk with subtle, continuing effects from timber harvests confounding recovery.

Monitoring suggestions are as follows:

- Turbidity measurements need to be taken by continuous recording devices stations throughout JDSF, particularly before and after any activities such as logging or extensive road decommissioning.
- Fine sediment in pools (V*) should be used every five years or after major storm events to gauge the recovery of pool volumes and discover potential sediment problems.
- Aquatic macroinvertebrates should be monitored at stations throughout JDSF using California RAPID Bioassessment protocols (CDFG, 1999) and similar in design to Friedrichsen (1999)
- Coho and steelhead spawner surveys on JDSF should be arranged with CDFG with the potential of involving volunteers from local high schools to improve cost-efficiency.
- Monitor ambient air temperatures above streams at different locations with varying canopy and riparian cover and relate to water temperatures.

This latter exercise could be directed at restoring water temperature to optimal for coho salmon and conditions to suitable for tailed frogs. Experiments also need to be conducted to see if thinning from below in the riparian zone is more effective at improving water temperatures versus removing dominant trees. Further timber harvest will likely not be needed for the latter study because the full range of riparian conditions currently exists on JDSF.

The JDSF Plan suggests a need for a State Forest Data Base, which is just beginning to be considered. While such a database might be useful for CDF overall, JDSF should become an active user of the KRIS Noyo and Big River projects because they are ideal adaptive management tools.

Sincerely,

Patrick Higgins

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Figures

Figure 1. The map above shows the last populations of coho salmon in the hundreds in all of northwestern California, according Brown et al. (1994), one of which is the Noyo River population. If these last populations are lost, then the coho recovery will not be possible.

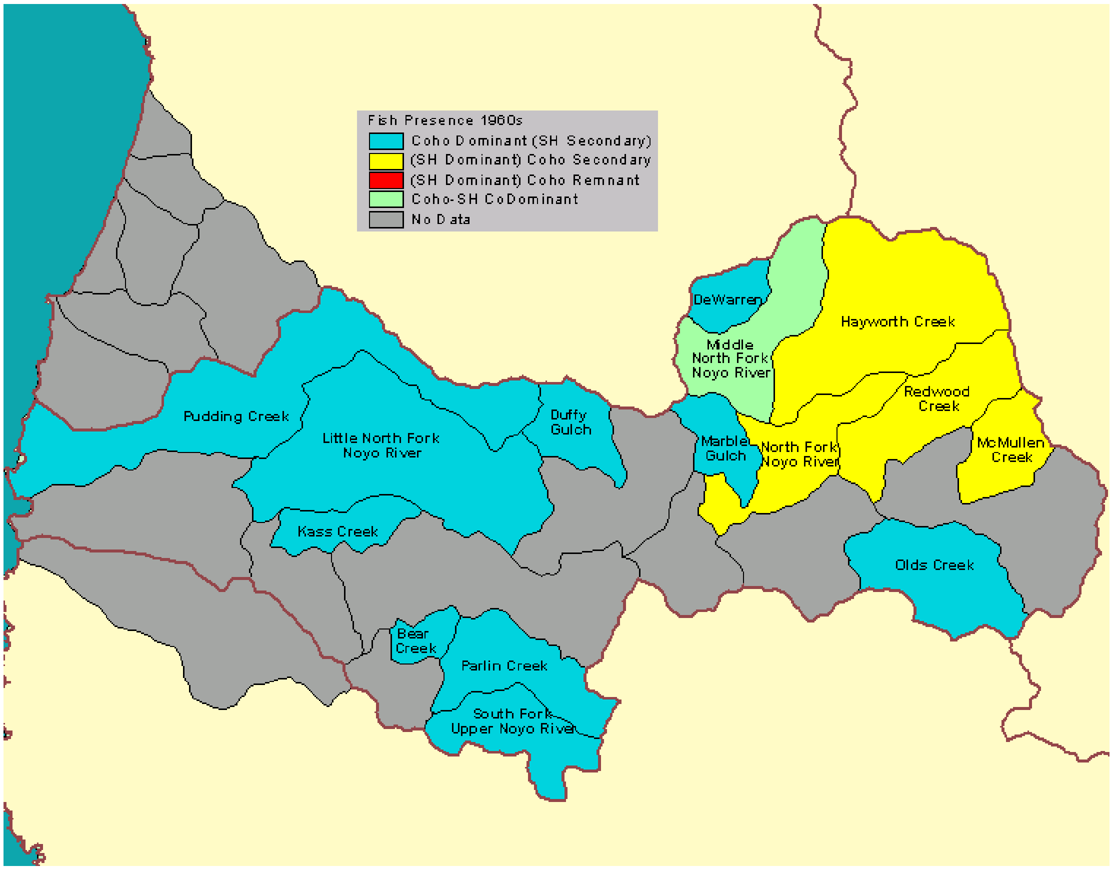

Figure 2. The light blue basins above are those dominated by coho salmon according to 1960's CDFG memos, while yellow basins had coho present but less numerous than steelhead juveniles in samples. From KRIS Noyo.

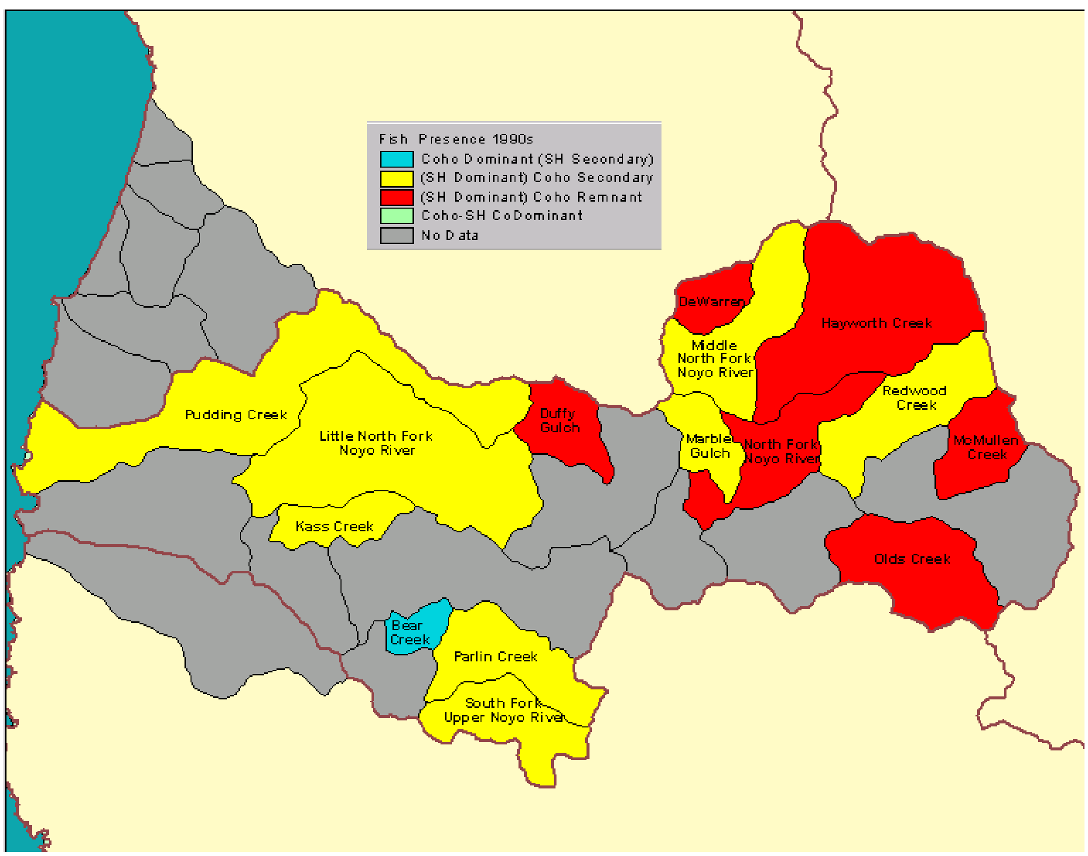

Figure 3. According to electrofishing and dive samples, the abundance and distribution of coho in the Noyo River changed substantially by the 1990's. Steelhead were dominant in western basins, except for Bear Creek. Coho were remnant or absent in the east and have decreased or disappeared in much of the Noyo Basin.

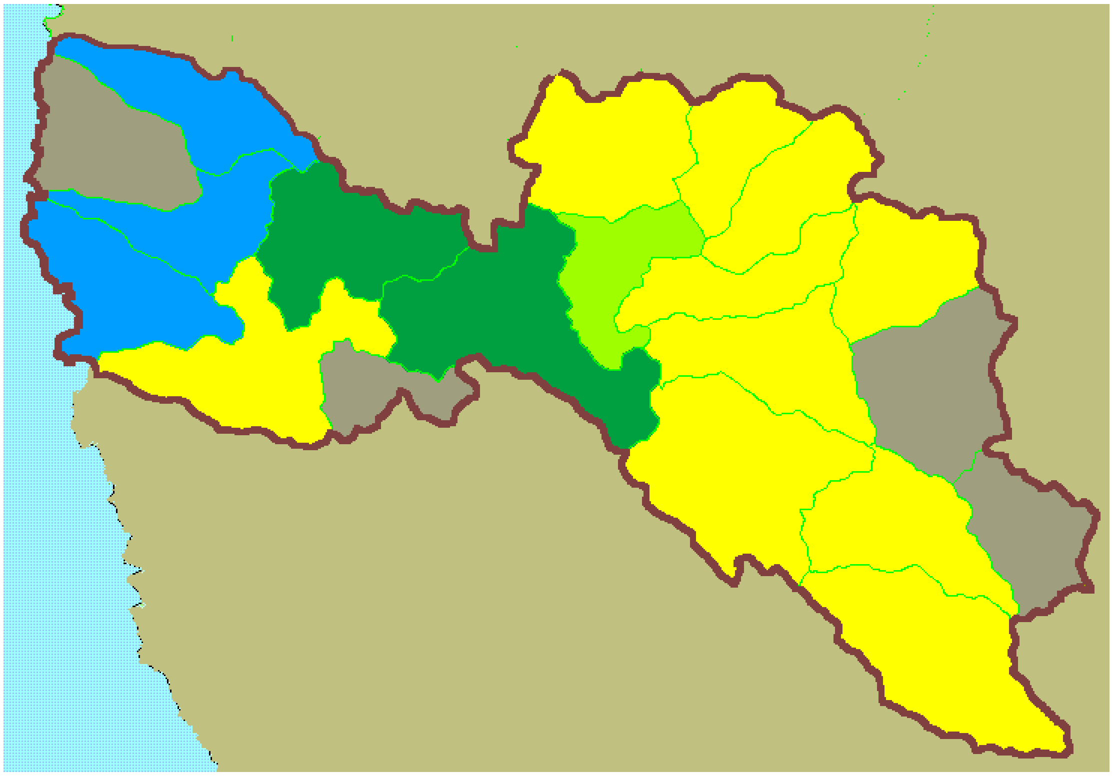

Figure 4. The map above from the KRIS Big River project shows basins where coho are still dominant in light blue, where they are co-dominant with steelhead as dark green, present but less numerous than steelhead in light green and remnant or absent in yellow. This map shows the extremely poor condition of coho salmon population in the Big River and the high importance of JDSF coastal tributaries.

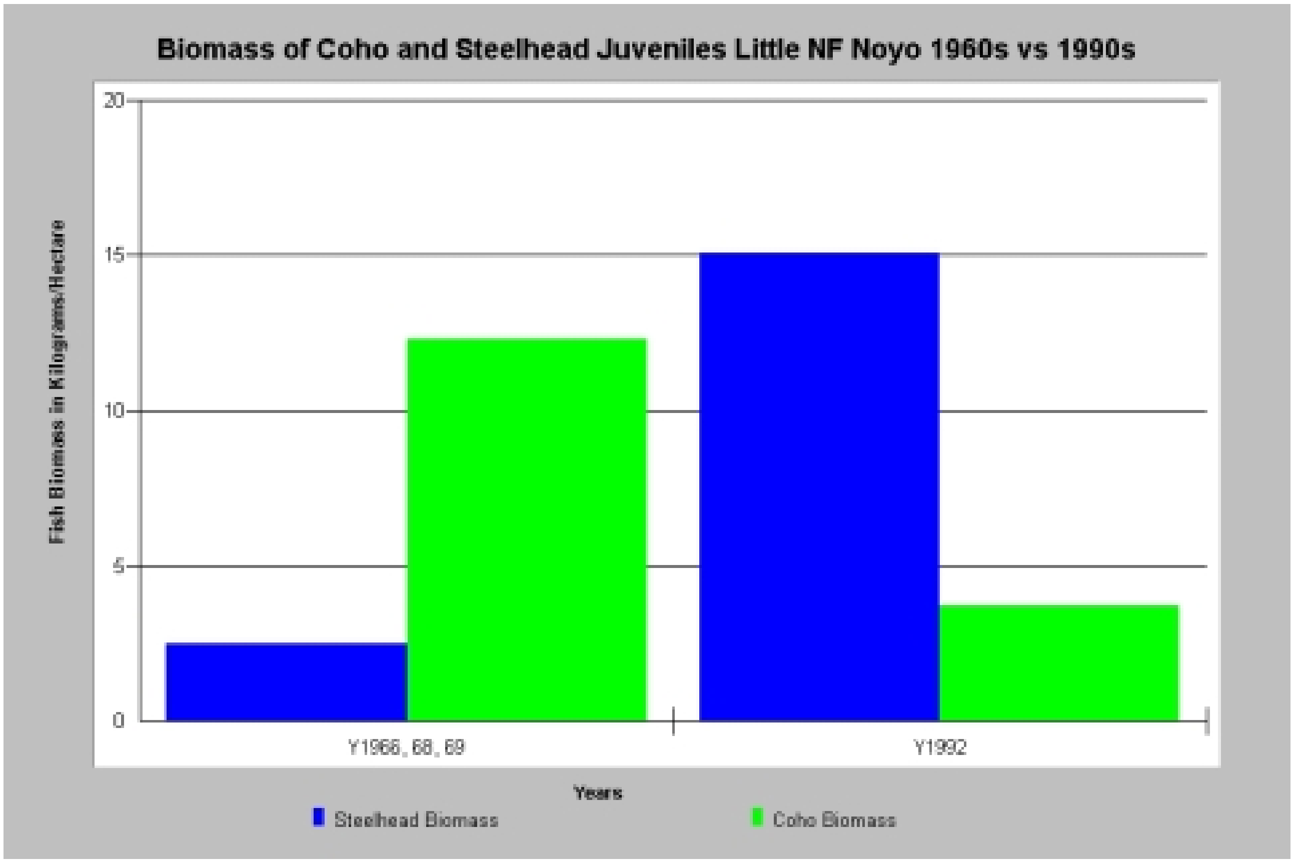

Figure 5. Comparison between electrofishing by Burns (1972) in 1966-68 and by Valentine and Jamison (1994) in 1992 show that the Little North Fork switched from a coho dominated ecosystem to one dominated by steehead. Chart from KRIS Noyo.

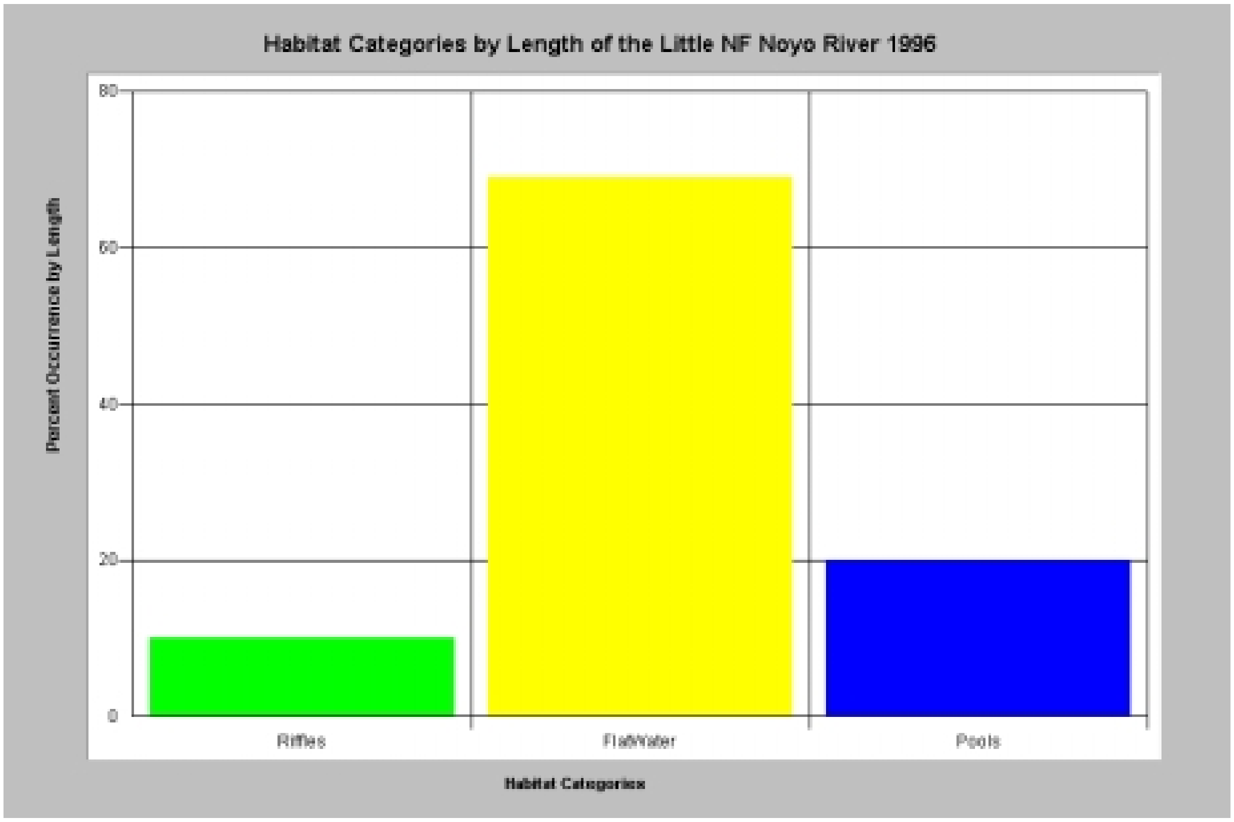

Figure 6. This chart shows the frequency by length of habitat categories for the Little North Fork Noyo River. Pools constituted only 20% of habitats, which is indicative of recent pool filling due to intensive land use management.

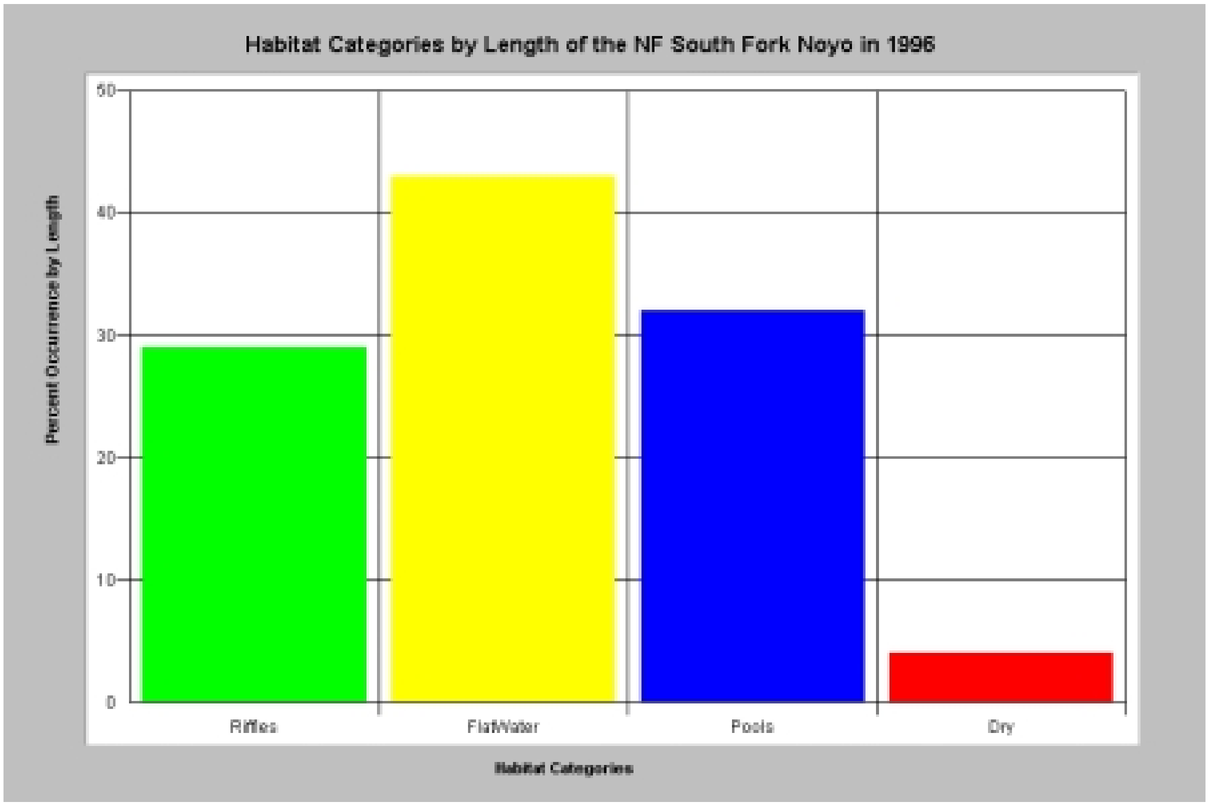

Figure 7. The habitat frequency chart from the North Fork SF Noyo within JDSF shows recovery from past activities but pool frequency is still below optimal. The dry stream segment suggests some remaining problems with aggradation.

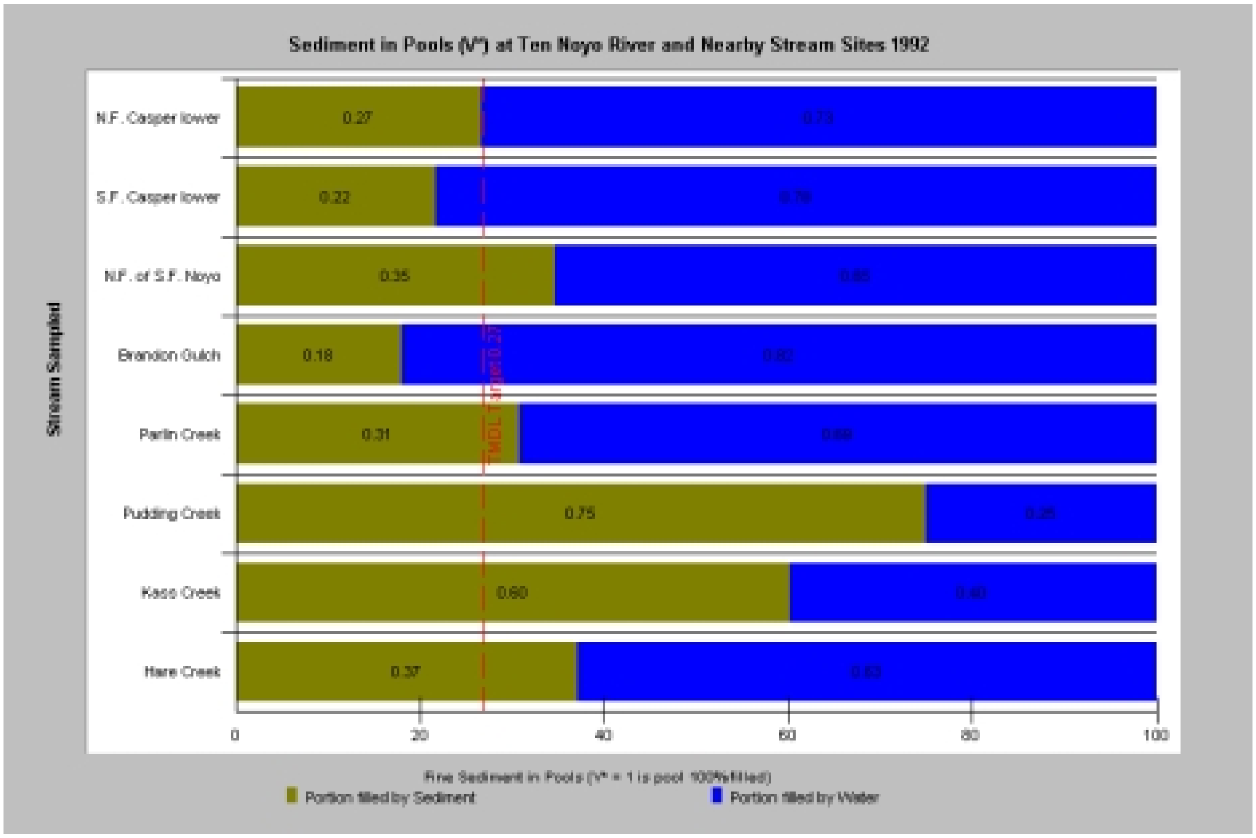

Figure 8. The V* data from Knopp (1993) above indicates that JDSF streams are in recovery from past logging damage while the streams on industrial timberland (i.e. Kass or Pudding creeks) are more filled in.

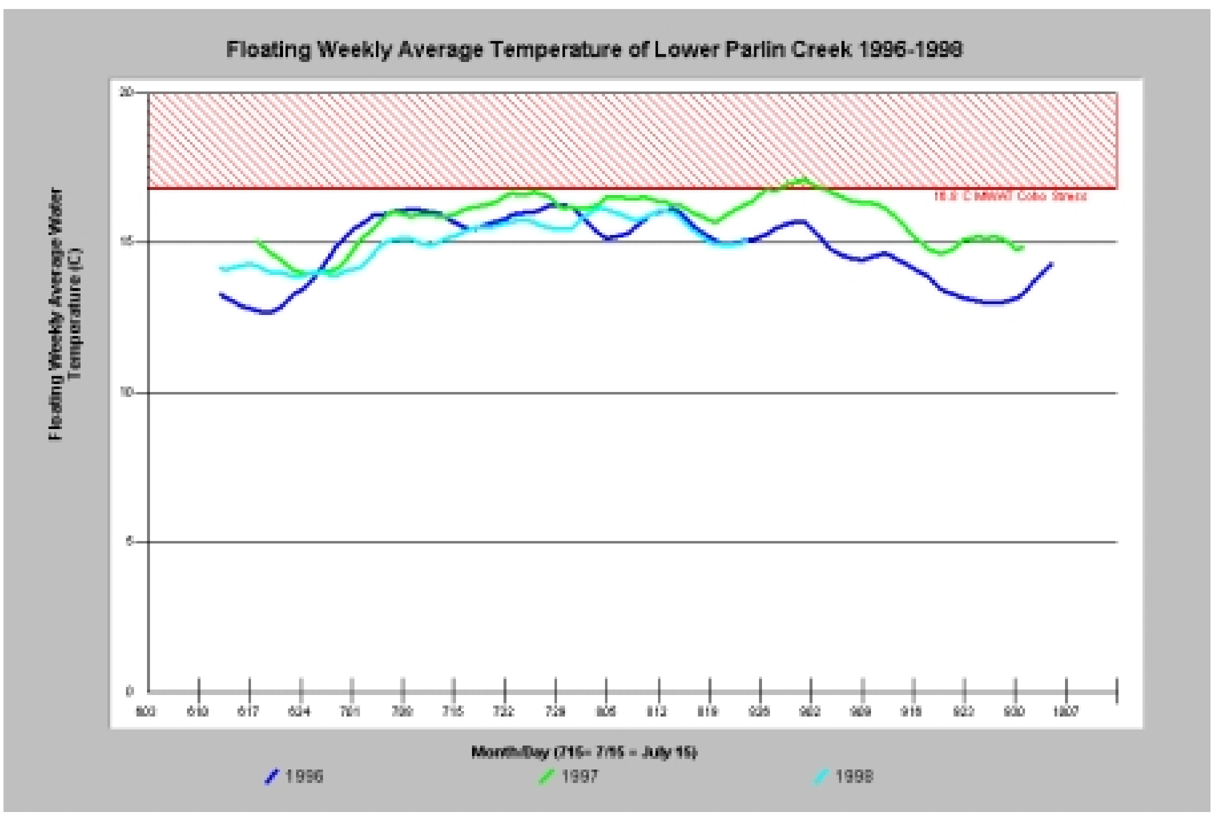

Figure 9. The floating weekly average water temperature of lower Parlin Creek exceeded the suitable range for coho salmon briefly in 1997. Although this reach is suitable in most years for coho, JDSF should try helping advance recovery to make it optimal in all years and help buffer warm stream temperatures in the lower South Fork Noyo on the Forest.

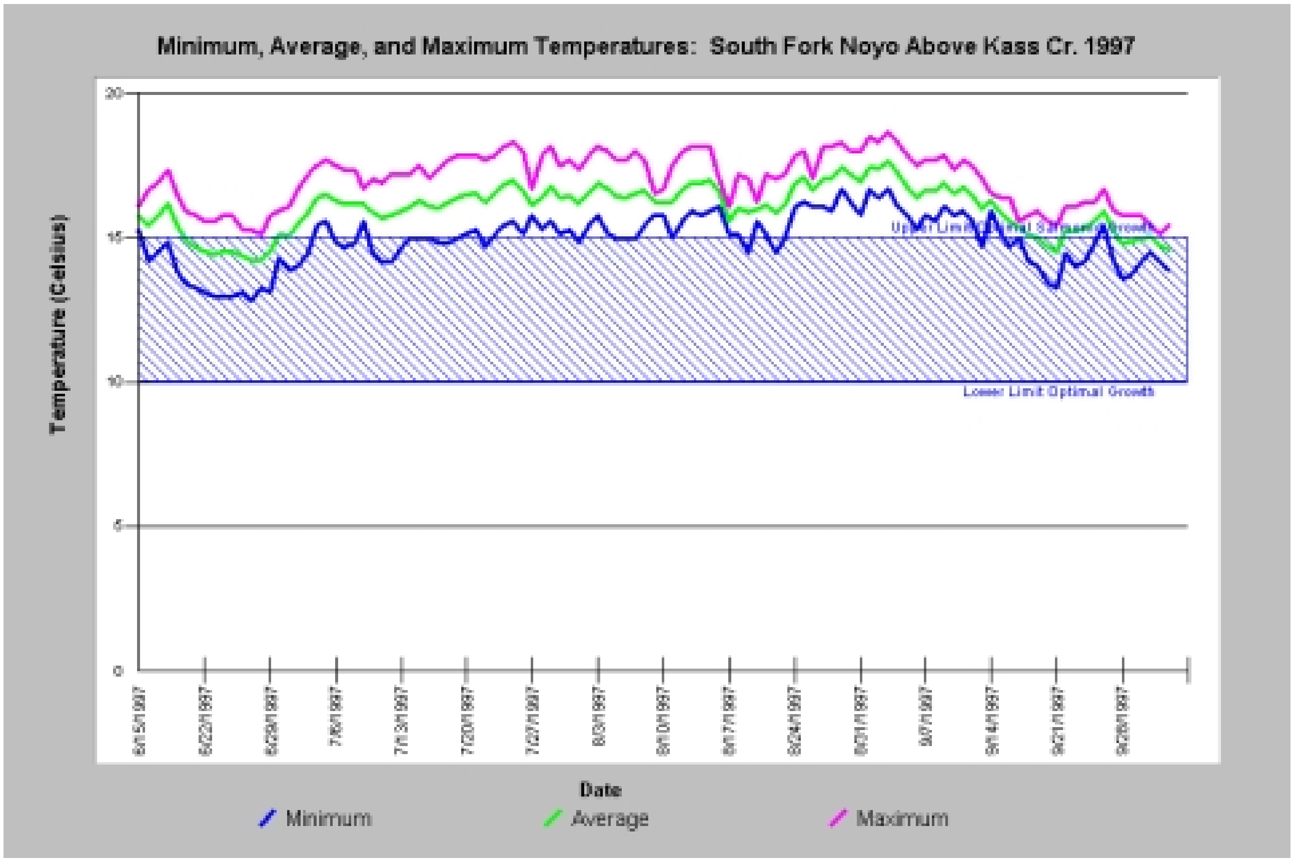

Figure 10. The minimum South Fork Noyo River temperature often exceeded the salmonid optimal growth range in 1997 and would have been too warm at this location to rear coho salmon.

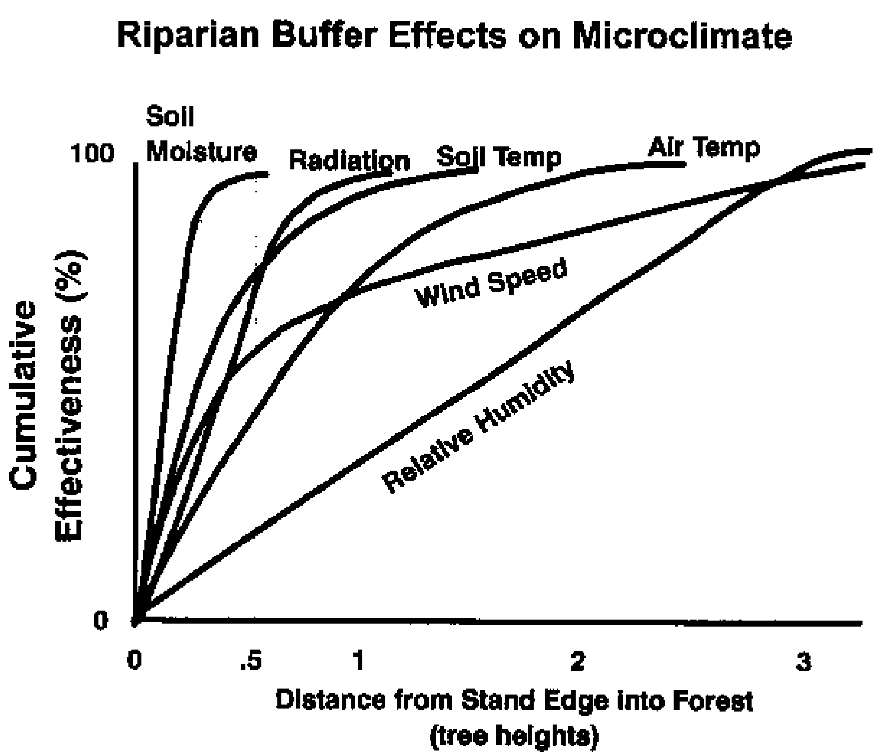

Figure 11. This figure taken from Chen (1991) shows how various riparian functions important to streams deteriorate as disturbance encroaches into stream side areas. One site potential tree height is at least 200' in redwood forests (Spence et al., 1996).

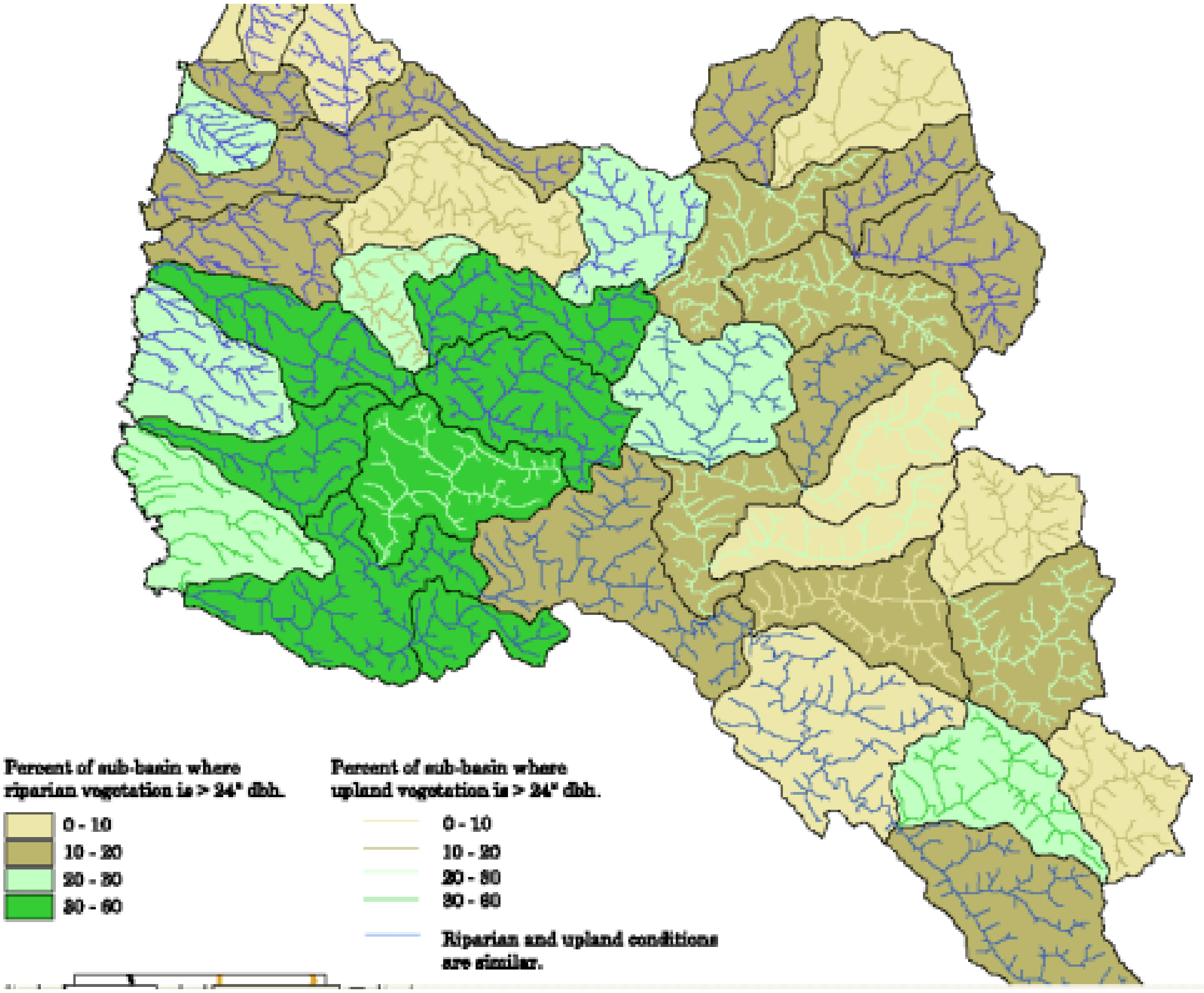

Figure 12. The above map taken from Keithley (1999) shows that JDSF has the only functional riparian zones for salmonid suitability in the entire Big River, Noyo River and adjacent small coastal tributaries. This shows widespread depletion of riparian zones off JDSF that will not recover to desired future condition for salmonid habitat for 100 years.

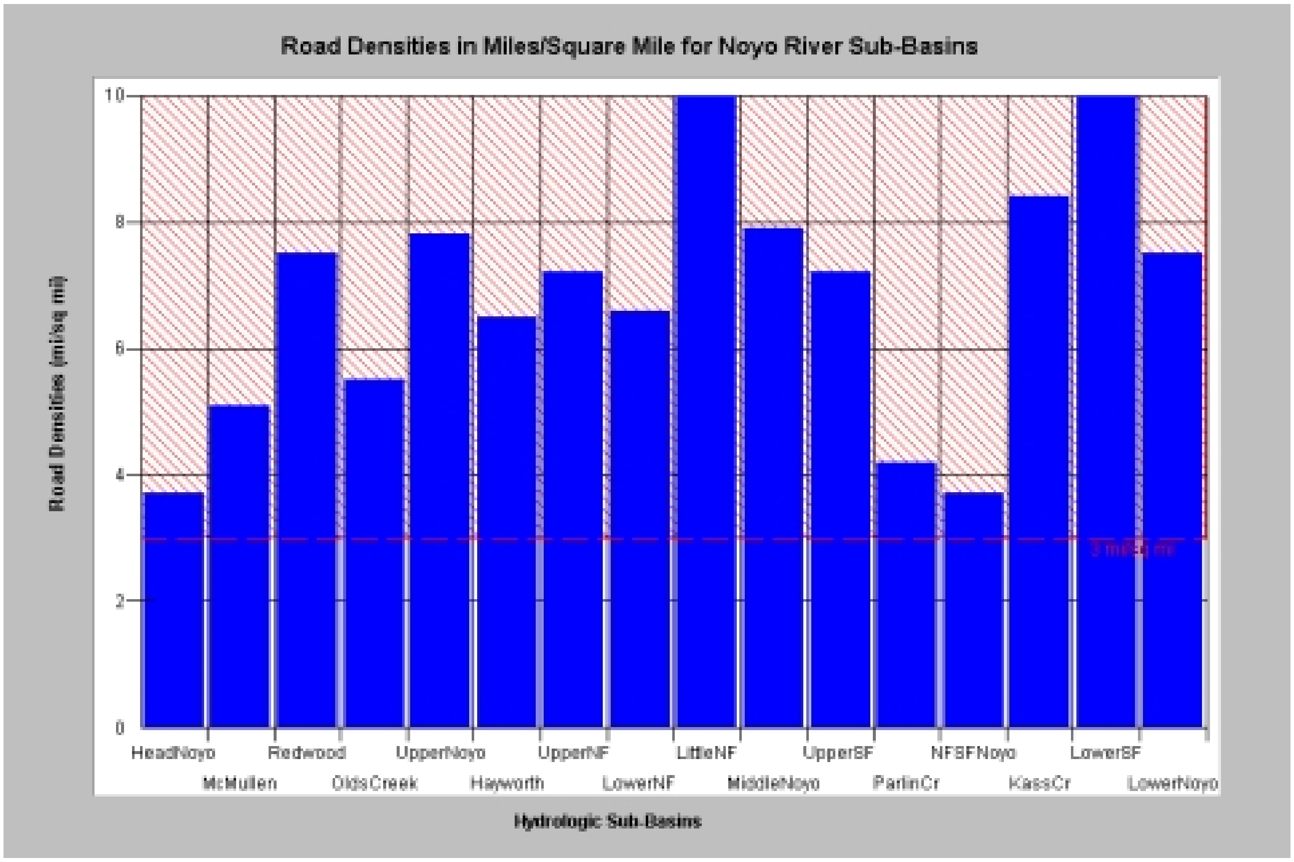

Figure 13. This chart comes from the KRIS Noyo project and shows the road densities in miles per square mile for all Noyo River sub-basins. Note that road densities on JDSF watersheds, such as Parlin Creek and NF SF Noyo, are lower than those on adjacent industrial timber land (i.e. Kass Creek).

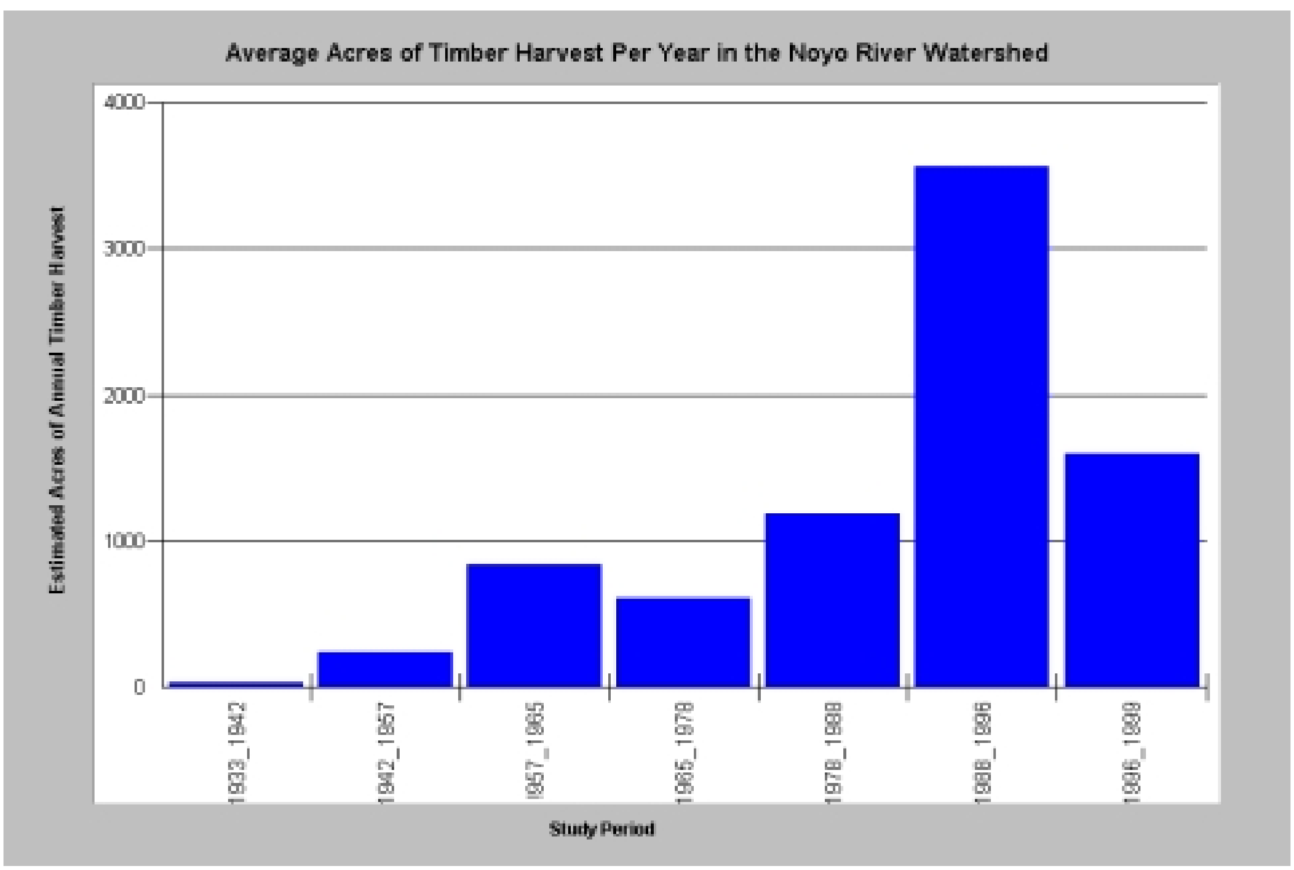

Figure 14. The chart above shows a dramatic increase in the acres timber harvested in recent decades in the Noyo River basin (GMA, 1999).

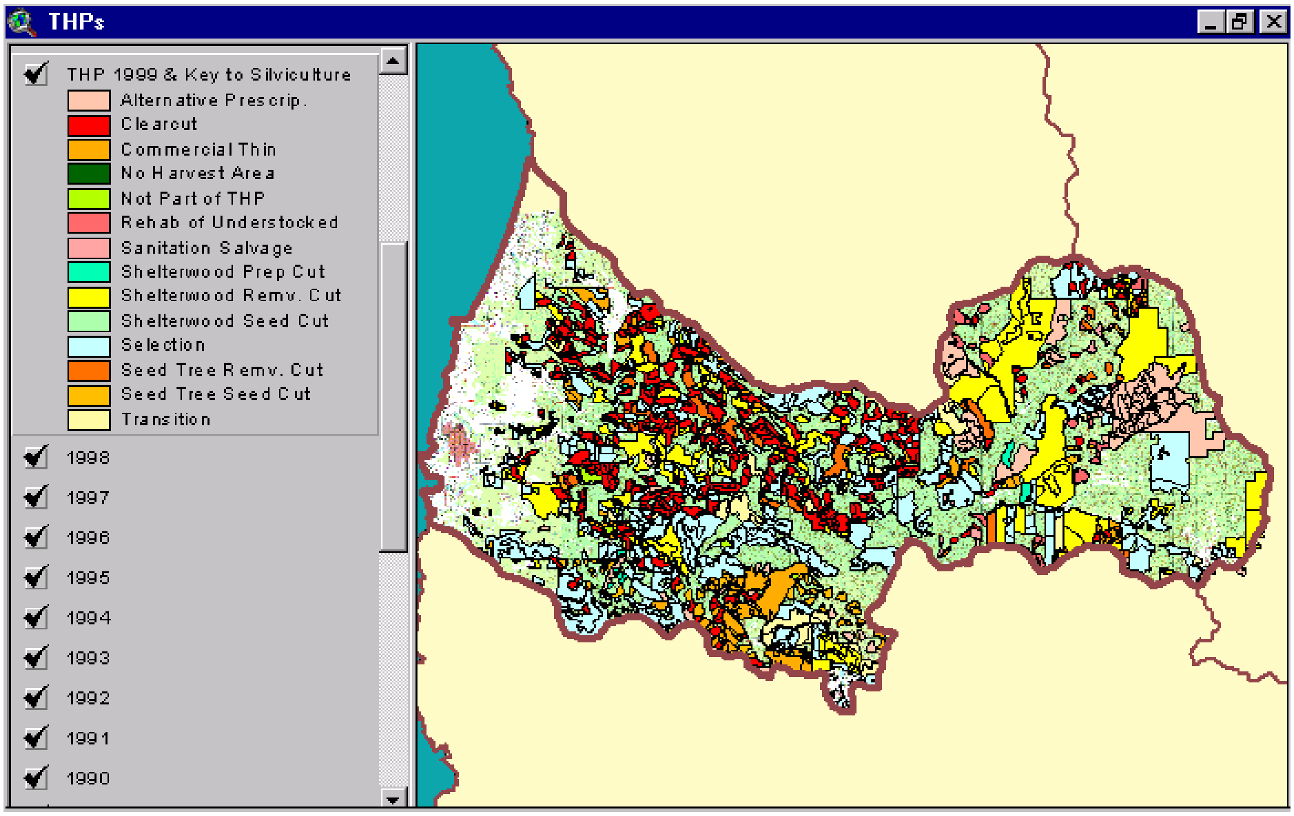

Figure 15. The image above from the KRIS Noyo Map project shows CDF approved timber harvest plans from 1986-1999 showing silvicultural methods. Not extensive clear-cutting just north of JDSF. Data from CDF Santa Rosa.

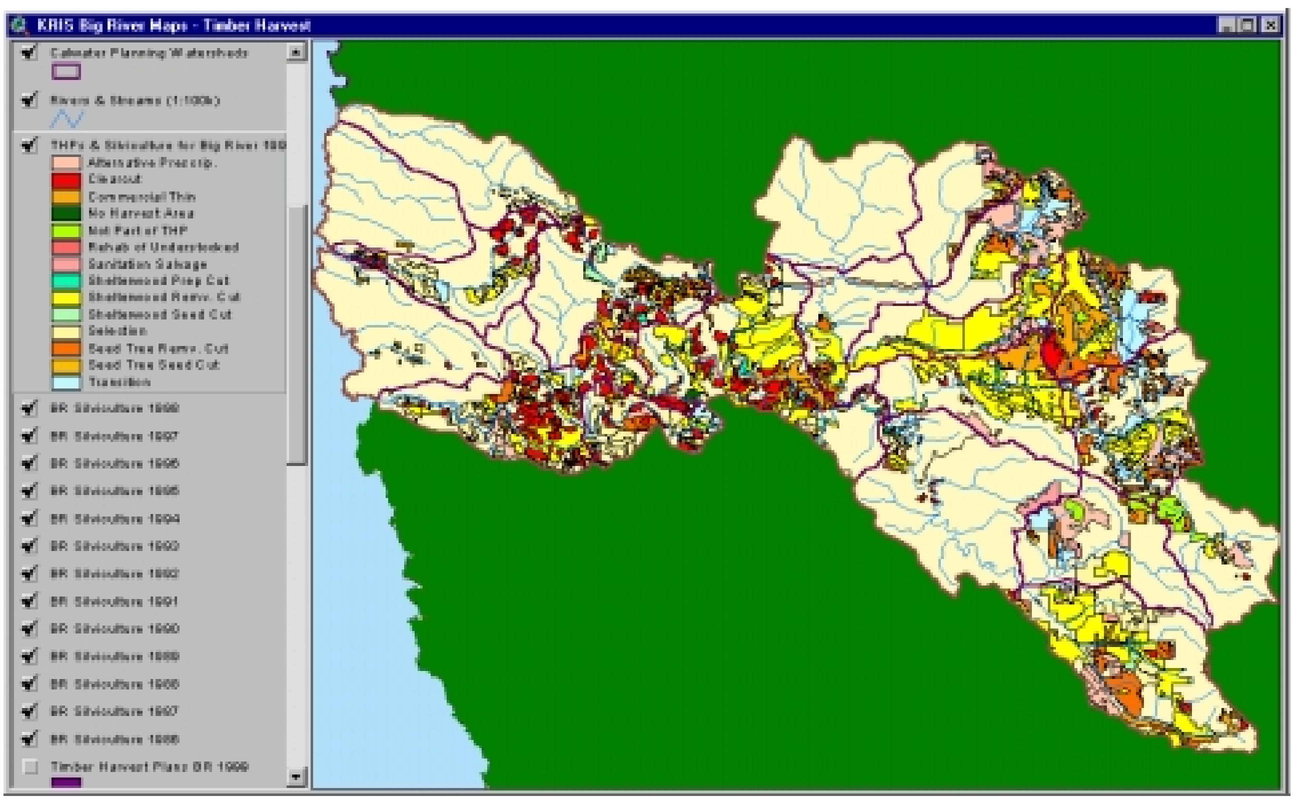

Figure 16. This map from the KRIS Big River Map project shows CDF timber harvests permitted from 1986-1999. Timber harvests, including many clearcuts, pretty cover extensive areas just south of JDSF holdings in the Big River. Data from CDF Santa Rosa.

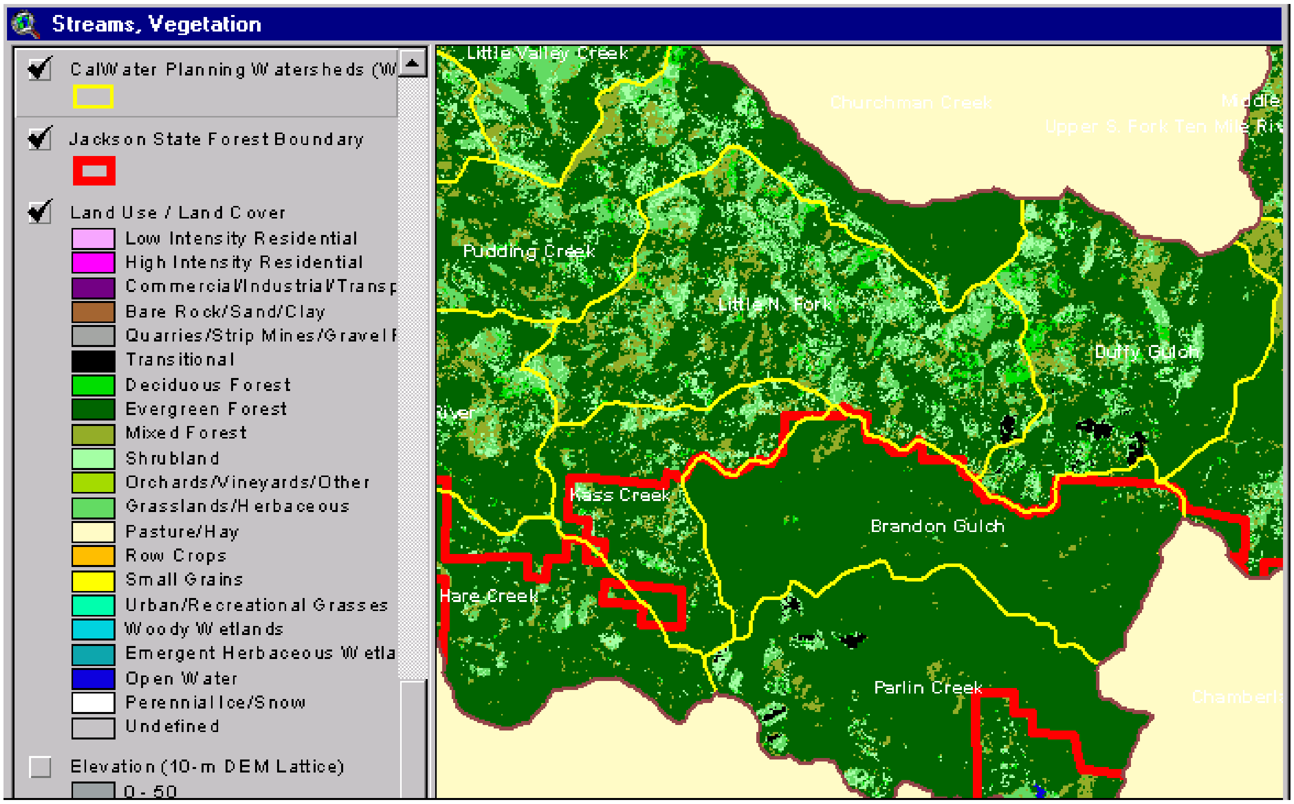

Figure 17. The EPA Land Cover types are derived from a 1994 Landsat image and show that industrial timberlands adjacent to JDSF to the north were so heavily timber harvested that they have the signature of mixed forest, deciduous forest and shrubland. JDSF mostly retained the signature of evergreen forests.

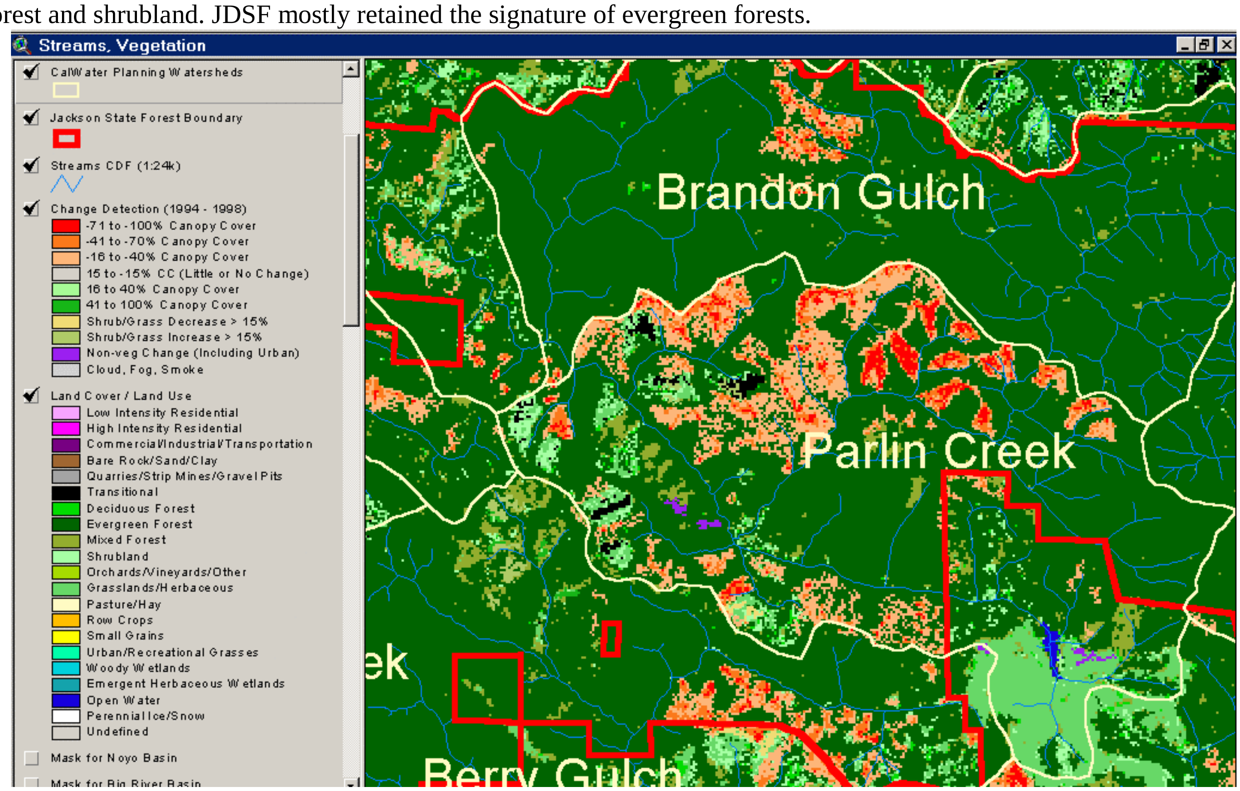

Figure 18. Changes detected using 1994 and 1998 Landsat images show extensive canopy removal associated with timber harvest in the Parlin Creek watershed with extensive timber harvests on JDSF in a short period.

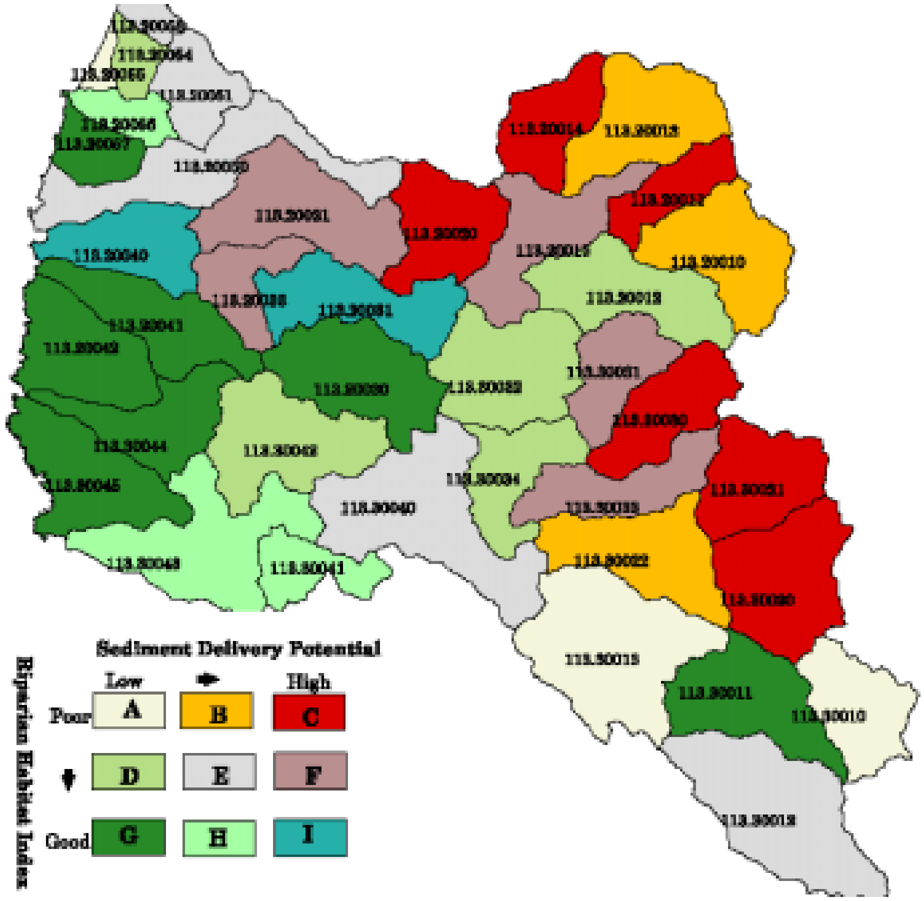

Figure 19. The map above from Keithley (1999) shows Noyo, Big River and coastal drainage riparian conditions and potential sediment yield. The dark green polygons represent the best prospects for restoration, most on JDSF.

Figure 20. Steep area in the lower Ten Mile River basin recently timber harvested with 20% of trees removed using full suspension cable operations with little ground disturbance. Cable corridors are visible on ridge, forming a V just below the center of the photo.