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Professional Paper

Single Tree Selection and Sustained Yield Planning in Northern California Private Forestry

Introduction and Background

Public is a dominant aspect of forest planning in the 21st century. As the values which are considered in forest management expand, restrictive policy also increases. With each new year the investment in time and manpower to successfully plan and execute timber stand management increases. This is no longer simply the concern of the public lands manager because the policy environment of many states is becoming as restrictive as federal standards (Flick 1994). The demand to consider public opinion in private land management and the subsequent policy changes that enforce the consideration of non-market values are making it more costly to successfully manage timberland. With this consideration in mind we must begin to examine why these changes in private forest policy are occurring and how private industry can cultivate collaboration with the public and curtail additional policy restrictions.

A prime example of this increasingly restrictive policy environment can be seen in the Sierra Nevada region of California. The shift from a state that historically relied heavily on timber and other natural resource extraction to an economy that stands on the leading edge of global industry, scientific exploration and information technology (Walker 2001) resulted in an evolution of public policy concerned with private forest management. Increasing concern over cut-and-leave harvest operations where the primary value of a landscape is the short term economic return has driven the creation of highly restrictive public policy (Flick 1994). These restrictive policies which affect private landholdings continue to increase and demand the consideration of new non market values such as aesthetics and recreation, which in turn drive up the associated cost of compliance. These new demands often conflict with the goal of continually and efficiently producing timber which is important because continuous and efficient production of timber is a goal set by the California legislation (CCR 1982) and is necessary for the continued social and economic stability of the Sierra Nevada region of Northern California.

As we examine the current paradigm of intensive forest management, even-aged management with site preparation, in the context of public participation there is potential for continued resistance (Flick 1994) and a lack of collaboration by the public with private land managers. Much of this lack of collaboration is related to visual judgment of harvest results. There must be an effort on the part of these individuals to reach out to the public and alter harvest pattern in such a manner as to accomplish both continued timber production and the addressing of publicly held values. One of the most important of these values is the visual aesthetic of the remaining stand after harvest. People often judge the value of forest harvesting as much by what they see as what they know and in many cases have preconceived notions about what they think a forest should look like (Bell 2001). These preconceived notions often drive the expectation that a healthy forest will look like a mature “old growth” stand, with large trees and other structural components associated with old forests (Vale 1988). This conception, though not necessarily ecologically accurate gives us direction to look for answers.

Many silviculture prescriptions utilized today help meet structural diversity and continuous cover objectives for more aesthetically pleasing stands (O’Hara 1998). These prescriptions, which are alternatives to intensive even-aged management, often emulate natural disturbance patterns, enhance habitat, preserve ecological processes and more closely mimic the visual pattern of “old growth” stands (Shelby et al 2003). Of these alternates single tree selection is the harvest scheme that I believe has the greatest chance of addressing continual harvest needs and social values such as aesthetics. It does not attempt to hide harvest by screening it from public view but implements elements of "positive design" (Bell 2001) in the planning process. It shows that harvest does not necessarily result in a disconnected "ugly" landscape and can contribute to the overall health and longevity of the stand. This acceptance is the first step toward creating a partnership with the public and moving past the strictly visual interpretation of the forest into something more closely representing an ecological aesthetic (Gobster 1995)

The purpose of this work is to evaluate, through existing literature, the value of trading the intensive even-aged management paradigm for an uneven-aged system, such as single-tree selction, in Northern California's private forest lands. I will investigate this issue from a historic, ecological and public policy context and attempt to draw some conclusions on how and why forest managers should consider moving to this harvest scheme. In addition I will examine the existing policy framework for California private forestry and determine what changes need to be made to make this a more feasible option for land holders.

Region of Interest

The region of interest in this paper is the mixed conifer component of the Sierra Nevada region of Northern California which is illustrated in Figure 1. The Sierra Nevada region has unique characteristics in regards to soil type, climate, vegetation and wildlife with some distinct boundaries that define them. The soil is derived from a granite base which is readily visible from the exposed slopes of the range and the soils that develop from this parent material are thin and rocky. On average the soil across the region has a low nutrient capital despite the fact that areas within the range are some of the most productive sites for conifers. Overall the soil forms a mosaic of conditions that influence vegetation communities, hydrology and myriad of human uses (SNEP 1996 Volume 1, Chapter 1).

The climate of the Sierra Nevada region is currently a Mediterranean pattern of cool, wet winters followed by long dry periods of summer. This has not always been the case and the period of modern settlement, approximately the last 150 years, has been uncharacteristically warm and wet. It was not uncommon in the past to have century long drought events. The climate is also heavily influenced by storm systems in the Pacific Ocean and a strong climactic gradient from elevation which move from east to west. This east to west transition of climate is important because it determines major vegetation communities and hydrologic characteristics (SNEP 1996 Volume 1, Chapter 1).

Vegetation in the Sierra Nevada has more than 3500 native species of plants which make up more than 50% of the plant diversity in California. In addition to common species there are hundreds of rare species as well as limited endemic species (SNEP 1996 Volume 1, Chapter 1). These resident species make it vitally important for the protection of habitat type and continuity in managed forest lands. From the perspective of this paper the most important areas are the broad coniferous zone typified by ponderosa-hardwood or pinyon-juniper forest types and the highly valuable mixed conifer zones which are found above the broad conifer zone. Also important is the fir belt, which contains both white and red fir dominated forest vegetation, in higher elevations (SNEP 1996 Volume 1, Chapter 1).

One of the most important topics, from the perspective of this paper, is the characteristic structure that develops as Sierra Nevada forests age. Under historic conditions this structure is affected by a variety of disturbance events such as fire. These disturbances create a broad series of openings and successional phases which support different plants and animals at different phases in their life cycle. The end result of this mixed-severity fire regime is the retention of large, old remnant trees, both alive and dead (SNEP 1996 Volume 1, Chapter 1). These remnants are survivors from the frequent disturbance events and are important as seed sources as well as agents of variety for the structural diversity of the stand.

The Sierra Nevada region has a rich variety of wildlife and contains approximately 400 species of mammals, birds, reptiles and amphibians. Only a fraction of these species are restricted to this range but animals that live in this region tend to be dependent on the local disturbance regime, most notably fire. Some of these species also depend on the existence of late seral habitat types, but even those that do not may have the need for large, old remnant trees for a portion of their life cycle (SNEP 1996 Volume 1, Chapter 1).

Intensive Even-aged Management

History

Historically the state of California has been a compelling case of resource-led development. Its current trillion dollar economy has been fueled by mineral extraction as well as long term harvest of agricultural, fishery and forest products (Bell 2001). In the early history of the state an open system of property rights, direct access to the profits of resource extraction and above all a relatively unrestricted attitude toward this resource extraction led to booming growth. In many cases this unrestrictive attitude led to cut-and-leave harvest being executed within large tracts of land acquired in the mid 1800s. (Bell 2001).

This unrestricted extraction was evident in timber harvest, as vast tracts were harvested by cut and leave timber operations. It is important to point out that at this time in history there was little concern about the end result of these harvest methods and little care was given to managing the land for sustained growth of timber. The national attitude still held that timber was in “endless supply”. Even in the early 20th century, as land ownership became more concrete, the predominant harvest methods were less about management and more about extracting the maximum amount of raw material from a landscape. This changed as less uncut timberland was available for and anti-harvest sentiment became more prominent (Walker 2001). More thought was being put into making the landscape produce in the long term.

Predominantly the answer to this lack of long-term forest management across the nation was the implementation of intensive even-aged management. Intensive management was originally developed in Europe in the 1800's in response to Adam Smith's soil rent theory, which sought to maximize profits as the general objective in forestry (Perry 1998).For the purpose of this paper intensive management is the removal of all on site trees and the subsequent use of site preparation such as tilling, possible herbicide application and finally manual replanting of desired tree species. These clearcuts result in even-aged stands with trees of similar size and spacing. Regardless of some misgivings by both foresters and the public this management strategy took root in the United States following World War II and by the 1950s was firmly established on both private and public lands (Perry 1998). The attitude following World War II established foresters as having a primary responsibility of providing wood fiber to the rapidly expanding US economy and many considered intensive forestry as the best option available. This attitude, although commonly supported, was not universal.

In the late 1960s, and continuing to present, public opposition to clear-cutting and herbicide use joined mounting scientific evidence that intensive management may not be the most suitable management scheme. The problem was that intensive management, like crop centered agriculture, did not necessarily evolve in the context of testable hypothesis (Perry 1998). It became an imperative, backed by public policy, for federally managed lands to be managed not on a strictly production basis but to adopt an ecosystem management strategy. Despite this change in public policy few companies in the private sector have adopted aspects of ecosystem management and intensive forestry remains by far the most commonly used approach on industrial lands (Perry 1998).

Ecology

Intensive silviculture has some significant impacts on the forest ecosystem when compared to silviculture systems that retain some live canopy. Some of these impacts include habitat reduction for late seral species and species that need interior forest qualities (Sullivan et al 2001), loss of functional biodiversity (Pimental et al 1992), increases in soil and nutrient loss, and fundamental changes in soil chemistry and microclimate (Swanson and Franklin 1992). These factors, when disregarded, can contribute to a decline in the long-term productivity of the site.

One of the most important ecological topics in this discussion is the effect of intensive forest management on habitat. One of the potential ecological consequences of timber harvest is a reduction in the amount of habitat available for forest interior species (Gustafson 1998). Intensive management tends to create larger than normal proportions of edge affected zones and altered microclimates, which is detrimental for many species of plants and animals that require older seral forest types. It has also been shown that Pacific Northwest Douglas-fir forests resulting in intensive management are designed to be simpler systems than natural forests (Swanson 1992). This simplification of the forest type can displace species with habitat requirements not in the early to mid-seral stages and can have an effect on the predator-prey relationships within these stands (Swanson 1992) A factor connected to habitat preservation is the preservation of biological diversity across the landscape (Lindenmayer and Franklin 2002).

Biological diversity is essential for agriculture and forestry systems, aesthetics, evolutionary processes, stabilization of ecosystems and overall environmental quality (Pimental 1992). The loss of this necessary biodiversity results from a wide array of complex factors including vegetation clearing, habitat destruction and pesticide use (Pimental 1992). All of these activities are used in intensive even-aged management. From a structural standpoint the simplification of forest structure that is the result of intensive even aged management also reduces the biological mosaic across the landscape and also the amount of biodiversity.

In the Sierra Nevada forests this biodiversity is also important for the maintenance of soil biota. It has been shown that in almost all cases the soil biology of a site changes significantly following clear-cut harvesting (Perry 1998). Inputs of nitrogen in this region occur, at least in part, from the presence of nitrogen-fixing organisms. Many of these organisms are present in both early and late seral stages of forest development and intensive management tends to truncate both. This could potentially result in a net decline in long term nitrogen availability (Swanson 1992).

Changes in soil biota are not the only pathway through which nutrients, and often soil, is lost as a result of intensive forest management. Short rotations and harvest patterns that remove a high proportion of site biomass often results in exceedingly large nutrient drains (Perry 1998). These nutrient drains are associated with the removal of all organic material from the site as well as altering the hydrology of the site. Small watershed studies have shown that intensive management increases water yield and peak flows after a harvest (Perry 1998). This increased offsite flow can increase leaching as well as erosion.

Uneven-aged Management

History

The idea of uneven-aged management is not a new idea and has existed in North American forestry since the early 1900s (O'Hara 2001). Currently it has gained renewed interest due to the ongoing global trend toward this management style (O'Hara 2002). California is no different and is currently experiencing a public push toward harvest schemes that are more natural in appearance. At the root of this controversy over even-aged management is the lack of variability associated with clear-cuts. People enjoy the diversity of a forest and perceive this diversity as natural (O'Hara 2001).

This need for naturalness in appearance has not always been the justification for the use of selection silviculture. In many cases this management scheme has been initiated for the increased economic efficiency of harvesting only large trees (O'Hara 2002). By removing the larger trees, which are also the highest value trees, there was less operational cost and a decrease in wasted effort associated with harvest of sub-commercial trees. This was supported by both the Great Depression and the invention of tractor yarding in the 1930s. In some cases this management was a well intentioned attempt to manage a stand as uneven but in many cases it was a convenient way to justify high-grading of a site.

One of the more contemporary management approaches that uses ecosystem management is single tree selection. This is a silvicultural system which evaluates each tree in a stand on a set of guidelines determined by the managing company; typically the largest and oldest trees are removed while leaving thrifty younger trees to replace them (Smith et al 1997). The result is a stand with retention of living trees in multiple species and size classes across a harvest unit. From a historic standpoint this harvest technique has been used by some land managers for as long as intensive forestry has been the predominant management scheme. This is illustrated by the Collins Pine Company, whose landholdings in Northern California have been managed in this fashion since approximately 1941 (Collins Pine Company 1998). This silvicultural system, though available, has not been widely utilized in North America until recently, as forest harvest has been dominated by even-aged systems. Uneven-aged systems such as single-tree selection have become more popular in the last decade as forest management is tailored to more closely mimic processes and outcomes of natural disturbance and succession (Sullivan 2001).

Ecology

Uneven-aged management of stands which include the retention of overstory material can help to mitigate some of the undesirable results of intensive even-aged management. As discussed earlier, one topic is the effect of harvest on internal forest habitat types and the removal of important large remnant trees (Sullivan et al 2001). Techniques such as retention of overstory can mitigate the detrimental habitat effects of intensive management. Multi-aged management, such as single-tree selection, can be used as a partial mimic of natural disturbance regimes and mature forest types for the long term retention of complex stand structure and composition. (Swanson 1992). Conceptually the basis for the retention of overstory in a harvest lies in the strong functional links among forest structure, ecological process and biological diversity found in natural forest ecosystems (Sullivan 2001). Besides the removal of structure the results of intensive management have little in common with the results of natural disturbance patterns because the lack of environmental legacies that are left behind by disturbance such as fire (Perry 1998, Lindenmayer and Franklin2002). Green tree retention definitely increases structural complexity when compared to intensive management and provides mature stand characteristics sooner than in clear cuts (Sullivan 2001). These strategies are superior to long rotations and intensive silviculture which can take as much as 2 centuries to develop mature stand characteristics (Swanson 1992).

Overstory retention also benefits belowground processes and biota such as the maintenance of tight nutrient cycles as well as refugia and inocula for mycorrhizae and nitrogen fixing bacteria (Hansen 1995). It has also been suggested that conifers retained on site after harvest have at least some positive effect on the renewal of soil post-harvest (Perry 1998). This could be due to the loss of both soil and nutrients through sedimentation associated with increased runoff of precipitation. The maintenance of overstory cover on these sites is the only permanent means of mitigating and economizing these increased peak flow events (Swanson 1992) through overstory interception and transpiration.

A final topic, but one of great concern, is the necessary regeneration of desired species on a site. From a century long suppression of the natural disturbance regime, namely fire, coupled with selective harvest of pine species, there has been a trend toward an increasing dominance of shade tolerant species on the landscape (Ansley and Battles 1998). These shade tolerant species (*Abies concolour, Abies magnifica, Psudotsuga menzezii and Calocedrus decurrens*) are taking advantage of the lack of continually created crown openings and lack of pine overstory providing a seed source. This relates to single-tree selection and uneven-aged management in general because the retention of overstory species tends to make these sites more compatible for the regeneration and recruitment of shade tolerant species (Smith et al 1997).

Selection cutting should be managed to take this regeneration issue into account. From a stand dynamics perspective single-tree selection allows the land manager to maintain the site in a perpetual state of understory re-initiation instead of continually returning the site to a stage of establishment (O'Hara 2001). This is valuable because the site will be able to yield commercially valuable timber every 15 to 30 years depending on the cutting cycle, whereas initiated stands must be managed without return for much longer periods of time. It is also important because a large percentage of planted trees within intensively managed sites will eventually die from stem exclusion or be removed through pre-commercial thinning.

While the increased shade on the site will encourage the regeneration of shade tolerant species there will also be the establishment of intolerants in areas with sufficient light. This is important because the preferred commercial species in this region are species of Pine and are shade intolerant. In areas of the Sierra Nevada region simulations have shown that while the on-site percentage of pine species is relatively low it still translates to a sufficient number of trees per acre (Lilieholm 1990). This is where effective management comes into play. Evaluation of trees for harvest must take into account their overall placement on the landscape and larger gaps should be created to encourage the regeneration of such shade intolerant species like pine (O'Hara 2001). If this is still ineffective then planting could supplement these intolerant species. Since planting is already employed in the application of intensive even-aged management there would not be an increased cost of management.

Public Policy and Social Science

From a public policy perspective, the battle between even and uneven-aged silviculture is a matter of societal expectations for the management of forests and is in a state of constant tension because people value both undisturbed forest and forest products (Gustafson 1998). The first of these needs is to produce timber, both a goal of private industry and an initiative from the California legislature (CCR 1982), and the second is the increasingly restrictive public policy realm which seeks to regulate what are often seen as destructive uses of forests. In this section of the paper I will examine the existing public policies that govern private timber management and the culture that has led up to the existing public policy environment.

To truly understand and interpret the existing legislation there should be some examination of the environment in which the policies developed. Forestry is undergoing a major transformation in response to social pressures, growing global concerns, and new knowledge about ecosystems. The effects of this transformation are perhaps nowhere more pronounced that in the Pacific Northwest where intense controversy surround the conversion of natural forests, particularly mature forests, to intensively managed stands or plantations (Swanson 1992). The California policy realm is no exception and has become highly restrictive when it comes to management of private land. Part of this is a result of past management decisions but it also has to do with an expanding range of non-timber values that the public is demanding be considered. Creation of policies addressing these non-market values are driven by a lack of profit motive, unlike timber harvest which has a well established profit motive and land use efficiency (McDonald 1954).

One value that is very important in driving the creation of this restrictive legislation is the visual interpretation of clear-cuts on the landscape. Different people interpret these harvested units in different ways but there is one popular interpretation that clear-cut harvesting is singularly destructive (Vale 1988). This interpretation views the issue from a historic perspective and does not see the ecological advantage of early seral patches, instead seeing only the destruction of mature or "primeval" forests. This interpretation is primarily based on the visual interpretation, or the sight aesthetic. The visual interpretation is important when we examine this argument because it is one of the most utilized of human senses. If a harvest looks bad to an individual then there is generally the belief that it is bad on other levels (Jones 1995). By this note, regardless of ecological argument, stands which are more visually appealing will often be more socially acceptable. Part of the difficulty inherent in measuring visual quality is the subjective manner in which it is judged. Despite these difficulties there is available information on the way that individuals interpret different silvicultural treatments and the transition of these treatments through time.

One important example of this work was presented by Shelby et al (2003). Their research rated the changes in post-harvest scenic quality for six different silvicultural treatments. This work is valuable because it not only addresses an important aspect of this review but is also regionally appropriate, having been conducted in a part of the Pacific Northwest. Some of the results from this study can be seen in Figure 2. As the figure illustrates "old growth" is consistently the most desirable forest type and when harvest is conducted clearcuts show the most negative results. It can also be seen that as the level of retention increases the initial scenic quality values are also higher. With the retention of overstory in single tree-selection land managers would be able to more effectively mimic mature stand characteristics, thereby making the harvest more favorable.

Similar results were found by Ribe (2004). Figure 3 shows the observed change in perceived scenic beauty due to various forest treatments found by Ribe (2004). The largest change in value can be seen for clearcuts with a deviation from start of over 150. The lowest observed decline in scenic value came from the stand which retained 75% of the overstory in aggregated clumps. In between these extreme values we can see that both increased retention and dispersal of harvest decreased the overall rate of change in scenic valuation. Similarly Ribe (2004) also found that the overall magnitude of change associated with different silvicultural techniques was the greatest for clearcuts (Figure 4). These two studies are representative of many similar studies in the region and show a trend toward public preference of overstory retention and dispersal of harvest. This shows some of the influence present in the public policy environment and where future legislation could potentially be directed. Especially important is the intense magnitude of change in scenic value associated with clearcuts.

In this argument there are two specific pieces of legislation that contribute to the existing policy climate, the most influential being the Z'Berg-Nejedly Forest Practice Act. This act was established in 1973 by the California Legislature to address the growing concern over cut-and –leave forest operations (CCR 1973). At the time there was little authority by which the state could govern the kind of forest management that was being conducted on private lands. With the creation of this policy this was drastically changed.

The Z'Berg-Nejedly Forest Practice Act was important because it formally recognized not only a commitment on the part of the legislature for the continued production of timber but also recognized the existence of non-timber values on the landscape (CCR 1973). In light of these expanded considerations for timber managers the act also established minimum requirements for the management of private lands. By doing this it established the need for public discourse about private land management in California and established the authority of the California Board of Forestry. This authority allowed them to enforce the minimum requirements and regulate management through the creation of the Forest Practice Rules (CCR 1973).

The Forest Practice Rules are guidelines adopted by the board in light of both timber and non-timber values. They help to enforce best management practices by private land managers as well as establishing a mechanism for the consideration of publicly held values such as recreation and aesthetics. They also dictate the creation of a Timber Harvest Plan in any case where the forest is going to be harvested (California Board of Forestry 2007). This document is a management plan which covers the harvest unit and takes into consideration all potential damage that could be done by the harvest as well as mitigating measures that will be conducted. Overall this document is potentially quite long and costly to produce for the land manager, which inspired the inclusion, within the Forest Practice Rules, of the Sustained Yield Plan (SYP) option.

The Sustained Yield Plan also known as option (b) allows a manager to create a supplemental document covering the extent of their land base. This document is intended to describe all potential effects of harvest across the landscape and to be cited in future Timber Harvest Plans. By creating this document, which includes all cumulative impacts on the landscape, it allows for these issues to be addressed just once and then referenced in a much more concise Timber Harvest Plan. This more concise version of the Timber Harvest Plan reduces costs by reducing the amount of time which is invested in the planning of harvests, especially in areas that are harvested frequently or which are adjacent but harvested in different years. It also encourages the land manager to embrace a much longer planning horizon. Instead of simply thinking in the short term it forces a consideration of the stand at a minimum of a 100 year timeframe. According to the existing rule the SYP is viable for 10 years after the date of acceptance by the California Board of Forestry (California Board of Forestry 2007).

The second important piece of legislation is the California Timberland Productivity Act. This Act was established in 1982 as a way of reinforcing the California Legislature's stated goals of continued timber harvest. It states that timber harvest is vital to the continued ecological, economic and social stability of the state and that this continuing timber harvest is threatened by both urban spread and conversion of timberland to other uses (CCR 51100 1982). This is important to the discussion in this paper because it not only established the motive for streamlining harvest planning but also formally recognizes the inherent problems associated with over regulating natural resource management. These issues are parallel to the potential streamlining effect of the SYP option as well as supporting the necessary changes that should be made if it is ever going to be effective or attractive to private timber managers.

Synthesis and Recommendations

The negative connotation associated with intensive even-aged management creates an ever widening gap between the values of commercial timber harvest and non-timber valuation of forests. This tension is not alleviated by the fact that in many ways ecological data suggests that intensive silviculture may not be sustainable in the long run. That in turn creates stress in the public policy realm between the California legislature's stated goals of producing a continual flow of timber and considering non-timber values such as visual aesthetics, soil, water and wildlife. This stress has the potential to instigate an increase in regulation which could take away the ability of land managers to determine the most effective method of management on their respective landscape.

From a public policy standpoint this potentially increased regulation could come from modification of the existing forest practice rules or through the adoption of a new piece of legislation. In either case the new rules would make it more difficult for private land managers to efficiently harvest timber from their landholdings. Two specific difficulties that could arise would be the restriction of harvest on trees above a diameter cap and the prohibition of clearcuts. These are both issues which have been presented to the legislation in the last two decades, though they were not passed.

The prohibition of intensive silvicultural practices such as clear cutting would take away important tools from the private land manger. In some cases the removal of all overstory vegetation and planting is the only practical option. An example would be in fir dominated sites with high pathogen incidence. Increased entry into the site, which is a necessity economically efficient management that highlights green-tree retention, could serve to create more opportunity for disease and declining wood quality (Garbelotto et al 1997).

Similarly the prohibition of large tree removal would also be detrimental. Without the ability to remove these large overstory trees the land owner would lose a valuable source of high quality timber. These trees could potentially begin to die as a function of old age and the land manager would have no recourse to capitalize on the wood, which represents as much as 5oo years of growth. In addition this scenario could create an unwanted incentive to liquidate large trees before legislation could be enacted.

The question remains as to how land managers can prevent this loss of decision making power which results from increased legislation. I am advocating the adoption of single-tree selection as a primary silvicultural strategy. Single-tree selection would allow land managers to continue harvesting wood from the landscape under the existing policy framework and cultivate public trust at the same time. As I have discussed it is visually preferable as well as having significant ecological advantage over intensive even-aged management. These advantages can be shown but without some long-term landscape based management it will not wholly accomplish the goal of integrating both ecological and intrinsic values. These goals could be accomplished through the use of the existing Sustained Yield Planning Option outlined in option b of the Forest Practice Rules. Unfortunately there are some fundamental problems in the existing language that must be addressed for this option to fulfill it potential.

The language in the Forest Practice Rules that outlines the SYP option need to be modified to address three problems: vague requirements as to what needs inclusion, more specific direction on how existing plans are to be renewed after 10 years and language that guarantees full utilization of their plan upon acceptance. The first problem is the most important because the current rules do not give guidelines as to what must be included in these documents. The resulting documents are widely varied and very expensive because they are exhaustive in detail. The length and varying content make them difficult to review because each must be weighed on their own without comparison to a baseline documents.

The expense of producing these documents also makes it vital that there is a mechanism for renewal available to land managers. Currently there is no specific language that addresses this issue, making many land managers unwilling to invest in SYPs. This is understandable as 10 years may not be a long enough time to recoup lost capitol from the streamlining of Timber Harvest Plans. If this document must be rewritten every decade then there is little hope that it would have the desired effect of making harvest more efficient.

The final issue I would like to address is the need for a contractual guarantee between the landowner and the California Board of Forestry that if this document is created and approved it must be honored to its full extent. This means that when this document is approved by the Board of Forestry it is understood to be sufficiently detailed that the land manger can cite it in subsequent Timber Harvest Plans without fear of having them rejected on the basis of insufficient information or mitigation of damage. Without this contractual agreement the land manager has no way of guaranteeing the utility of this expensive investment.

With the adoption of these changes, management of large private landholdings in Northern California will become more economical and ecologically efficient. By adopting the Sustained Yield Planning Option and single-tree selection voluntarily, land owners have the potential to develop a more favorable dialogue with the public and eventually a mutual trust. Consideration of aesthetic values and other intangibles may cost the land owner more in the short term, but should be considered an investment in the future of private timber management.

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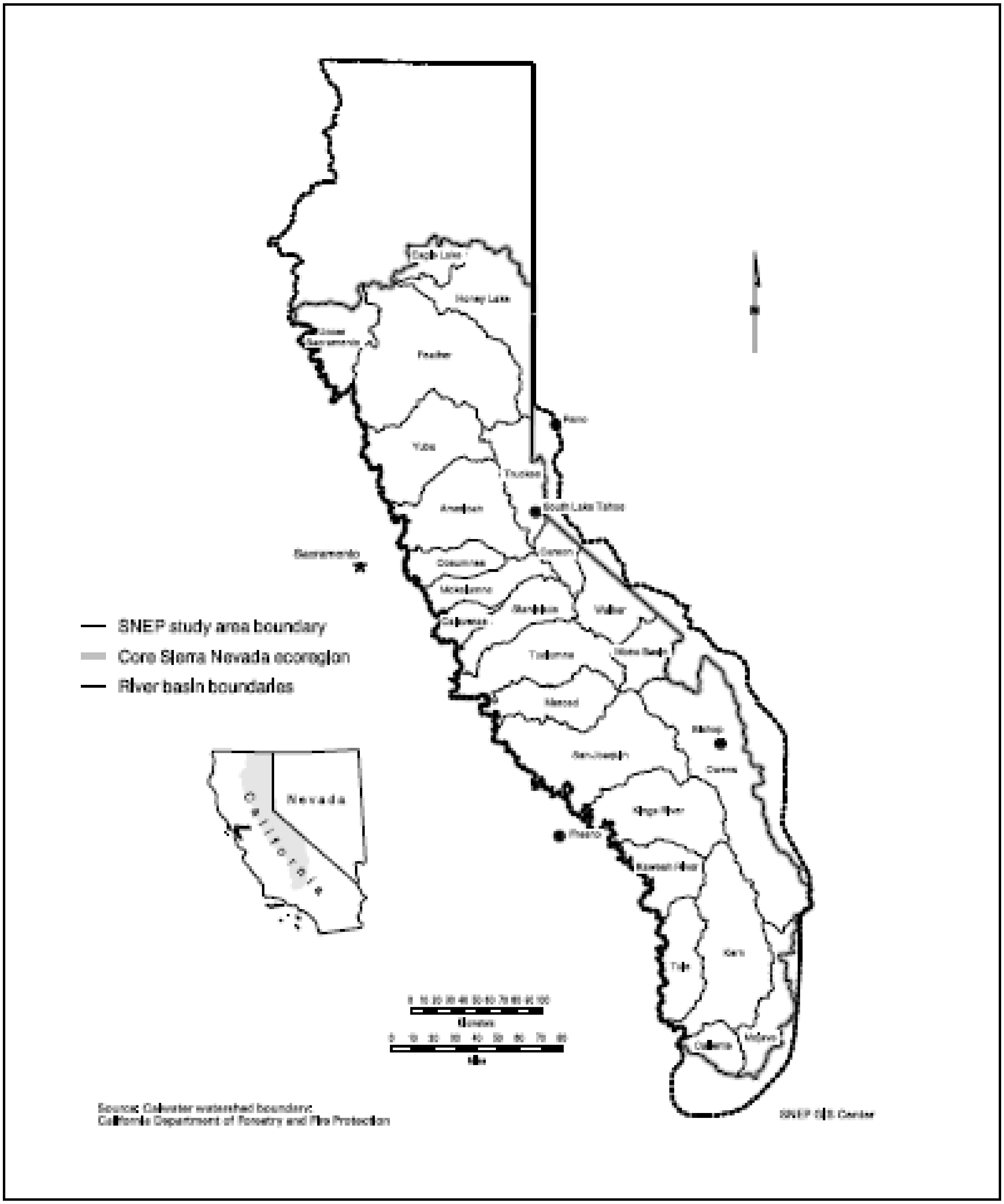

Figure 1. Boundaries of the core Sierra Nevada eco-region, Sierra Nevada Ecosystem Project (SNEP) study area, and the twenty-four river basins used by SNEP in its assessments. (SNEP 1996 Volume 1, Chapter 1)

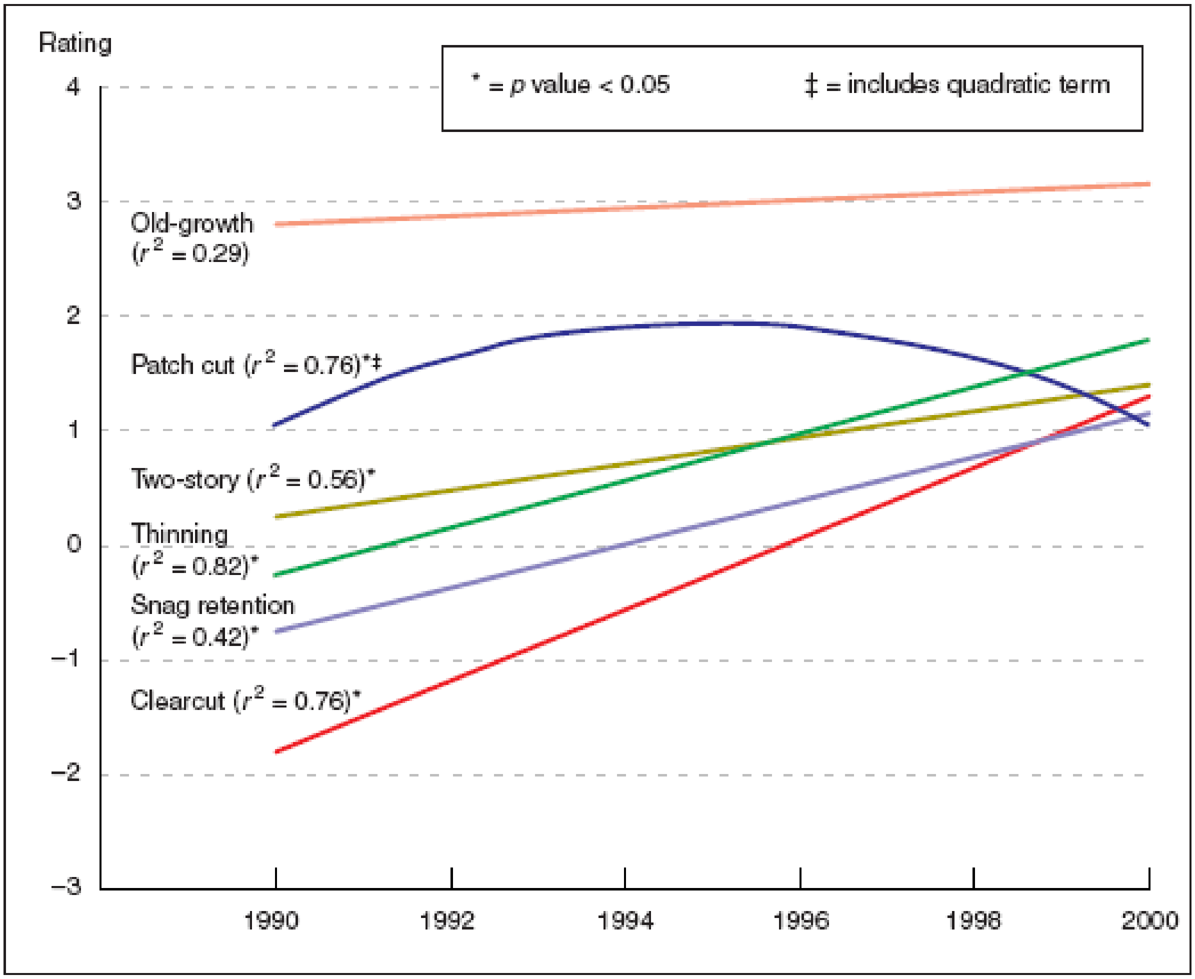

Figure 2. Regression of average scenic quality values post-harvest for 6 silvicultural techniques.

(Shelby et al 2003).

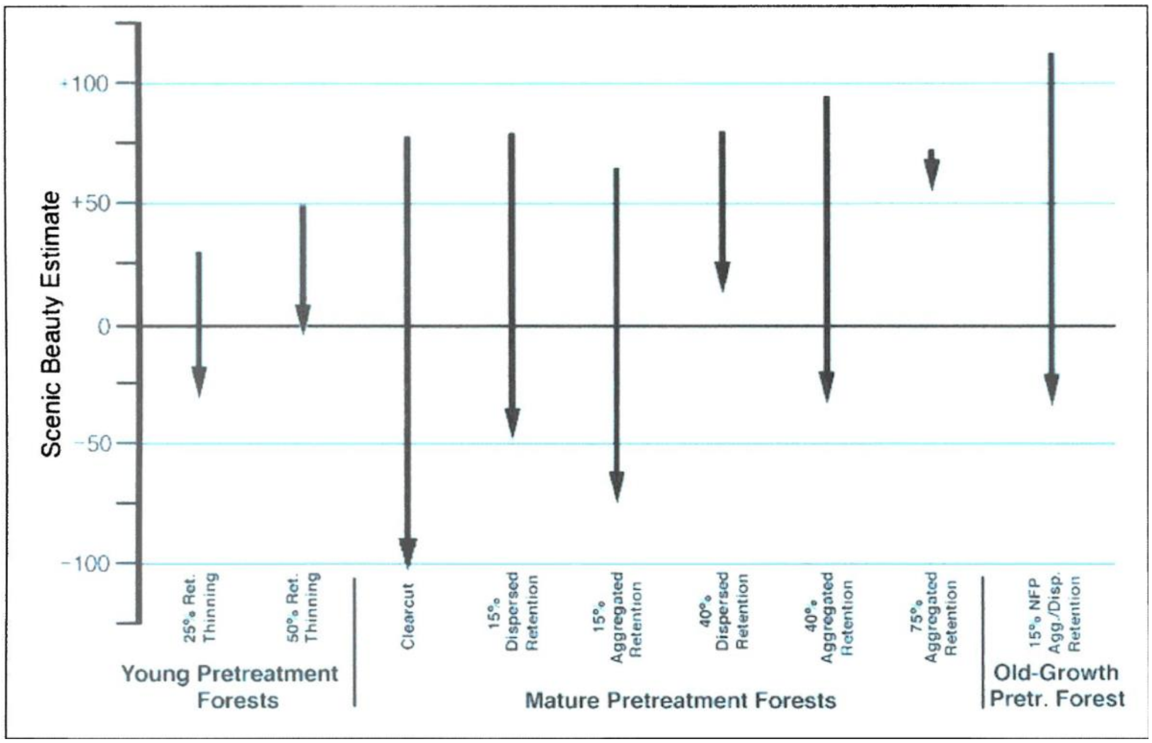

Figure 3. Overall change in scenic quality across different silvicultural strategies. (Ribe 2004)

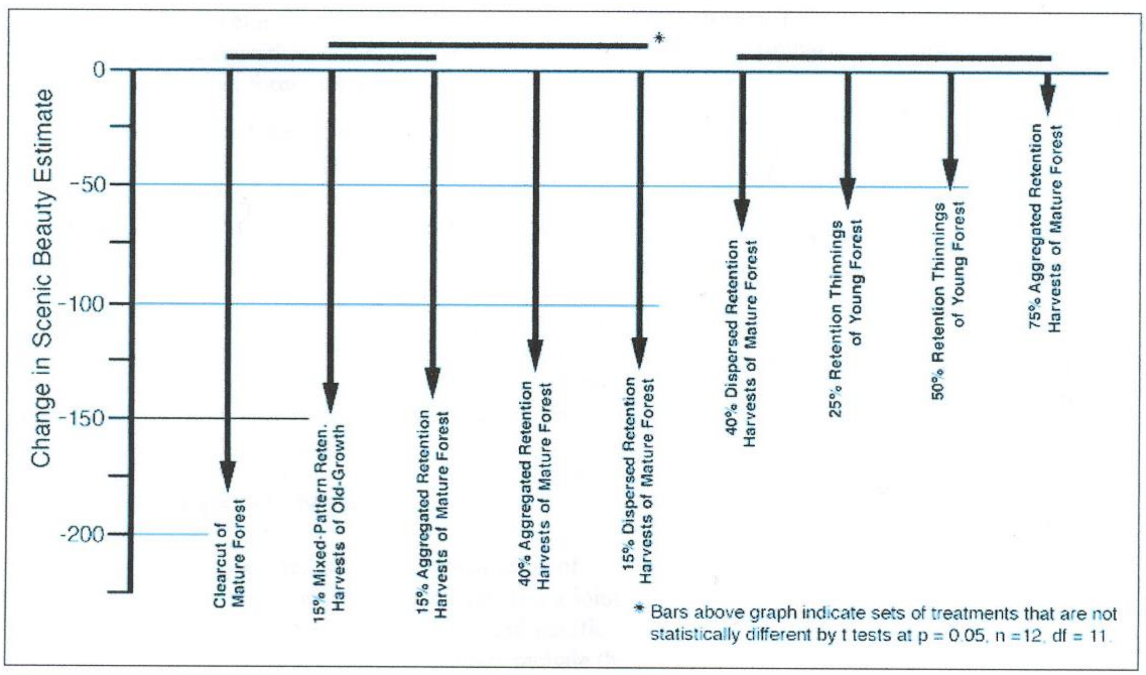

Figure 4. Magnitude of change in scenic quality across different silvicultural strategies.

(Ribe 2004)