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A Review of Current Non-Federal Policies on Non-Federal Lands in the Sierra Nevada that affect Aquatic, Riparian, Upland and Late-Successional Biological Diversity

ABSTRACT

Current policies affecting biological diversity on the non-federal lands in the Sierra Nevada are complex and interlinked. These policies, the jurisdictions from which they are derived, and the landtypes to which they extend are summarized and discussed in this paper. The range of policies affecting biodiversity considered include those with direct biodiversity goals well as those with secondary effects. First, relevant water quality law and provisions of the California Environmental Quality Act (CEQA) are described. Second, policies with impacts on late-successional/old growth systems are analyzed in detail. Third, policies affecting the biological diversity of aquatic and riparian systems, upland areas, and late-successional forests are summarized across five different land types: (1) forested lands under the jurisdiction of the California Department of Forestry and Fire Protection (CDF), (2) forested lands not under CDF's jurisdiction, (3) hardwood woodlands, (4) rangelands, and (5) areas of human settlement. Finally, a comparison is made between different aquatic and riparian protection strategies discussed in the Sierra Nevada Ecosystem Project report and the current goals and regulations that exist in different jurisdictions.

I: INTRODUCTION

In order to pursue the Sierra Nevada Ecosystem Project's (SNEP) goal of examining management strategies that maintain the health and sustainability of Sierran ecosystems while meeting human needs we need to know what policies are in place that may already provide protection or may be used to provide protection under various strategies discussed in the project. The information in this report may be used to help ascertain whether current policy on non-federal lands is sufficient to achieve the goals of these management strategies, and if not, to define what additional biodiversity protection goals would be needed.

Throughout this paper we use the term "biodiversity" in a more general sense than its narrow definition of diversity of species, communities, or gene pools. The assumption behind our choice of this word is that high biodiversity often correlates with relatively intact, functional systems while more disrupted systems often have lower levels of biodiversity compared to their former condition. Biodiversity is not *always* higher in less-disturbed systems, however. For clarification, in this paper we are using the term "biodiversity" loosely, as a surrogate for the various forms of biodiversity, functioning ecosystems, and presence of native biota. The protection of biodiversity, in its broadest sense, including late-successional forests, is an important ingredient in maintaining the health and sustainability of Sierran ecosystems.

Sierra Nevada Ecosystem Project: Final report to Congress, Addendum. Davis: University of California, Centers for Water and Wildland Resources, 1996.

The protection of biodiversity in the Sierra Nevada takes many forms and involves many institutions and approaches. There are more than 50 agencies at the federal and state levels with some degree of jurisdiction over California's rivers. A number of agencies involved in terrestrial resources and county and municipal levels of government swell the ranks of agencies involved in regulating the Sierra Nevada's environment. To depict all regulations and discuss their effects for each of these agencies, and all of the local jurisdictions as well, is a daunting task.

In this paper, we examine major institutional players and policies that probably have the greatest effect on Sierran non-federal biological diversity. The primary intent of this paper is to support discussion on more focused topics, such as biodiversity in aquatic, riparian and late-successional areas in the Sierra. Within the limited scope of this work, some elements of biodiversity are not covered. Many levels of detail of current policy, for example, particularly local municipalities and their programs, are addressed only briefly here (instead, see Duane 1996). Due to the large scope of this analysis, policy information has not been collected on policies relating to pesticides, agricultural laws and mining, and minimal data has been collected on air quality (instead, see Cahill 1996).

Policies may directly and intentionally affect biodiversity (polices with biodiversity *goals*) or indirectly or incidentally affect biota (policies with biodiversity *effects*). The state Endangered Species Act, for example, is a policy with distinct goals for protecting biota. The regulations affecting significant visual impacts in the environment, in contrast, may have significant indirect effects on local flora and fauna. Policies often have both direct and indirect effects, however. Water quality policy, case in point, has both direct and indirect influences. Temperature regulation is primarily a control for biota. At the same time, however, many legally defined beneficial uses" of water quality are directly intended to satisfy human needs for water—even these policies, however, affect biodiversity.

The links between policies and their effects are rarely distinct. Policies discussed in this paper may have had positive effects on biological diversity through their implementation. Then again, they may not have. The goal of this paper is not to investigate and report whether policies on non-federal land have increased or relieved pressures on biodiversity—that is the role of more focused assessments elsewhere in the Sierra Nevada Ecosystem Project—but to describe these policies and, when possible, the extent of their application. Additionally, the goal is not to identify all policies with influence on biodiversity in the Sierra, but to focus on those which differentially affect biota on one land type or another. Road building regulations, for example, tend to be very different on different land types and so probably have different effects on local biodiversity.

The initial section of this paper provides background on policies that affect all or most of the non-federal lands in the SNEP study area. These policies extend across all the lands discussed below with Section III. Section II focuses on policies specific to late-successional forests on non-federal lands. Section III contains a detailed comparison of current policies that affect biological diversity by examining policies in five different land types: (1) forested lands under the jurisdiction of the California Department of Forestry and Fire Protection (CDF), (2) forested lands not under CDF's jurisdiction, (3) hardwood woodlands, (4) rangelands, and (5) areas of human settlement. Appendix I contains a comparison of different goals and objectives for conservation of aquatic and riparian systems in different jurisdictional settings. Later appendices provide levels of detail on road and riparian regulations that were too extensive to fit into the matrix in section III.

General Provisions under the California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) applies to all public or private projects carried out by or approved by non-federal agencies. These agencies include state agencies, boards and commissions, county, city, regional public district, redevelopment, or other political subdivision authorities (including interstate commissions such as the Tahoe Regional Planning Agency). In short, the requirements of the CEQA review process apply to any decision which is *discretionary* in that it involves the judgment of public officials or expenditure of state money. *Ministerial* projects—those required or allowed by law without administrative discretion—are exempt from the CEQA process.

CEQA requires assessment of significant adverse impacts in the *past, present* and foreseeable *future* stemming from existing or proposed activities. Often this review takes the form of an environmental impact report (EIR). Under state law, reviewing agencies must reject proposals that still have significant effects after mitigation measures and alternatives have been considered. Agencies are not required to reject proposals, however, if there are "overriding considerations."

All lead agencies, including CDF and California Department of Fish and Game (DFG) and Regional Water Quality Control Boards (RWQCB) are supposed to disapprove plans with significant adverse impacts, except as noted above. If a reviewing agency finds significant adverse impacts it must notify the lead agency that a significant adverse impact is likely and advise that the project be stopped.

If there is no way to avoid significant effects then the lead agency must suggest feasible means of significantly reducing those effects. Barring that, the effects must be mitigated to the extent possible. If no feasible alternatives exist or if the mitigation measures will not have a significant effect in reducing impacts then a finding of overriding considerations may allow the project to proceed within the limits of other environmental laws such as the Clean Water Act (CWA) and Endangered Species Act (ESA). While the existence of overriding considerations may be used to approve a project that may have significant adverse environmental effects, typically an attempt is made to deal directly with any significant adverse impacts that do occur.

While CEQA is largely procedural, it can result in the generation of significant information and analysis which the lead agency may use to make sounder decisions and modify

or reject plans with significant effects and cumulative impacts.

Some agency review processes have been declared the functional equivalents to CEQA. The California Forest Practice Rules, for example, are considered equivalent to CEQA in process. As a result, when a landowner files a timber harvest plan (THP) with the California Department of Forestry and Fire Protection (CDF) no separate CEQA review is required. The Forest Practice Rules are more specific than CEQA when it comes to not allowing activities with significant adverse impacts. When a timber harvest plan is filed a licensed forester (Registered Professional Forester, RPF) must describe whether there will be any significant adverse impacts. If there will be significant effects the forester must take any feasible means possible to avoid, reduce, or mitigate the impacts. These can be required to be very expensive as long as the mitigation costs do not exceed project revenue for more than three years in a row.

Significant Adverse Impacts

The presence or absence of significant adverse impacts is key to almost all CEQA-related evaluations in the state. While there are many different kinds of significant adverse impacts not all are relevant to a discussion of biodiversity. A selected list of the kinds of effects which may impact biological diversity is summarized below.

A project will normally have a significant effect on the environment if it will:

- Substantially affect a rare or endangered species of animal or plant or the habitat of the species;
- Interfere substantially with the movement of any resident or migratory fish or wildlife species;
- Induce substantial growth or concentration of population;
- Substantially diminish habitat for fish, wildlife or plants;
- Convert prime agricultural land to non-agricultural use or impair the agricultural productivity of prime agricultural land;
- Have a substantial, demonstrable negative aesthetic effect;
- Conflict with adopted environmental plans and goals of the community where the project is located;
- Cause substantial flooding, erosion, or siltation;
- Contaminate a public water supply;
- Substantially degrade or deplete ground water resources;
- Interfere substantially with ground water recharge;
- Conflict with established recreational, educational, religious or scientific uses of the area;
- Violate any ambient air quality standard, contribute substantially to an existing or projected air quality violation; or
- Disrupt or adversely affect a prehistoric or historic archaeological site or a property of historic or cultural significance; or a paleontological site except as part of a scientific study.

(Remy, et al. 1994)

The item about aesthetic effects deserves elaboration. While aesthetic values, including visual viewsheds, are not inherently tied to biodiversity the strength of aesthetic values and regulations often result in stronger protection for local biodiversity than would regulations specifically designed to provide biological protection.

Regulation of Water Quality

Who Regulates Water Quality and Cumulative Watershed Effects?

While this paper focuses on non-federal lands in the Sierra Nevada, water quality regulations, as administered, transcend the federal/non-federal boundary. For this reason, some discussion of federal policy accompanies discussion of non-federal approaches to dealing with water quality and cumulative impacts. Water quality law typically deals with point and non-point pollution. Impacts from land management, including building roads and harvesting timber, are considered non-point pollution sources. The following discussion focuses on these non-point sources.

The Federal Water Pollution Control Act (commonly called the Clean Water Act or CWA) entrusts the state with the role of ensuring water quality within the constraints of detailed federal legal requirements and approval. Under the CWA states may set their own water quality standards and both state and federal agencies must comply with them. Best management practices (BMP) of the federal agencies do not supersede the states' authority and states' water quality boards' regulatory authority even when Memorandums of Understanding (MOU) or Management Agency Agreements (MAA) have been signed. Thus, the federal agencies must meet state water quality requirements in forest management activities. In contrast, this state authority over federal lands is not paralleled by state forestry laws and regulations administered by the California Department of Forestry and Fire Protection (CDF). These state forestry laws are strictly limited to the non-federal lands.

In California, Regional Water Quality Control Boards (RWQCB) have been established which have developed EPA-approved regional and basin-specific water quality plans. There are two boards with jurisdiction in the Sierra. All the drainages flowing into the Central Valley are under the auspices of the Central Valley RWQCB while the East side drainages are regulated by the Lahontan RWQCB.

In addition to the Basin Plans of the Regional Water Quality Control Boards, the Department of Fish and Game (DFG) is involved in the process of approving any plans which will affect aquatic or riparian biota. Plans must be submitted to DFG if activities suggested in the plan will divert, obstruct or change the natural flow or the bed, channel, or bank of any waterway if fish or wildlife use that water; or if the activity occurs in a water body designated by DFG; or if any debris will be discharged where it can pass into a water body designated by the department (§1601 and §5650 California Fish and Game Code). DFG notifies the lead governmental agency of the potential effect and suggests mitigation measures. On-site investigations may be made as necessary. The code states,

> A governmental agency or public utility proposing a project subject to this section shall not commence operations on that project until the department has found that the project will not substantially adversely affect an existing fish or wildlife resource.
>
> (§1601 (c) California Fish and Game Code)

> It is unlawful for any person to commence any activity affected by this section until the department has found it will not substantially adversely affect an existing fish or wildlife resource or until the department's proposals, or the decisions of a panel of arbitrators have been incorporated into such projects.
>
> (§1603 California Fish and Game Code)

In short, if land management activities will affect stream environments the Department of Fish and Game must be notified and there must be a finding that fish and wildlife are not significantly impacted.

Beneficial Uses

Key to water quality evaluations in the state are pre-determined "beneficial uses." These beneficial uses are defined in the basin plans for each water body in the Sierra Nevada. Before any plan can be approved effects on downstream beneficial uses of water must be evaluated. The in-stream use of water for recreation and preservation and enhancement of wildlife resources constitute beneficial uses of water (§1243, California Water Code). Adjudications that were utilitarian and precluded water necessary for fish and wildlife might be changed to include fish and wildlife as legitimate beneficial uses (Mono Lake decision, 1983, National Audubon Society v. Superior Court, 33 Cal. 3d 419, 189 Cal. Rptr. 346, 658 P.2d 709).

In any timber harvest plan (THP) filed with CDF, the responsible forester must identify existing and *restorable* beneficial uses (§916.5a State Forest Practice Rules). Salmon habitat isolated from salmon runs by a downstream dam is not considered a restorable use. Dams are considered permanent blockades. Diversions and culverts, however, are impermanent and habitat beyond them must be sustained or restored.

How do RWQCBs Regulate Water Quality and Cumulative Effects on Non-Federal Lands?

On non-federal forested lands the primary mode of assessing and regulating cumulative watershed effects is CDF administering the state Forest Practice Rules as per a management agency agreement (MAA) between the state Board of Forestry (BOF) and State Water Resources Control Board (SWRCB). Regional Water Quality Control Boards (RWQCB) are called in on consultation with CDF to do pre-harvest inspections and, sometimes, post-harvest inspections. Currently these are done when a Timber Harvest Plan (THP) is filed. In the future, they also will be performed when Sustained Yield Plans (SYP) are approved.

The state Board of Forestry (BOF) has established rules for meeting water quality standards but it does not have prescribed methods of determining attainment of the standards. Additionally, while there are some quantitative standards laid out in the Forest Practice Rules (§912.9, 932.9, 952.9 and Technical Rule Addendum #2) CDF and the RWQCB perform qualitative visual inspections and do not usually take actual measurements. On occasion, stream temperatures and canopy cover data are collected.

Cumulative Watershed Effects (CWE) analysis is not required by the regional water quality control boards but represents one of many ways in which CDF standards meet and exceed the scope of the water boards' goals. The Forest Practice Rules do not require one method in particular to use to determine cumulative impacts. Many methods are allowed, including Equivalent Roaded Acre assessments (ERA) and general narratives (see Berg, Roby and McGurk 1996; and Menning, et al. 1996). The actual form is up to the Registered Professional Forester (RPF) who works on the THP or SYP. Informal sources report that the rigor with which these cumulative watersheds effects analyses are reviewed, however, is questionable. Typically, the analyses are qualitative rather than quantitative.

The RWQCB's water quality protection strategies are primarily *performance oriented* and not *prescriptive.* State law, in fact, precludes the agencies from stating how effects must be avoided (California Porter-Cologne Act). The RWQCBs determine what water quality levels must be met but they will not state specifically *how* those standards must be met. Where permits are required in instances of discharges or other activities with effects on aquatic systems the regional boards can accept or deny proposals. These determinations are based on the activities' probable impacts on declared downstream beneficial uses. The RWQCBs can require mitigation or minimization but cannot say how a project must be done.

In situations in which no permits are required the boards have no say on how impacts should be avoided. Instead, they react to impacts when they exceed ambient standards. When ambient standards are violated the RWQCB may require permitting of non-point pollution sources.

This difference between being *prescriptive* about goals as the Forest Practice Rules are defined, versus *performance oriented*, as the RWQCB basin plans are written, represents a primary difference in the way water quality policy is administered under these different jurisdictions.

The Regional Water Quality Control Boards establish guidelines for entire water basins including standards for:

> Taste, Odor, Temperature, Turbidity, Dissolved Oxygen (DO), Total Dissolved Solids (TDS), Sediment (a qualitative measure), Bacteria, Ammonia, Nitrates, and Phosphorus.
>
> (California Regional Water Quality Control Board, Central Valley Region 1994)

Additional numeric standards are established for river basins and for specific hydrologic subunits such as particular lakes and streams. These standards apply to all jurisdictions.

Standards enforced on non-federal lands during review of THPs are stated in the State Forest Practice Rules (including

Technical Rule Addendum #2). These standards are also enforced for exemptions and emergencies. As described above, actual methods of assessment vary. In the SYP rules, ERA is considered an acceptable but not exclusive method of analysis. The "Final Report of the Forest Practice Rules Assessment Team to the State Water Resources Control Board" (1987) indicates that as of the late 1980's best management practices on these non-federal lands under CDF's jurisdiction often had BMPs poorly implemented, and in many cases they were not implemented at all.

A Brief Discussion of Air Quality

A number of air quality districts range up and down the Sierra (see Cahill 1996). Each has its own method of dealing with air quality and burning based on local sources, wind conditions, population centers and sources of other pollutants. Burn plans are required to be submitted and approved before burns begin. These are applied for at the individual forest level. In the Northern Sierra Air Management District these plans must be filed thirty days in advance (Gilbert, personal communication, 1995).

Currently, the air quality districts are expecting increases in prescribed burning requests from the federal agencies. The Interagency Air and Smoke Council (ISAC) has been formed by the U.S. Environmental Protection Agency (EPA), state air quality authorities and federal agencies, to facilitate cross-jurisdictional cooperation. Anticipating more management fires, the Northern Sierra Air Management District is considering giving credits for reducing fuel loads with methods such as chipping and shredding instead of burning. The goal is to reduce the total amount of fuel burned *at a site* and also in terms of *total number of sites*, as well as to keep fires cooler by creating finer fuels so fires mobilize fewer particulates.

Larger prescription fires in the Northern Sierra Air Management District may be limited to 50 acres per day (Gilbert, personal communication, 1995), although the total burned in a larger area is not specified. This might mean that a 2000 acre area such as one of SNEP's late-successional/old-growth (LS/OG) polygons (see Franklin and Fites 1996) might be required to burn over a 40 day period or longer. Since the physical conditions (prescription window) for this are quite unlikely it remains uncertain how these policies would this affect federal and state land management agency policies which embrace an expanded prescribed burning policy. The biological effects of an increase in prescribed burning also remain unknown.

II: CURRENT NON-FEDERAL POLICY FOR LATE SUCCESSIONAL / OLD GROWTH FORESTS

California Non-Federal Late-Successional / Old Growth (LS/OG) Definition

A late-successional forest stand is primarily defined in the Forest Practice Rules according to its California Wildlife Habitat Relationships (WHR) forest structure classification. Thinned or previously harvested forests can be considered old growth if they meet the 5M or higher WHR standard and exhibit other characteristics of late successional forests.

> Late Successional Forest Stands means stands of dominant and predominant trees that meet the criteria of WHR class 5M, 5D, or 6 with an open, moderate or dense canopy closure classification, often with multiple canopy layers, and are at least 20 acres in size. Functional characteristics of late succession forests include large, decadent trees, snags, and large down logs.
>
> (§895 Forest Practice Rules)

Technically, just assessing WHR ranks is not sufficient to classify a forest stand as LS/OG since canopy layers, species composition, habitat characteristics and woody material need to be considered in the determination. While no formal inventory of late-successional forests on non-federal lands has been completed a number of informal sources report that stands meeting the state late-successional / old growth criteria do exist scattered around the Sierra.

The Forest Practice Rules definition is a more restricted definition of late-successional / old growth forest than that adopted by the Sierra Nevada Ecosystem Project. In the SNEP approach to LS/OG stands Sierran forests are evaluated for their relative contribution to late-successional forest characteristics. In a fine-scale mosaic of forest structure, as is present in the Sierra, stands of different late-successional character grade into each other presenting a landscape-level pattern of late-successional characteristics (Franklin and Fites 1996).

Jurisdictional Extent and the Planning Process

Virtually all Late-Successional Forest / Old Growth forest lands not on Federal Lands are under the jurisdiction of the California Department of Forestry and Fire Protection (CDF). LS/OG forests are *not* under CDF's jurisdiction if they are (1) on federal land, (2) in state parks, (3) not used for commercial timber purposes, or (4) outside or have been removed from designated timber production zones (TPZ).

Traditionally, timber plans have been filed as Timber Harvest Plans (THP) that describe the activities and probable effects of an individual harvest. The new state Sustained Yield Plan (SYP) program allows a Registered Practicing Forester (RPF) to file a ten year plan projecting forest

structure and outputs on a yearly basis. Individual timber harvest plans are still required for harvests, but much of the information they would have contained is required to be in the SYP. The SYP rules stipulate that once a private owner projects a timber structure over a ten year period the owner cannot deviate markedly from that structure (plus or minus 10%) without amending the plan and regaining CDF approval. If a company projects a certain acreage of LS/OG forest in a watershed it must retain that much LS/OG forest over the ten year period.

At this time, however, very few SYPs have been written or approved and every timber harvest continues to require an approved Timber Harvest Plan.

The Forest Practice Rules described in this paper extend to all timber harvest plans. Not all operations are timber harvest plans, however. There is an exemption for *salvage*. Salvage cuts allow cutting of dead and dying trees. Technically, a salvage cut is not a plan, but an *exemption* from a plan. In a salvage cut no plan is required to be filed. Timber interests have tried using this mechanism where significant adverse impacts would almost certainly have been found had a plan been developed. A forester conducting a salvage harvest, however, still must comply with all other Forest Practice Rules. Ironically, after a THP is implemented habitat features protected in the plan, such as snags, are often removed using the salvage exemption.

Allowable Activities and Restrictions

The *first* key to assessing the allowable activities in a Late-Successional Forest / Old Growth forest is the determination of whether *significant adverse impacts* will occur as a result of a proposed action. When a timber harvest plan is filed the forester must disclose whether there will be any significant adverse impacts. If there will be significant effects the forester must take any feasible means possible to avoid, reduce or mitigate the impacts. These means can be required even if the measures are quite costly as long as the mitigation costs don't exceed project revenue for more than three years in a row.

In developing a timber harvest plan that will affect any LS/OG forest stands 20 acres or larger the forester must disclose significant amounts of information about the forest and related species habitats. First, the Forest Practice Rules require identification of key habitat features that may need additional protection when LS/OG habitat will be affected (§912.9, 932.9, 952.9 (h), technical rule addendum #2, section C, #4). Second, the RPF must submit information on whether the activity will change the structure from LS/OG structure to a lower WHR classification. Third, during plan development the RPF must review the California Natural Diversity Data Base (CNDDB) in order to determine whether there are any recorded observations of sensitive, threatened or endangered species that might be affected. A recent report to the Board of Forestry claims this database, which is maintained by the Department of Fish and Game, is inadequate to assess current population distributions (*Wildlife/Science Committee Report to California Board of Forestry* 1994).

Once a plan is submitted to CDF it is forwarded to the California Department of Fish and Game (DFG) and the appropriate Regional Water Quality Control Board (RWQCB) for review. DFG, in its advisory role, advises whether significant adverse impacts will occur, are unavoidable given infeasible alternatives, or mitigation is sufficient. If CDF approves the plan over DFG's dissent DFG can appeal the plan to the Board of Forestry. According to the Forest Practice Rules, long-term adverse effects on fish, wildlife and listed species known to be associated with late successional forests *must* be identified and mitigated (§919.16, 939.16, 959.16 (b)). Under California Environmental Quality Act law, of which the Forest Practice Rules are considered an equivalent, a reviewing agency should not allow a plan to be approved if there are significant adverse impacts. As with CEQA, however, an open exemption for "overriding considerations" exists.

According to several sources there is presently no defensible scientific method for determining when significant adverse effects will occur to non-listed species of plants and animals. To find that an adverse impact to a late-successional forest structure and its wildlife habitat will occur it must be found that an entire late-successional wildlife *population* will be affected. It is very difficult to analyze the effects on entire populations, particularly in areas with contiguous old growth forest. Currently there is little data on species distributions at a local level and even less information on individual populations in local areas. Species listed under the state or federal Endangered Species Acts have considerably more information collected on them, but non-listed species are very difficult to analyze. As a result it is very difficult to determine that a significant adverse impact will occur.

The *second* key to LS/OG forests on non-federal lands has to do with changes in forest structure. As with any timber plan, cumulative effects must be analyzed. As long as a proposed THP does not lower the WHR ranking below five, however, the forester is not required to perform a separate cumulative effects analysis on late-successional forest characteristics. This means that since the harvest plan filing process (THP/SYP) is essentially a disclosure process, the forester may harvest late-successional forest timber as long as the WHR size rating does not drop below five and the acreage does not drop below minimum levels. Density, however, may be reduced. As a result, thinning or light cutting may occur in late successional areas without special analysis of the effects on the late-successional characteristics of the stand.

The current late successional rule focuses on assessing the change in structure of a modified late-successional stand but the effects of changes in structure on wildlife habitat are not well established. As a result, the current forest rule may be inadequate to protect the ecological characteristics of late-successional forests. There is no scientific basis, for example, for such criteria as the eighty acre threshold and one-mile distance measure described below.

Current law does nothing to encourage or require the creation of new late-successional / old growth forest. If timber owners do not have late-successional forests they do not have to create the stands. The only—and rare—exception is if mitigation measures are written in to a plan which require the owner to recruit more old growth due to cumulative effects on wildlife habitat.

Fragmentation of Late-Successional Forests

Most cumulative impacts assessments of fragmentation of LS/OG stands and habitat are rooted in the Forest Practice Rules' technical rule addendum #2 (§912.9, 932.9, 952.9 section C, #4):

> Forests not previously harvested should be at least *80 acres* in size to maintain the effects of edge. *This acreage is variable based on the degree of similarity in surrounding areas*. The area should include a multi-layered canopy, two or more tree species with several large coniferous trees per acre (smaller subdominant trees may be either conifers or hardwoods), large conifer snags, and an abundance of large woody debris... [Emphasis added]
>
> Late seral habitat continuity: Projects containing areas meeting the definitions for late seral stage characteristics must be evaluated for late seral habitat continuity. The fragmentation and resultant isolation of late seral habitat types is one of the most significant factors influencing the sustainability of wildlife populations not adapted to edge environments.
>
> This fragmentation may be evaluated by estimating the amount of the on-site project and the biological assessment area occupied by late seral stands greater than 80 acres in size (considering the mitigating influence of adjacent and similar habitat, if applicable) and less than one mile apart or connected by a corridor of similar habitat.

As previously noted, there are no specific scientific underpinnings for these criteria and little data on the actual effects of the fragmentation described.

The Forest Practice Rules are intended to ensure that timber harvest activities will not have significant adverse impacts. If there are no known adverse impacts, the rules allow for harvests to proceed while meeting other conditions of law. Thus, the rules do not intentionally protect late-successional forests in an undisturbed condition. After disclosure of all relevant information the timber harvest plan filer can proceed with the proposed harvest of a late-successional stand if there are no adverse effects, such as when there is "adequate" habitat in contiguous areas.

These rules may result in fragmentation of areas that have large, contiguous blocks of LS/OG forest stands. Such fragmentation may occur in areas where private lands and federal lands exist in a checkerboard arrangement. The private owners can contend that the adjacent federal lands provide sufficient habitat for species needs and that the remaining areas are large enough to prevent the negative effects of habitat fragmentation.

In contrast, remote or *isolated* blocks of LS/OG which meet the acreage criteria described above are more difficult to harvest or fragment under CDF rules. Since there is no contiguous LS/OG habitat nearby, removal or fragmentation of the last parcels of LS/OG in a planning watershed would likely have significant adverse impacts. Thus, these isolated pieces of late-successional forest cannot be approved unless the harvest is small enough not to reduce WHR rank or significant mitigation measures have been developed. The legal protection of these isolated patches is based on little data, however, and it may be possible that they are ecologically far less important than large, continuous blocks of late-successional forest (see Franklin, et al. "Alternative Approaches" 1996). The net result is that significant fragmentation may occur in continuous blocks of LS/OG forest while smaller, isolated blocks remain more protected.

Currently, no other regulations or incentives exist in the Forest Practice Rules to maintain roadless areas. With the exception of minimum-size late-successional forest blocks, roadless areas that do occur on private lands (see Franklin and Fites 1996) are incidental to the goals of the Forest Practice Rules. There are no special restrictions on roads, recreation, or activities in riparian areas. Details of allowed and restricted activities in late-successional forest stands are summarized in Table 1 in Section III.

Current Policy Mechanisms that may be Important for Late-Successional Protection Strategies

Classification as Sensitive Species

Newly identified sensitive, threatened, or endangered species can be classified sensitive by the Board of Forestry for special consideration. When species are classified, they are evaluated for their susceptibility to fragmentation and other harvesting impacts. They will be classified if (1) the species requires timberland as habitat, (2) the population is in decline or threatened, and (3) timber harvesting may threaten population viability (§919.12, 939.12, 959.12).

Unforeseen Circumstances in Timber Harvest Plan Review

CDF does not have to approve a plan just because there is no current regulation against an activity or impact. If current Forest Practice Rules do not cover an issue or concern then CDF must go to the Board of Forestry for direction (Z'Berg-Nejedly Forest Practice Act of 1973, §4555). This flexibility in the rules allows CDF and the Board of Forestry to develop new requirements or develop new mitigation measures if a previously-unanticipated adverse impact is predicted.

Sensitive Watersheds

A new, unproven, and potentially powerful tool for the protection of late-successional forests on non-federal lands is CDF's "sensitive watershed" designation. Virtually anyone, from private citizen to government agency, can petition the Board of Forestry to designate a particular planning watershed as a sensitive watershed. The request must be supported by

substantial evidence of adverse impacts that would result from harvest activities. The Department of Fish and Game, however, which typically has the best expertise and information base to make these judgments, is not allowed to petition for sensitive watershed status since it is a reviewing agency. There is some speculation that this restriction on DFG may change since the Department, as a trustee agency, is responsible for conserving the public trust and should, therefore, have the role of petitioning directly.

Approval of the request for sensitive watershed status and designation by the Board depend on watershed-specific values that might not be protected by current forest practice rules. The Board may determine that in order to achieve protection of certain watershed resources restrictions on allowable activity should extend to all commercial timberland owners in a watershed rather than being applied as mitigation measures each time a timber harvest plan in the watershed is considered.

> The Board, at a public hearing, shall determine whether nominated planning watersheds are "sensitive" to further timber operations. Classification of a watershed as "sensitive" must be supported by substantial evidence that a condition, or conditions exist(s) where further timber operations within the planning watershed will create a reasonable potential to cause, or contribute to ongoing, significant adverse cumulative effect(s)...and that mitigation of such significant cumulative effects requires the application of protection measures not required by the Forest Practice Rules. For all planning watersheds classified as "sensitive" the Board shall identify the specific resources which are sensitive to further timber operations and specific mitigation measures that will provide the necessary protection of the sensitive resource(s).
>
> (§916.8 Forest Practice Rules)

The Board can preclude or significantly restrict logging or other timber-related activities in a watershed if they have significant adverse impacts. In essence there are no limits to the kind of protections that the Board can place on a watershed, as long as they are related to timber harvest activities. The role of sensitive watersheds and the protections they offer is already becoming an issue in coastal areas with Coho Salmon. Only one petition for sensitive watershed status had been filed by the end of 1995, however. It was sent back for additional information since it lacked adequate depth upon which to make a determination. Residential areas and wild and scenic river corridors could emerge as candidates for designation.

Petitions may be filed seeking protective measures to individual planning watersheds or clusters of watersheds. In the future, declaration of new beneficial uses of water may lead to more petitions for sensitive watersheds. Murrelets, fishers, spotted owls and other species and resources may, as well, provide grounds for the designation of sensitive watersheds.

III: GOALS AND REQUIREMENTS AFFECTING BIODIVERSITY

General Trends in Jurisdictions and Regulation: Implementation and Efficacy

The goals and requirements discussed in this section and the rest of this paper on current policies affecting biodiversity are in various states of successful and unsuccessful implementation. Yet any discussion of goals to protect biodiversity must be considered in the context of their efficacy.

First, protecting various forms of biodiversity often is not a primary goal of the agencies discussed in this report. The goal of the California Department of Forestry and Fire Protection (CDF), for example, is to provide a sustainable flow of timber while sustaining relatively intact and functional ecosystems: biodiversity protection is the by-product rather than the objective. The same focus on biodiversity enhancement as secondary is true of the Regional Water Quality Control Boards. Even the Department of Fish and Game, the trustee agency for native biota in the state, is not charged simply with the goal of maintaining or enhancing the levels of biodiversity, but is, instead, mandated to do so in the context of other societal concerns. In short, the goals of the state and of the agencies representing its interests is not to protect biodiversity, but to meet societal. In the process, a common secondary goal is to disrupt biodiversity as little as possible.

Second, as one moves across the matrix in this section (table 1, below) from the broad and relatively uniform application of Forest Practice Rules (left column), to hardwood woodlands and rangelands, to range lands and settlement area (righthand columns), the laws and regulations become increasingly variable, localized and often vague. Implementation and follow-through are increasingly inconsistent as well. A recent report to the Board of Forestry states,

> The local 'cultures' (i.e., professional norms and modes of behavior) of agency field personnel and private interests may have a greater influence on the future condition of wildlife habitat than do Forest Practice Rules, and different resource management practices are applied in different parts of the State.
>
> (*Wildlife/Science Committee Report to California Board of Forestry* 1994)

The report goes on to state that no comprehensive assessment of the implementation and success of current forest practice rules has been completed and notes that the task would require considerable research. In the *Final Report of the Forest Practice Rules Assessment Team to the State Water Resources Control Board* (1987) key findings included:

- Documentation was commonly inadequate and/or lacking on natural resources which were potentially threatened by proposed operations;

- Explanations and justifications contained in THPs were usually not sufficient to allow reasonable evaluation of the adequacy of proposed protection measures;
- Potential impacts of timber operations on beneficial uses of water were adequately recognized only fifty-four percent of the sites investigated; and
- The best feasible protection measures were implemented at only fifty-eight percent of the sites investigated.

While many positive findings about the process were also noted, the general lack of implementation of Best Management Practices and dearth of evaluations of key natural resources made it difficult to evaluate the success of the different goals and requirements of the Forest Practice Rules. Since the filing of this report in 1987, the Board of Forestry initiated a task-force approach to develop better rules for water and lake protection zones, erosion control, and roads and landings. Results of this more recent task force approach are unavailable, but in many interviews with individuals at other agencies, the authors learned this same pattern of questionable implementation and variation with local cultures persists.

Moving beyond the scope of CDF and the Forest Practice Rules, determining the efficacy of biodiversity-related policies becomes even more difficult. With the less-regulated hardwood woodlands and rangelands, and the highly variable nature of local municipal regulations, a uniform assessment of policies and regulations would be extremely difficult. To further assess the efficacy of these variable policies would be an even more challenging task.

Third, adequate information often is lacking about the biota at a site affected by a management activity. Assessments of the biological condition and presence of rare species are required but are based on little information. The California Natural Diversity Data Base (CNNDB), a source of information on the presence of rare, threatened and endangered species in the state is purported to be "much too small and often out of date" (*Wildlife/Science Committee Report to California Board of Forestry* 1994). Reviews of THPs may not have adequate information on which to truly evaluate the likely consequences of proposed actions. In addition, no specific training of RPFs to develop skills to recognize many important habitat features is required. The *Wildlife/Science Committee Report to California Board of Forestry* (1994) goes so far as to say that current efforts to assess cumulative effects on wildlife habitat are "intractable with the current rules, policies, and lack of emphasis on cumulative data collection."

The policies described in this paper must be treated at starting points. Each policy exists first as a goal. The actual implementation of that goal through adherence to the requirements remains less certain. The policies reported in Section III and the rest of this paper are varied in their success and states of implementation. While much is either not known about the success of implementation or what is known indicates that implementation is not always successful we still need to evaluate the degree of protection called for in existing laws and regulations. Secondly, assessments of the actual effects of policies, when discernible, which affect biodiversity in its various forms, are needed.

Currently there are no range-wide policies for conservation or enhancement of biodiversity across all ownerships in the Sierra. The California Council on Biodiversity (formerly the Executive Council on Biodiversity) provides a framework for developing state-wide conservation but the Council is still in its formative stage and its ideas have not been fully developed. Further, the signatory agencies to the Council's Memorandum of Understanding (MOU) have differing missions and degrees of commitment to the effort.

Biodiversity Protection and Planning Across Large Areas with Multiple Owners

Policies considered in this report can be characterized as being "intensive" or "extensive." Intensive policies are those applied locally but not region-wide. Extensive policies extend across an entire jurisdiction and/or a large portion of the range. A riparian buffer requirement of the Forest Practice Rules, for example, is extensive since it applies to all lands under CDF's jurisdiction in the SNEP study area. A state park policy, on the other hand, is intensive; park policies may have significant effects on biodiversity in the park unit, but the effects are largely limited to that local area. In this report, with the scale of analysis being an entire mountain range, we have chosen to focus on extensive policies since they have the greatest impact on the range as a whole. Intensive policies, however, can contribute significantly in aggregate to the overall protection of biodiversity.

Intensive protection polices are locally important and can take many forms. A number of agencies, jurisdictions and efforts exist which can affect aquatic and terrestrial biodiversity locally:

- Coordinated Resource Management Programs (CRMP): a collaborative public/private project planning and implementation process;
- County and municipal open space programs;
- Heritage Tree Programs (for individual trees);
- County General Plans with a "Biological Diversity" component: Some counties, such as Tuolumne County, have Significant Ecological Areas (SEA) or their equivalent; and
- Non-governmental organizations (NGOs) may purchase title or easements to lands for conservation purposes.

It should be noted, however, the effects of these programs and opportunities are uncertain. The Policy Implementation Planning (PIP) Team of the California Spotted Owl Assessment's (1994) report concluded:

> At the present, few legal or administrative devices promote planning for ecosystem conservation across jurisdictions. In fact, there are no effective means of enforcing the regional planning initiatives that do exist. Further, the lack of a common state-wide biological database, hampers effective local and multi-jurisdictional planning.

A recent, highly-touted policy approach, which can be considered either extensive or intensive depending upon its scale of application, is Natural Community Conservation Planning (NCCP). This state policy is designed to promote multi-species and multi-habitat conservation planning on a county-wide or regional basis. It was developed in response to controversy over the proposed state-listing of the California gnatcatcher. In this planning process all interested parties cooperate—across jurisdictions—to conserve threatened natural communities. This process requires developing conservation plans to maintain viable populations of California's native animal and plant species and their habitats in landscape units large enough to ensure their continued existence while retaining maximum local discretion to plan and authorize urban development. The idea is being implemented in the south coastal sage scrub habitat of the gnatcatcher, and though unproven, has been endorsed by the Secretary of the Interior. It may be a useful mechanism for protection of biodiversity where entire systems are in decline such as in the Sierran foothills.

A Summary Of Key Protections Of Biodiversity

In summary, the strongest policies currently influencing the conservation of biodiversity across all landtypes in the Sierra are the (1) limitations on projects with significant adverse impacts, (2) Regional Water Quality Control Boards' Basin Plans and designated beneficial uses of water, (3) State and Federal Endangered Species Acts. At a more local level city and county ordinances and General Plans may have major influences.

Among the most promising but unproven opportunities for conservation planning across multiple ownerships are (1) the declaration of sensitive watersheds under CDF's jurisdiction, (2) Natural Community Conservation Planning (NCCP) efforts, and (3) future efforts of the California Council on Biodiversity.

Notes On The Matrix (Table 1) In This Report

Information obtained for this report is summarized in table 1, below. This table is divided into four sections (in rows) with five different land types (in columns). The table begins with "Part I: Broadly Applicable Provisions." All the rules and protections in this section apply to each of the next three sections: Part II: Aquatic and Riparian, Part III: Uplands, and Part IV: Late-Successional / Old-Growth. Each of these sections has environmental protections unique to this particular land type. At the end of table, the linchpin rules and protections that may most concern the Sierra Nevada Ecosystem Project are briefly summarized.

The Forest Practice Rules administered by CDF are investigated and reported in Table 1 in much greater detail than are regulations for the other land types. There are several reasons for focused coverage. First, CDF has the most extensive, consistent, protective and explicit prescriptions so its regulations have significant effects on the condition of Sierran ecosystems. Second, the specific foci herein are due to particular interests of SNEP, such as late-successional forests, road density and riparian rules. For these reasons, the CDF jurisdiction receives the most attention.

In the matrix there are numerous references to state code, especially the California Forest Practice Rules. These rules apply to different forest districts in the state. California is divided into three forest districts, including two in the Sierra. The Northern District and the Southern District divide the Sierra between Placer and El Dorado Counties. Lake Tahoe Basin is in the Southern District. Each district has its own set of regulations. Quite often, however, the regulations for all three districts will be the same. In this case the code in the table below is referenced first for the Coast district, second for the Northern District and lastly, for the Southern District. For example, "§919.2, 939.2, 959.2" is placed before code referring to all three zones. Although it is clearly not of interest to a Sierran analysis, the Coast District code numbers are included in this document since they represent the primary reference number under which the code is listed in the Forest Practice Rules. The table may list only the first section number with "++" signs following (for example, §919.2++). These plus signs indicate that the code is valid not only on the coast but also in the two districts that divide the Sierra.

Finally, areas shaded in gray indicate "Not Applicable." For example, it would be pointless to discuss Late Successional / Old Growth rules and protections in rangelands. "*No specific requirements*" generally indicates that this category of biodiversity-affecting policy is not addressed at the jurisdictional level specified. For example, very little may be said about allowable road densities in hardwood woodland areas. Rows that extend across several columns or the entire width of the table indicate policies that apply to all jurisdictions.

Table 1: Biodiversity Protection Matrix: Strategies and Rules

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
Introductory Details Source of information (for full listings see "References and Resources" at the end of the paper)	California Forest Practice Rules, June 1994; Z'berg-Nejedly Forest Practice Act; Robert Heald (California State Board of Forestry); Pete Caffereta (CDF); Russ Henly (CDF); Jim Steele (California Department of Fish and Game); Central Valley and Lahontan Regional Water Quality Control Board Basin Plans, Fred Blatt and Tom Suk (Lahontan Regional Water Quality Control District), Sue Yee (Central Valley Regional Water Quality Control District); Marty Berbach (CDF); Mike Chapel (USFS); *Final Report of the Forest Practice Rules Assessment Team to the State Water Resources Control Board (1987);* Doug Leisz (forestry consultant); *Management Agency Agreement Between The Water Resources Control Board, the Board of Forestry, and the Department of Forestry and Fire Protection*, State of California (1988)	California Forest Practice Rules, June 1994; Z'berg-Nejedly Forest Practice Act; Robert Heald (California State Board of Forestry); Pete Caffereta (CDF); Russ Henly (CDF); Fred Blatt (Lahontan Regional Water Quality Control District), Sue Yee (Central Valley Regional Water Quality Control District); Marty Berbach (CDF); Mike Chapel (USFS)	Bob Motroni (CDF), Rick Standiford (UC Berkeley Extension), Tim Duane (UC Berkeley), California's Forests and Rangelands, Mariposa County Voluntary Oak-Woodland Management Guidelines Draft Resolution, Integrated Hardwood Range Management Program: Sixth Progress Report and Fifth Progress Report, Regional Water Quality Plans, Fred Blatt (Lahontan Regional Water Quality Control District), Sue Yee (Central Valley Regional Water Quality Control District)	Tom Randolph (CDF, with Range Management Advisory Board), Bob Motroni (CDF), Rick Standiford (UC Berkeley Extension), Tim Duane (UC Berkeley), California's Forests and Rangelands, Regional Water Quality Plans, Fred Blatt (Lahontan Regional Water Quality Control District), Sue Yee (Central Valley Regional Water Quality Control District	Tim Duane (UC Berkeley), Robert Heald (Cal. State Board of Forestry) , Regional Water Quality Plans, Tom Suk and Fred Blatt (Lahontan Regional Water Quality Control District), Sue Yee (Central Valley Regional Water Quality Control District
Where are these lands located and what is their extent?	In the Sierra, non-federal lands under CDF's jurisdiction are generally in the lower and mid-elevation range of the Sierra, more on the West than the East and more in the North than the South. These lands are often intermixed with Forest Service and BLM lands. Where federal agencies have rights of way across private forest lands CDF has jurisdiction.	Where these lands do occur they generally are in urbanized areas where lots are small. Any forested land geographically in a timber production zone (TPZ) that has been removed from that zone is outside CDF's coverage. State Parks are exempt from CDF jurisdiction.	Hardwood woodlands are primarily on the Western side of the Sierra at lower elevations. Virtually all hardwood woodlands are private.	Non-federal, non-forested rangelands are found in alpine and mid-elevation meadows (particularly in the Northern Sierra), and in lower elevational grasslands. These lands are more common on the West side of the Sierra than the East.	Settlement areas are scattered throughout the Sierra but are particularly dense around Lake Tahoe, along trans-Sierran highway corridors, and throughout the western foothills.
Jurisdictional extent and relationship to other agencies and laws	CDF has jurisdiction over virtually all timberlands in the state on non-federal lands that are located in timber production zones (TPZ). In the Z'Berg-Nejedly Forest Practice Act of 1973, timberland is defined as land that is "available for, and capable of, growing a crop of trees of any commercial species used to produce lumber and other forest products, including Christmas trees" (§4526).	Few forested lands fall outside CDF's jurisdiction. Forest land may be converted if a permit to convert is approved by CDF and the County but these lands are no longer timberlands. Non-industrial forest	CDF has "made it clear the Board has both the authority and responsibility to protect hardwood resources on private lands." (California's Forests and Rangelands, p. 153). But the Board of Forestry has worked with the livestock industry and counties to get	Counties have developed Hardwood and Range Management Voluntary Guidelines for implementing Best Management Practices (see column to left).	Counties and municipalities each have jurisdiction at the local level.

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
(continued)	To be under CDF's jurisdiction, forested land first has to be used for a commercial purpose. Firewood and wood for one's own house are not considered commercial uses. Trees considered commercial species are listed in the Forest Practice Rules for each TPZ. Non-industrial forest landowners—those with less than 500 acres and no clear cuts— are not exempt from CDF regulations although they do not have to file the same kind of timber harvest plans. Salvage harvests are ministerial in nature and still must comply with forest practice rules. No plan is required to be filed but the forester must comply with all Forest Practice Rules. The Forest Practice Rules invoke other laws and regulations: • state and federal Endangered Species Acts • state and federal water quality laws. The Department of Fish and Game (DFG) and the Regional Water Quality Control Boards (RWQCB) review timber harvest plans submitted to CDF. These agencies comment on any significant adverse impacts. The Regional Water Quality Control Boards have jurisdiction over all lands in the state. On federal lands implementation and monitoring responsibility has been assigned to the federal agencies through Management Agency Agreements (MAA).	landowners (<2500 acres and no clear cuts) are not exempt from CDF regulations. There used to be a provision that owners with less than 3 acres were exempt but this rule was struck down by the courts. Areas around dwellings are treated for fuel reduction are exempt from CDF's jurisdiction even if the species are commercial and the wood has a commercial use.	local jurisdictions to control environmental effects on the private lands. Compliance comes primarily through educational programs coordinated by the U. of California's Integrated Hardwood and Range Management Program (IHRMP). Secondly, counties are encouraged to develop voluntary environmental regulations. These do not require approval by CDF The idea has been to encourage voluntary adoption of best management practices (BMP) with the use of education and the background threat of regulation if BMPs aren't followed and environmental conditions decline. Tehama County was one of the first to put voluntary guidelines together. Other counties have followed suit. Some people feel that the rules are probably fairly consistent between counties while others say they vary widely. CDF's remaining role is that of fire protection.		
	The Department of Fish and Game (DFG) and the Regional Water Quality Control Boards (RWQCB) review plans submitted to CDF. These agencies comment on any significant adverse impacts.				
	1. Federal and state Endangered Species protections extend to all landowners considered here. 2. Water pollution laws apply to all jurisdictions (§1600, §5650 of California Fish and Game Code). 3. The Regional Water Quality Control Boards have jurisdiction over all lands in the state.				

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
Part I: Broadly applicable Provisions **Notes on timber plans/activities**	Timber Harvest Plans (THP) are the primary methods of filing plans to harvest timber commercially. Sustained Yield Plans (SYP), may also be filed, which reduce the amount of information required in each THP. While SYPs have been submitted, none yet has been approved. Mitigation measures are written as an enforceable standard. They are required as long as the cost of mitigation does not make the project go in the red for 3 consecutive years. CDF performs pre-harvest and completion inspections. Many plans are sent back for more mitigation measures prior to their acceptance for filing with CDF: 25-40%, depending on the forest district, are returned as inadequate for submission. They go back for additional mitigation measures. Once the plans are administratively complete and accepted for filing most are approved. All plans and mitigation measures may be reviewed by Fish and Game and RWQCBs, as well as Mines and Geology. CDF can ask other agencies to review plans as well.	As long as timber cutting is for personal use there is no authority from CDF. Firewood cutting and logging for building one's home are allowed. Any activity such as bartering with firewood, that has any commercial aspect, puts land activities under CDF's domain—assuming the second provision is met, that is that the tree species are in their natural ranges. Areas around dwellings are treated for fuel reduction are exempt from CDF's jurisdiction even if the species are commercial and the wood has a commercial use.	Hardwood woodlands are currently under the auspices of county and municipal jurisdictions. Many counties are adopting voluntary guidelines to encourage Best Management Practices (BMPs). Most guidelines are qualitative rather than quantitative		See column II, forested lands not under CDF's jurisdiction. Even within city boundaries, however, a commercial timber activity falls under CDF's authority. Under the Heritage Tree Program, large trees of historical significance are protected. Criteria vary by jurisdiction. For example, heritage tree programs may be different in a city and the county it is in.
Special Protections and Rules forest structure/ composition	Specific structure requirements do not exist. For example, there is no requirement that a watershed must have a certain percentage of late-successional forest. There are specific structure requirements in the riparian zone (see below). Additional points: 1. General biodiversity emphases: • Local seeds from state-specified seed zones must be used • No high grading is allowed. Forest practices for natural regeneration require retaining good seed trees in any situation requiring natural regeneration • Replanting has to retain a certain mix of species native to the site. The forester can't markedly increase the number of trees of a non-indigenous species out of its range—such as Giant sequoia	No regulations unless specified at municipal or county level	An *example* of the kind of *voluntary* guidelines described above. These vary widely by county: • retain heritage size oaks of all species • retain representative composition • remove trees that are a fire hazard and reduce density to 15-30% near structures and fire breaks • retain dead trees for wildlife habitat • plan for replacement trees		No structural requirements unless in place at local level. Individual trees may be protected under Heritage Tree programs.

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
(continued)	2. Wolf trees and snags are seen by DFG as important components of forests that are *not* protected by CDF. "The current rules do not systematically provide for recruitment and retention of these components in ways that are tied to conserving individual or groups of wildlife species," (Wildlife/Science Committee Report to California Board of Forestry (1994)). Snags that are written into a timber harvest plan as mitigation measures may later be removed as part of a salvage cut without review by CDF. 3. If a SYP is developed and long-range forest structure is projected the owner must adhere to that plan or subsequent THPs will not be accepted by CDF. In an SYP plan the owner must depict WHR types at 10 year intervals. The owner can't markedly deviate from the expected structure without filing revisions. This projection requirement isn't true of THPs or other plans.		• leave clumps of natural, undisturbed vegetation. • cluster development to protected wildlife habitat.		
roads	Road regulations in the Forest Practice Rules are complex. Specific questions should refer to Appendix II of this report and the Forest Practice Rules. In general, see Article 12 of Forest Practice Rules (§923++). Road regulations are primarily erosion control regulations. They do not attempt to deal with habitat fragmentation and biological invasions. As a result there are no rules on road densities although cumulative effects analysis might prohibit road densities too high. Roads must be built to minimize damage to soil and wildlife habitat and prevent degradation of the quality and beneficial uses of water. Roads are classified as permanent, temporary or seasonal (§923.1++). Foresters must: • use existing roads whenever possible • layout roads to minimize total mileage • avoid routes near bottoms of steep canyons • minimize stream crossings • locate roads on flat areas/benches when possible • maintain drainage structures 1-3 years after plan completion	No restrictions unless sediment discharge exceeds water quality standards for the water body or impede downstream beneficial uses.	Generally there are no rules on road densities and crossings. The only major controls are avoiding injury to downstream beneficial uses as defined for the water body. In some cases, such as water bodies with zero discharge regulations, there are limits to activity within the floodplain and permits are needed for road building. Voluntary guidelines, which vary widely by county, may require interests to: • limit heavy equipment in root zone (1.5x crown width) • avoid root cutting during road building • not use machinery on slopes exceeding 30%	Generally no rules on road densities and crossings. The only major controls are beneficial uses as defined for the water body. In some cases there are limits to activity within the floodplain and permits are needed for activities.	

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
(continued)	Extra protection must be given where slopes are over 65% or where slopes are over 50% and the road is within 100 feet of a WLPZ (Water and Lake Protection Zone) (§923.1++) New roads shouldn't go over 15% steepness except for short pitches of less than 500 feet (§923.1(e)++) Roads should be single lane and well drained. Roads should stay out of WLPZ unless absolutely necessary (§923.1(g)++)		• divert water to prevent erosion • minimize soil disturbance • install culverts where needed • rock major dry gulch crossings		
	The California Fish and Game Code states: plans must be submitted to the department if they will divert, obstruct or change the natural flow or the bed, channel, or bank of any waterway if fish or wildlife use that water; or if the activity occurs in a waterbody designated by F&G; or if any debris will be discharged where it can pass into a waterbody designated by the department (§1601). It is unlawful for any person to commence any activity affected by this section until the department has found it will not substantially adversely affect an existing fish or wildlife resource or until the department's proposals, or the decisions of a panel of arbitrators have been incorporated into such projects (§1603).				
recreation use and impacts	Information must be collected and reported on recreation activity but there are no requirements (Technical Rule Addendum #2, Forest Practice Rules)	No specific requirements unless determined locally.			
	The use of water for recreation is a beneficial use of water (§1243 California Water Code). RWQCB Basin Plans do discuss recreational impacts, although no specific restrictions are described.				
development	Development would require an application to convert forest land to a non-forest use thereby removing it from the Timber Production Zone (TPZ). Such actions would have to be approved by the county and CDF.	Restricted only by county and municipal regulations and limited by downstream beneficial uses.	Examples of the kind of voluntary guidelines that vary widely by county include the request to: • plan for replacement trees • cluster development to protected wildlife	Restricted only by county and municipal regulations and limited by downstream beneficial uses.	
	RWQCB Basin Plans discuss land development as it affects water quality. Building and road construction, and maintenance may need to be permitted.				
grazing impacts	Trees in meadows and wet areas may be clear cut and are exempted from stocking to attain or retain these areas for wildlife and livestock (§939.15, 959.15(b)).	Restricted only by county and municipal regulations	Voluntary guidelines may include the request to provide soil protection and maintain forage on rangeland by following "Residual Dry Matter (RDM)" standards for annual grasslands.	Restricted only by county and municipal regulations	
		The Rangeland Water Quality Management Plan is currently under review by the Regional Water Quality Control Boards and may be adopted. It suggests a number of Best Management Practices that must be approved by the RWQCBs.			
mining impacts	Not covered in this paper				

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
wildlife, including birds	For a timber harvest plan, the Registered Professional Forester (RPF) must contact neighbors, and search the natural diversity database (CNNDB). Such efforts may include identifying species of concern for State Fish and Game. General regulations: A timber harvest plan can be rejected if a federally or state listed threatened or endangered animal or plant species is adversely affected (§898.2). Nest sites—there is general protection of nest sites (§919.2, 939.2, 959.2) and of listed (state/federal) or sensitive (CDF) species. Buffers are described for Golden and bald eagles, peregrines, osprey, Northern Goshawks, Great blue herons, and great egrets. Non-listed species also are protected. (§919.5, 939.5, 959.5). When significant adverse impacts occur, practices are supposed to be implemented to reduce impacts. Sensitive species (p. 8, 919.12, 939.12, 959.12 on 76): If there is a concern about a species then BOF may start a review of the species for classification as a CDF sensitive species. When species classified, they are evaluated for their susceptibility to fragmentation and other effects of harvest. The species will be classified if it meets all of the following requirements: 1) it requires timberland as habitat, 2) the population is threatened or in decline and, 3) timber harvesting may threaten population viability. Wolf trees and snags seen as important components of forests by DFG are sometimes not protected by CDF. "The current rules do not systematically provide for recruitment and retention of these components in ways that are tied to conserving individual or groups of wildlife species," (Wildlife/Science Committee Report to California Board of Forestry (1994)). Because of staffing constraints DFG reacts only if there is a complaint of a violation.	Conservation and open space elements of County General Plans usually address state or federally listed species under the Endangered Species Acts.	Voluntary guidelines may include requests to • maintain diversity of species • develop scattered openings and undisturbed patches • retain thermal cover in riparian zone • retain scattered dead trees for habitat • provide escape from predators • retain scattered large down logs • provide scattered brush piles • retain hollow logs for nesting. Policy for the Department of Fish and Game states it "shall oppose the issuance of permits or licenses, the authorization of plans or programs, and the appropriation of funds which it determines will result in the removal of hardwoods in a manner which will result in significant adverse impact(s) to fish and/or wildlife resources and for which mitigation and compensation measures are judged to be inadequate (Fish and Game Code, Addenda, p. 601)	Conservation and open space elements of County General Plans usually address state or federally listed species under the Endangered Species Acts.	

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
	First, DFG has the authority to set bag limits, including a zero bag limit for certain species. Disturbing nesting habitat constitutes a taking which violates the zero bag limit. Second, landowners must comply with CEQA and its prescriptions against causing significant adverse impacts. Third, species protected under state and federal Endangered Species Acts but there are no special restrictions, monitoring or protection by DFG. Fourth, the Cal. Endangered Species Act states, • Agencies must consult with DFG when an action may destroy or adversely impact habitat critical to a T/E species (§2090 Fish and Game Code); • If jeopardy is found DFG must suggest to the state lead agency "reasonable and prudent alternatives" (§2091 Fish and Game Code) • If jeopardy is found the lead agency "shall require reasonable and prudent alternatives..." However, overriding economic, social or other conditions may make infeasible the alternatives then the project can be allowed if as must mitigation as possible is required, benefits clearly outweigh costs, and extinction is unlikely (§2092 Fish and Game Code)				
treatment of exotics	Seed stock must come from inside seed zone. Composition can not dramatically change.	Subject to city and county planning. Generally there are no specific requirements			
rare or endangered vegetation	Plans "shall not be restricted by this chapter because of the presence of rare or endangered plants" (Fish and Game Code §1900-1913). If the DFG tells an owner that rare or endangered plant is on his/her property the owner must notify the DFG before changing the land use.				
pollution prevention	Zero discharge is allowed into the streams. See the details below in the aquatic/riparian section, part II, below.	No activity can injure downstream beneficial uses. Permits are required by RWQCBs for point-source pollutants.			
unforeseen impacts	1. If current rules don't cover an issue/concern then CDF must go to the Board of Forestry for direction. CDF does not have to approve a plan just because there is no regulation against an activity or impact. 2. Sensitive watersheds: sensitive watershed designations can be requested for a watershed by anyone, regardless of ownership. Special rules can be written for that particular watershed For a fuller description see Part II below or the write-up in Section II of the main text.	Individual counties and municipalities may have modes of dealing with unexpected occurrences.			
	Beneficial uses cannot be harmed, so anything that would injure downstream beneficial uses could create a problem and the landowner would have to mitigate the effect in negotiation with the Regional Water Quality Control Board. New beneficial uses may be developed.				
Part II: Aquatic and Riparian **Definitions**	**For additional reference see Riparian Matrix in Appendix I of main text** In Forest Practice Rules generally see Article 6, "Water Course and Lake Protection" (§916 ++)				
	RWQCB key principles summary: 1: RWQCBs have jurisdiction on all lands in the state (see Section I of main text); 2: RWQCBs focus on waterbody-specific *beneficial uses* which can include biological resources such as wildlife and freshwater and anadromous fish; 3: There are key difference between permitted uses and non-permitted uses in terms of requirements for compliance; 4: There are RWQCB protections of temperature, flow, and sedimentation; 5. Wetlands protections are not prescriptive but follow "avoid, minimize, mitigate" hierarchy.				

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
distance buffer extends from stream	Watercourse and Lake Protection Zones (WLPZ) are to be established when timber harvest plans are developed. The size of these buffers depends upon slope, stream class, and sensitive stream conditions (§916.4++). Additionally, the method of yarding may reduce the buffer width: for complete table and references see the Forest Practice Rules (§916.5). CDF makes site-inspections on 200 ft. segments of watercourses/lakes (§916.4,b,2++) Buffer widths for ground based skidding (in feet): see table 4 in main text.	Subject to county and municipal regulations. Local buffer standards are highly variable ranging from 50 to 500 feet.			
kinds of streams	In the table above stream classes do not correlate explicitly to perennial or intermittent streams. Class I streams are almost always perennial, but class II streams may be either perennial or intermittent. Class III streams are intermittent or ephemeral. In terms of characteristics, class I streams are flowing with fish present at least part of year or are used as domestic water sources. Class II streams have invertebrates or other aquatic life, or are class III streams within 1000 feet of a class I stream. Class III streams have "no aquatic life" and class IV categorizes human-made diversions.	Subject to county and municipal regulations.			
kinds of effects and areas of concern	Two major site-specific components are identified for protection: stream condition and vegetation structure. The following information is required to be gathered on the streams when cumulative effects analysis is performed. If significant adverse effects will occur with any of these conditions and or structures the plan is supposed to be rejected or modified. *stream condition:* class/order, gravel embeddeness, pool filling, aggrading, bank cutting, bank mass wasting, downcutting, scouring, debris jamming, canopy reduction, recent flooding, changes in peak flows (Cumulative Impacts Guidelines (1994)). *Vegetation structural diversity*: vertical diversity, migration corridors, nesting habitat, food abundance, snags, surface cover (§916.4) A third major consideration is not site-specific: downstream beneficial uses, including designated fish and wildlife. These are described below.	Downstream beneficial uses. See below.			

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
Key values being protected	Forest Practice Rules key on *"beneficial uses"* (§916, 936, 956 and see below). Water quality assessments often depend on downstream beneficial uses as defined in the RWQCB plans. Do beneficial uses ever constrain a timber harvest plan? Indirectly. The torrent salamander, tailed frog and some anadromous fish are declared beneficial uses in certain watersheds. Their presence has lead to the limitation of certain kinds of activities. This protection is primarily due to their threatened status, however, and not their declaration as beneficial uses. Domestic water supply beneficial uses might become more constraining (§916.10). Beneficial use changes linked to population growth could become a major factor in limiting management strategies. (see 916.4c++).	Beneficial uses. See below.			
	The California Fish and Game Code states: plans must be submitted to the department if they will divert, obstruct or change the natural flow or the bed, channel, or bank of any waterway if fish or wildlife use that water; or if the activity occurs in a waterbody designated by F&G; or if any debris will be discharged where it can pass into a waterbody designated by the department (§1601) It is unlawful for any person to commence any activity affected by this section until the department has found it will not substantially adversely affect an existing fish or wildlife resource or until the department's proposals, or the decisions of a panel of arbitrators have been incorporated into such projects (§1603). The Keene-Nielsen Fisheries Restoration Act of 1985 states that the protection and increase of naturally spawning fish (anadromous and other) is important. It promotes efforts to "double" salmon and steelhead resources (§2760--2765). The use of water for recreation and preservation and enhancement of wildlife resources is a beneficial use of water (§1243 California Water Code).				
Special Protections and Rules riparian forest structure/ composition	Special protections are complex. They are briefly summarized here but it is best to refer very specific questions to the lengthy description in the Forest Practice Rules (§916.5++) and Appendix III of this paper.. Within the WLPZ at least 75% surface cover and undisturbed area shall be retained undisturbed (§916.4++). Foresters are required to retain multi-story canopy for shading and other values (§916.5e "D"++) Where there is less than 50% canopy cover (50% of ground must be shaded) only sanitation logging is allowed unless specially excepted. (§916.3f++). The following is a applicable to class I (generally perennial) streams : "To protect water temperature, filter strip properties, upslope stability, and fish and wildlife values, at least 50% of the overstory and 50% of the understory canopy covering the ground and adjacent waters	No specific requirements unless mandated by county and local jurisdictions.			

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
(continued)	shall be left in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of operations. The residual overstory canopy shall be composed of at least 25% of the exiting overstory conifers. Species composition may be adjusted consistent with the above standard to meet on-site conditions when agreed to in the THP by the RPF and the director." Regulations for other stream classes "H" and "I" have similar restrictions. (§916.5, p. 58) Woody debris recruitment: foresters must retain two 16"+ trees 50' tall/ acre within 50' of Class I and II watercourses (§916.3g++). Trees in meadows and wet areas may be clear cut and are exempted from stocking to attain or retain these areas for wildlife and livestock (§939.15, 959.15(b)) Additional values considered: • streambed and flow modification by large woody debris • filtration of organic and inorganic material • upslope stability • vegetation structure diversity for fish and wildlife habitat including vertical diversity, migration corridors, nesting habitat, microclimate modification, snags and surface cover. (§916.5)				
excessive roading	Complex regulations in Forest Practice Rules cover road densities and crossings (see Appendix IIII of the main text). In general, no roads, or landings can be built., except with prepared crossings and permission of CDF (§916.3c++). No heavy equipment is allowed in the WLPZ (Water and Lake Protection Zone) without justification (§916.4d++). Extra protection must exist where slopes are over 65% or where slopes are over 50% and the road is within 100 feet of a WLPZ (§923.1++) For more details see Appendix II in the main text on road regulations.	Subject to local jurisdictions. In some county and municipal plans there are grading ordinances for specific slopes and soil conditions.			
recreation impacts	No specific requirements				

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
grazing impacts	Trees in meadows and wet areas may be clear cut and are exempted from stocking to attain or retain these areas for wildlife and livestock. (§939.15, 959.15(b)). BMPs signed between management agencies may create some standards for allowable activities.	Subject to county and local plans and ordinances.	Subject to county and local plans and ordinances. Grazing impacts are considered in the new range management plan being reviewed and discussed above. BMPs signed between management agencies may create some standards for allowable activities.		Subject to county and local plans and ordinances.
flow protections	The Forest Practice Rules state that maintaining natural flow is important and should be considered when addressing cumulative impacts (§916.5++). When water is drawn out of streams to water roads the total amount drawn is limited (§1600 Fish and Game Code)	See below			
	Regional Water Quality Control Board Basin plans have restrictions on the amount of change in flow that is allowable due to management activities.				
barriers to fish movement / water diversions and dams	In any timber harvest plan, the forester must identify existing and *restorable* beneficial uses (916.5a2++, p. 58). Salmon habitat that is isolated from salmon runs by a downstream dam is not considered a restorable use. Dams are considered permanent blockades. Diversions and culverts, however, are impermanent and habitat beyond them must be sustained or restored.	See below.			
	A private party seeking to take action requiring a discharge permit from the RWQCB might have to mitigate blockades to fish movement. Status as a restorable beneficial uses depends on the RWQCB's review process with DFG.				
Wetlands Protection	In the Lahontan RWQCB Basin Plan there is a strong effort to protect wetlands. This effort takes the form of a three-tiered approach: avoid, minimize, mitigate. All plans reviewed for a permit that propose activity in a wetland are scrutinized to see if there is any feasible alternative since a wetland intrusion is considered an significant adverse impact. A project may be allowed only after alternatives are explored. If significant adverse impacts occur, mitigation must be arranged. The Central Valley RWQCB has no such rule in its Basin Plan. The State Wetlands policy, which extends to all non-federal lands and all state jurisdictions has the following distinct goals: • No net loss of wetlands; • Achieve long-term net gain in quantity, quality and permanence of wetlands; • Focus on *maintaining economic uses* while achieving *voluntary participation* of landowners; • Develop a standard definition for all regulation that will be compatible with federal definitions ; • Achieve wetlands conservation through landowner Incentives; • Create wetlands credits generated when new wetlands are developed that can be bought, sold and traded (Wilson 1993).				
ground disturbance	Rules require protection of riparian vegetation and soils—but no quantitative limits are defined in the Forest Practice Rules (§916.3d++). No heavy equipment is allowed in the WLPZ without justification (§916.4d++).	See below	Voluntary guidelines may recommend minimizing the disturbance, particularly in riparian areas and around oaks.	See below	
		Subject to county and municipal regulations and waterbody-specific standards set by RWQCBs.			
	In the Tahoe Basin there are grading deadlines. Individuals cannot disturb more than three cubic yards of soil in fall and winter, regardless of the distance to streams. Additional requirements may require over-snow or helicopter logging on steep slopes of more than thirty percent.				

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
riparian vegetation	The Southern section of the Sierra has a special rule affecting riparian vegetation: "All non-commercial riparian vegetation found along streams and lakes and within meadows and wet areas shall be retained and protected insofar as practical" (§953.7). No explicit equivalent exists for the Northern zone of the Sierra although the riparian canopy cover requirements discussed above extend across the entire Sierra.	Subject to county and local regulations. Typically there are no specific requirements.			
treatment of exotics	Non-woody species not addressed. Tree species: • Local seeds from state-specified seed zones must be used • No high grading is allowed. Forest practices for natural regeneration require retaining good seed trees in any situation requiring natural regeneration • Replanting has to retain a certain mix of species native to the site. The operator can't markedly increase the number of trees of a non-indigenous species out of its range—such as Giant sequoia	Subject to county and local regulations. Typically there are no specific requirements.			
	If Endangered or Threatened species are affected by exotic species DFG may react but there are no specific requirements in the Fish and Game Code.				
pollution prevention	Forest operations can't put anything in the water—no soil, bark, toxins, petroleum, slash or sawdust. If pollutants are accidentally placed there they must be removed (Forest Practice Rules §916.3++; Fish and Game Code §5150). Informal sources indicate that compliance with this rule is weak and this sentiment is corroborated: "Operational wastes and discharges were adequately controlled at 61% of the sites visited" (Final Report of the Forest Practice Rules Assessment Team to the State Water Resources Control Board 1987).	See below.			
	1. Permits to discharge may not be awarded and some water bodies have zero discharge requirements in the Regional Water Quality Control Board Basin Plans. 2. The State Fish and Game Code states that it is "unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this state...any petroleum...refuse...sawdust...substance or material deleterious to fish, plant life, or bird life" (§5650). 3. Numerous waterbody-specific requirements exist dealing with particular contaminants due to agricultural or urban uses.				
unforeseen impacts	1. If current Forest Practice Rules don't cover an issue/concern then CDF must go to the Board of Forestry for direction. CDF doesn't have to approve a plan just because there is no regulation against an activity or impact. 2. Sensitive watersheds possibility (see discussion in the Section II of the main text)	No specific requirements	No specific requirements	No specific requirements	No specific requirements

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
Sensitive Water-shed protection	See discussion in the Section II of the main text				
Part III: Upland areas	Remaining area in planning watersheds upslope of riparian buffers. There are no explicit constraints on uplands management activities although cumulative watershed effects analysis is required to cover entire watersheds for any timber harvest plan. ERA is an acceptable but not requisite method of evaluation. CWE may be assessed qualitatively.	No specific requirements.			
Special Protections	No specific requirements. See general provisions in Part I of the table.				
Part IV: LS/OG	Virtually all Late-Successional Forest Lands not in State Parks or Federal Lands are under the jurisdiction of CDF. See LS/OG discussion in Section II of main text. Only details are summarized here.	No specific requirements unless mandated by county and municipal ordinances.			
definition	Late Successional Forest Stands means stands of dominant and predominant trees that meet the criteria of WHR class 5M, 5D, or 6 with an open, moderate or dense canopy closure classification, often with multiple canopy layers, and are at least 20 acres in size. Functional characteristics of late succession forests include large, decadent trees, snags, and large down logs. (§895 Forest Practice Rules)	none			
Special Protections forest structure / composition	LS/OG cumulative effects analysis not required if the stand is not reduced below WHR rank 5. A stand can be thinned without losing its characterization at late-successional. The area should include a multi-layered canopy, two or more tree species with several large coniferous trees per acre (smaller subdominant trees may be either conifers or hardwoods), large conifer snags, and an abundance of large woody debris... [Emphasis added] (§912.9, 932.9, 952.9) Late seral habitat continuity: Projects containing areas meeting the definitions for late seral stage characteristics must be evaluated for late seral habitat continuity. The fragmentation and resultant isolation of late seral habitat types is one of the most significant factors influencing the sustainability of wildlife not adapted to edge environments (§912.9, 932.9, 952.9).	No specific requirements unless mandated by county and municipal ordinances.			

Category	Forests under jurisdiction of CDF/ FPR	Forests not under CDF	Hardwood Woodlands	Rangelands	Human Settlements
(continued)	This fragmentation may be evaluated by estimating the extent of the on-site project and the biological assessment area occupied by late seral stands greater than 80 acres in size (considering the mitigating influence of adjacent and similar habitat, if applicable) and less than one mile apart or connected by a corridor of similar habitat (§912.9, 932.9, 952.9).				
roads	No specific requirements.	No specific requirements.			
recreation	No specific requirements.	No specific requirements unless by county and municipal ordinances.			
development	Forests not previously harvested should be at least 80 acres in size to maintain the effects of edge. *This acreage is variable based on the degree of similarity in surrounding areas*. (§912.9, 932.9, 952.9) [Emphasis added]	No specific requirements unless by county and municipal ordinances.			
grazing impacts	No specific requirements.	No specific requirements unless by county and municipal ordinances.			
wildlife, including birds	Significant adverse impacts to wildlife must be avoided. See the longer textual summary in Section II of the main text.	No specific requirements unless by county and municipal ordinances.			
treatment of exotics	No specific requirements.	No specific requirements unless by county and municipal ordinances.			
Summary of key protections	The strongest factors influencing the conservation of biodiversity are existing water quality and endangered species laws. The most promising opportunity may well be the designation of sensitive watersheds which may be created with any host of rules to limit timber harvest-related activity	These lands typically fall under municipal rules and if not they are not being used for commercial timber purposes and are unlikely to have extreme changes in condition (excepting disturbances).	Few key protections exist other than voluntary guidelines. This lack of strict regulation could change in future if voluntary compliance is found to be inadequate.		Protection of biodiversity is highly variable, questionably enforced and often written in reference to regulations imposed from higher jurisdictions.
	The strongest factors influencing the conservation of biodiversity are these: • A plan can't be approved if it has a *significant adverse impact* unless there are overriding considerations; • Beneficial uses of water, as defined for the location, affect allowable activities; and • Species protection under ESA and state endangered species act is strong. In addition to the Endangered Species Acts at the state and federal levels, the most promising opportunities for conservation across many jurisdictions may well be the unproven but promising, • Natural Community Conservation Planning (NCCP) policy • California Council on Biodiversity's future efforts				

APPENDIX I: COMPARISON OF GOALS AND REQUIREMENTS AFFECTING AQUATIC AND RIPARIAN RESOURCES IN DIFFERENT JURISDICTIONS

SNEP's charge is to suggest strategies that maintain the health and sustainability of Sierran ecosystems while meeting human needs. Toward that goal an aquatic and riparian strategy, described below, is considered by SNEP. In this paper this policy is considered the standard in for comparison purposes because SNEP has chosen to examine it and its consequences closely. This policy should be considered draft and subject to revision but represents a starting point for thinking about riparian systems.

Thinking about aquatic and riparian ecological systems

The riparian zone protection scheme SNEP is considering has been designed according to four principles: (1) a stream needs functional inputs to sustain its biological functions; (2) some plant and animal communities rely on the forest adjacent to streams; (3) streams are more affected by hillslope activities where the stream is smaller—for example, a headwaters aquatic system is small in relation to the zone that influences it so it has a larger influence area than does a larger section of the stream downstream; and (4) disturbance probability for in-stream effects increases with adjacent hillslope gradient, therefore buffer protection should increase accordingly (see Kondolf, et al. 1996; Kattelmann and Embury 1996; Menning, et al. 1996).

The aquatic management protection scheme developed by D. C. Erman, N. Erman, L. Costick and S. Beckwitt (see Kondolf, et al. 1996, and Kattelmann and Embury 1996), has three spatial components. The first is a *Community Influence Region*. This region is the area in which plants, animals and other organisms that are dependent upon the area adjacent to the water live or spend time. *Obligate* species such as beavers and dippers, and *transients* , such as bats and predator mammals, are species for which this zone is critical.

The second component is an *Energy Influence Region*. This area, which extends as far from the stream as the tallest tree (when tree cover is present), includes all the habitat necessary for the community influence region plus all the area that contributes energy and nutrients to the aquatic system. Recruitment of leaves and snags into the stream, for example, usually originate within the length of one tree height. Included in the functions of this zone are the recruitment of woody debris and shading canopies.

These first two zones derive from different ways of thinking about ecosystems. The first is rooted in *community ecology* in which the organisms and their structure in biological communities is examined, and the second in *ecosystem ecology*—the study of flows of energy and materials between organisms and other components of the system. In this protection strategy both approaches are used.

The third part of the system, the *Land Use Influence Region*, includes the area in which land use activity will influence stream conditions and the functioning of the community influence and energy influence regions. Influences include nutrients above baseline levels, increased sedimentation, and changed microclimate. Changes in flow and temperature are considered in the Energy Influence Region due to the filtering and buffering capacity of the near-stream area. The width of the Land Use Influence region varies according to the probability of disturbance to a stream as a function of bank slope and/or hazardous soil and geologic conditions.

In this riparian protection scheme different levels of disturbance and tree removal could occur in each region. In the Community Influence region, for example, a strict limit on activity would exist—very little activity would be allowed and a mature forest generally would be established as the goal. The Energy Influence Region would have varying degrees of activity allowed including selective removal of canopy. Finally, the Land Use Influence Region would have more activity allowed in its domain.

At the scale of the entire Sierra Nevada, SNEP does not have the capacity to determine the precise widths of each of these zones for every stretch of stream. Actual land management would require gathering additional site-specific information that could be used to determine these buffer distances. For these reasons, SNEP has organized these three ecological regions into two riparian management zones for SNEP's modeling efforts.

SNEP's Adaptation of the three ecological regions into SNEP's two riparian zones

The aquatic and riparian system described above is being incorporated into the SNEP's policy analysis in two tiers. An inner tier, called the "green" zone, merges the first two regions mentioned above—Community Influence and Energy Influence regions. The height of one tree is approximated by designating the width of this area as 150 feet on both sides of the stream. The outer tier, corresponding to the Land Influence Region, is represented in SNEP's variable width "grey" zone. While the width of this outer tier actually depends on soils and slope information, the SNEP analysis is using only slope data since a complete soils coverage for the entire Sierra is not currently available (for complete description of how the width of this zone is determined Kondolf, et al. 1996; Kattelmann and Embury 1996; and Menning, et al. 1996).

In the SNEP policy analyses, these goals and limits are expressed in two ways: (1) late-successional goals for the forest in each zone are set using the LS/OG rank system developed by Franklin and Fites (1996), and (2) disturbance limits based on the Equivalent Roaded Acres (ERA) approach for assessing watershed disturbance constrain road building and harvest-related management activities in the various management strategies (see Menning, Erman, Johnson and Sessions 1996).

Objectives of the Aquatic and Riparian Protections Strategies Discussed by SNEP:

The following two tables are intended to be used in conjunction with Table 1, the Biodiversity Protection Matrix in Section III above, which provides supporting details on policies. The grey and green zones mentioned in the tables derive from the two-tier Erman, et al. stream buffer system discussed above (see Menning, et al. 1996; Kondolf, et al. 1996; and Kattelmann and Embury 1996). While the strategy here has been adapted from D. Erman, et al., the goals, which are shown as criteria in the lefthand columns, derive from P. Moyle (see Moyle, et al. 1996). This strategy should be considered tentative but represents one approach to thinking about riparian systems and their protection.

Table 2: Riparian Objectives

Key to current policies in the table below (righthand 3 columns). Also, see description on previous page.

	√	goal exists in current policy and requirements are comparable to the Erman, et al. riparian protection strategies
	+	goal exists but requirements are less likely than the Erman, et al. strategy to achieve the goal
	~	goal exists but requirements are voluntary or indefinite
	X	goal does not currently exist
	?	Don't know

Riparian (grey & green zone) Objectives		In Moyle et al.'s goals this objective applies to...		Current policy on non-federal lands: Protection goals and requirements exist via...		
		Inner **green** zone	Outer **grey** zone	RWQCB Basin Plans	CDF / Forest Practice Rules	DFG / F & G Code
1	Maintain and enhance in-stream, lake, wetland habitat structure (vegetative *and* geomorphological structure)	♦		~ wetland protection	+	+
2	Maintain natural temperature regimes in streams	♦		+ beneficial uses	+	~
3	Provide continuous habitat for riparian-dependent and associate native plants and animals	♦	♦	X	+	+
4	Maintain large riparian trees for shade, woody debris, habitat	♦		~ via informal cooperation w/ DFG	+	~
5	Maintain native riparian vegetation	♦		X	+ in southern district	~
6	Limit sediment inputs to natural levels	♦	♦	~ limited, but not to natural levels	+ strong limits on inputs to streams	~
7	Maintain near stream microclimate	♦	♦	X	~	X

Table 3: Aquatic Environment Objectives

Refer to the key with Table 2.

Aquatic Environment—Streams & Lakes		In Moyle et al.'s goals this objective applies to...		Current policy on non-federal lands: Protection goals and requirements exist via...		
		In-water conditions	Watershed	RWQCB	CDF / Forest Practice rules	DFG / F & G Code
1	Reduce pollution from toxic sources such as mines.	♦	♦	+	+ no discharge allowed	+ no discharge allowed
2	Limit human caused watershed disturbance using, for example, ERA or a qualitative assessment.		♦	X	+	+ §1600 agreement
3	Manage streams and natural lakes to favor native species.	♦		X	X	~
a	Reduce influence of non-native species on aquatic and riparian ecosystems.	♦	♦	X	X	~ fish but not plants
b	Increase Chinook spawning area and improve habitat for all life stages.	♦		~ restorable beneficial	~ restorable beneficial	~
c	Reintroduce native fish and frogs and other organisms.	♦	♦	X	X	~
d	Reduce the impacts of recreational activities on native biota.	♦		X	X	~
e	Maintain natural range of fish movement: no blockades.	♦		~ restorable beneficial uses	~ restorable beneficial uses	~ Review PERC permits
f	Maintain or re-establish natural flow regime: • Timing and duration; • Dams and diversions; • Connect streams with flood plains.	♦		X addresses flow but not natural flow	X addresses flow but not natural flow	~
4	Protect unique or sensitive habitats within the watershed that are limited in area.		♦	X	~ must use CNNDB, nesting sites protected	+
5	Have continuous management and responsible monitoring of watersheds.	♦	♦	X	X	~ goal exists but no requirement

APPENDIX II: SPECIFIC ROAD RULES ON LANDS UNDER CDF'S JURISDICTION

Road regulations in the Forest Practice Rules are primarily erosion control strategies. They do not attempt to deal with habitat fragmentation and biological invasions. As a result there are no rules on road densities although, in some cases, cumulative effects analysis might preclude excessive road building. In general, road regulations in the Forest Practice Rules are complex. Specific questions should refer to Forest Practice Rules (see Article 12 of Forest Practice Rules, §923, 943, 963).

Currently no regulations or incentives exist through the Forest Practice Rules to maintain roadless areas. Roadless areas that do occur on private lands (see Franklin and Fites 1996) are incidental to the goals of the Forest Practice Rules.

The road regulations in the Forest Practice Rules state that roadways should be planned, located, constructed, reconstructed, and maintained in a manner that: is consistent with long-term enhancement of maintenance of the forest resource; best accommodates appropriate yarding; minimizes damage to soil and fish and wildlife habitat; and prevents degradation of the quality and beneficial uses of water.

Wherever feasible foresters are expected to: use existing roads; layout roads to minimize total mileage; avoid routes near bottoms of steep canyons; minimize stream crossings; locate roads on flat areas/benches when possible; and use logging systems that will reduce excavation or placement of fills on unstable areas.

In addition:

- Road construction in the Water and Lake Protection Zone (WLPZ) is prohibited except for stream crossings specified in the THP (see below and §923.2 (v)++);
- Extra protection must be provided where slopes are over 65% or where slopes are over 50% and the road is within 100 feet of a WLPZ (§923.1++). Overhanging or unstable concentrations of slash, woody debris and soil along the downslope edge or face of the landings shall be removed or stabilized when they are located in these areas (§923.5 (f) (1)++);
- New roads should not exceed 15% steepness except for short pitches of less than 500 feet (§923.1(e)++);
- Roads and landings shall be planned so an adequate number of drainage facilities and structures are installed to minimize erosion on roadbeds, landing surfaces, sidecast and fills (§923.1(f));
- Drainage should be provided by an adequate number of ditch drains (§923.1(g)++);
- On slopes greater than 35%, the organic layer of the soil shall be substantially disturbed or removed prior to fill placement (§923.2 (f)++);
- Excess road cut material must be placed and stored in a fashion that does not affect downstream beneficial uses (§923.2 (g)++);
- Waste organic material such as stumps shall not be buried in fill (923.2 (j)++);
- Sidecast or fill material extending more than 20 feet in slope distance from the outside of the roadbed must be planted, mulched, removed, or treated as specified in the THP to minimize erosion (923.2 (m)++);
- Roads should be single lane and well drained unless otherwise justified in the THP. Roads should stay out of WLPZs unless absolutely necessary (§923.1(h)++).

In general, roads or landings cannot be built without prepared crossings and the permission of CDF (§916.3c++). No heavy equipment is allowed in the WLPZ (Water and Lake Protection Zone) without justification (§916.4(d)++). Watercourse crossings must either meet the following criteria or require Department of Fish and Game 1601 and 1603 permits:

- Drainage structures shall allow for unrestricted passage of fish where they are present (§923.3 (c)++);
- Drainage structures and facilities shall be sufficient size to minimize erosion, and maintain or restore the natural drainage pattern. Permanent watercourse crossings and associated fills and approaches shall be constructed where feasible to prevent overflow down the road (§923.2 (h)++, §923.3(e)++);

The California Fish and Game Code states that plans must be submitted to DFG if they will divert, obstruct or change the natural flow or the bed, channel, or bank of any waterway if fish or wildlife use that water; or if the activity occurs in a waterbody designated by DFG; or if any debris will be discharged where it can pass into a waterbody designated by the department (§1601 Fish and Game Code). It is unlawful for any person to commence any activity affected by this section until the department has found it will not substantially adversely affect an existing fish or wildlife resource or until the department's proposals, or the decisions of a panel of arbitrators have been incorporated into such projects (§1603 Fish and Game Code).

In addition, in terms of maintenance and season:

- Drainage structures must be in place by October 15 for the wet season (§923.2 (q)++);
- Drainage structures, if inadequate to carry water from a fifty-year flood, must be removed by October 15 or the end of the timber operation, whichever comes first (§923.4 (f)++);
- Temporary roads shall be blocked or closed to traffic before the winter period (§923.4 (g)++).

APPENDIX III: RIPARIAN BUFFER RULES FOR LANDS UNDER CDF'S JURISDICTION

Watercourse and Lake Protection Zones (WLPZ) are to be established when timber harvest plans are developed. The size of these buffers depends upon slope, stream class, yarding method, and sensitive stream conditions (for complete table and references see the Forest Practice Rules, Article 6, §916).

Table 4: Buffer widths for ground based skidding

Stream class	percent slope			Stream characteristics	Prohibitions and activities
	<30%	30-50%	>50%		
I	75 feet	100 feet	150 feet (100 feet for cable yarding)	Class I streams are perennial. Fish are present on-site full or part time, or the stream is used as a domestic water supply on-site or within 100 feet downstream. Habitat needed for migration or spawning is included in this stream class.	To protect water temperature, filter strip properties, upslope stability, and fish and wildlife values, at least 50% of the overstory and 50% of the understory canopy covering the ground and adjacent waters shall be left in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of operations. The residual overstory canopy shall be composed of at least 25% of the exiting overstory conifers. Species composition may be adjusted consistent with the above standard to meet on-site conditions when agreed to in the THP by the RPF and the director (§916.5++).
II	50 feet	75 feet	100 feet (75 feet for cable yarding)	Class II streams may be either perennial or intermittent. Fish may be present off-site within 1000 feet downstream. Other aquatic life is present. Excludes class III waters that are tributaries to Class I waters.	To protect water temperature, filter strip properties, upslope stability, and fish and wildlife values, at least 50% of the total canopy covering the ground shall be left in a well distributed multi-storied stand configuration composed of a diversity of species similar to that found before the start of operations. Due to variability in Class II watercourses these percentages and species composition may be adjusted to meet on-site conditions when agreed to by the RPF and the Director in the THP.
III	Wide enough to act as a filter strip and maintain soil stability. May include equipment exclusion zone only.			Class III streams are intermittent or ephemeral. "No aquatic life present" but the watercourse shows signs of being able to transport sediment under normal high water conditions.	At least 50% of the understory vegetation present before timber operations shall be left living and well distributed within the WLPZ to maintain soil stability. This percentage may be adjusted to meet on-site conditions when agreed to in the THP by the RPF and the Director. Unless required by the Director, this shall not be construed to prohibit broadcast burning with a project type burning permit for site preparation (§916.5++).
IV	Same as above.			Class IV streams are human created diversions, usually downstream. They are established for domestic, agricultural, hydro-electric or other beneficial uses.	See those listed with Class II waters above.

Buffer sizes listed above may be reduced if the RPF and Director agree in the THP but not by more than 25% (§916.4 (b) (5)++). Before and after timber harvest CDF performs site-inspections on 200 ft. segments of watercourses and/or lakes to check for compliance (§916.4,b,2++).

Policies that extend to all WLPZ areas:

- Within the WLPZ at least 75% surface cover and undisturbed area shall be retained undisturbed (§916.4++). Foresters are required to retain multi-story canopy for shading and other values (§916.5++);
- Areas where mineral soil exceeding 800 continuous square feet in size has been exposed by logging operations must be treated to reduce soil loss. This treatment shall occur prior to the winter season beginning on October 15 (916.7++);
- Where there is less than 50% canopy cover (50% of ground must be shaded) only sanitation logging is allowed unless specially excepted (§916.3f++);
- For woody debris recruitment foresters must retain two sixteen inch or greater trees at least fifty feet tall per acre within fifty feet of Class I and II watercourses (§916.3g++);
- Trees in meadows and wet areas may be clear cut and are exempted from stocking to attain or retain these areas for wildlife and livestock. (§939.15, 959.15(b));
- No heavy equipment is allowed in the WLPZ without justification (§916.4d++);
- Maintaining natural flow is important and is to be considered when addressing cumulative impacts (§916.5++);
- When water is drawn out of streams to water roads the total amount drawn is limited (§1600 Fish and Game Code).

During development of a timber harvest plan additional values are to be considered for protection:

- Water temperature control;
- Streambed and flow modification by large woody debris;
- Filtration of organic and inorganic material;
- Bank and channel and upslope stability;
- Vegetation structure diversity for fish and wildlife habitat including vertical diversity; migration corridors; nesting, roosting and escape habitat; microclimate modification; snags; and surface cover. (§916.5).

In any timber harvest plan, the forester must identify existing and *restorable* beneficial uses (916.5a2++). Anadromous fish habitat isolated from salmon runs by a downstream dam is not considered a restorable use. Dams are considered permanent blockades. Diversions and culverts, however, are impermanent and habitat beyond them must be sustained or restored.

The Forest Practice Rules require protection of riparian vegetation and soils—but no quantitative limits are defined (§916.3d++). The Southern section of the Sierra has a special rule affecting riparian vegetation: "All non-commercial riparian vegetation found along streams and lakes and within meadows and wet areas shall be retained and protected insofar as practical" (§953.7). No explicit equivalent exists for the Northern zone of the Sierra although the riparian canopy cover requirements discussed above extend across the entire Sierra.

In terms of pollution, forest operations are not allowed to put anything in the water—no soil, bark, toxins, petroleum, slash or sawdust. If pollutants are accidentally placed there they must be removed (§916.3++). Informal sources indicate that compliance with this rule is weak and this sentiment is corroborated: "Operational wastes and discharges were adequately controlled at 61% of the sites visited" ("Final Report of the Forest Practice Rules Assessment Team to the State Water Resources Control Board" 1987).

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