Karuk Tribe
Department of Natural Resources
Eco-Cultural Resources Management Plan

An integrated approach to adaptive problem solving, in the interest of managing the restoration of balanced ecological processes utilizing Traditional Ecological Knowledge supported by Western Science.

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Integrated Resource Management Plan
Karuk Tribe of California
September 2009

Background:

The Karuk Tribe of California (Karuk Tribe) is a federally recognized Indian Tribe (73 Fed. Reg. 18,535, 18, 544 (April 4, 2008)) occupying aboriginal land along the middle course of the Klamath and Salmon Rivers in Northern California. The Tribe's Aboriginal Territory has been previously mapped and includes an estimated 1.38 million acres, within the Klamath River Basin. This Territory is the land base that was utilized in the process of receiving a determination of Tribal recognition. Nearly all of The Karuk Aboriginal Territory is located concurrent to lands administered by the USDA Forest Service's Klamath and Six Rivers National Forests.

The Karuk trust lands are composed of individual and Tribal Trust properties scattered along the Klamath River between Yreka and Orleans, California, with Tribal centers and administrative facilities located in Happy Camp, Orleans, Somes Bar, and Yreka. The Constitution of the Karuk Tribe defines the external boundaries of the Karuk Aboriginal Territory and is considered as the planning area for this document.

Karuk Tribe:

The Karuk Tribe envisions the Eco-Cultural Resource Management Plan to serve as a long term implementation strategy to move toward fulfillment of our mission. It is intended to integrate the strategic direction of Karuk Department of Natural Resources Programs and affiliates into one overarching document in the interest of establishing a unified approach to managing the human, cultural/natural resources and interests of the Karuk Tribe.

Values:

The Karuk Tribe values the interests and wellbeing of the Karuk People. The values associated with this wellbeing are primarily health, justice, economic security, education, housing, self governance, as well as the management and utilization of cultural/natural resources within and adjacent to the Karuk Aboriginal Territory now and forever.

The Tribe also values the interests and wellbeing of the general public. Applicable Tribal services and management principals are extended to the general public as a secondary benefit to the overall good within our service area.

Principles:

It is the belief of the Karuk Tribe that the values stated above must be managed in a manner consistent with Karuk tradition, custom, culture and ceremonial principals in order to ensure cultural perseverance for our members and descendants.

Mission:

The mission of the Karuk Tribe of California is to promote the general welfare of all Karuk People, to establish equality and justice for our Tribe, to restore and preserve Tribal traditions, customs, language and ancestral rights, and to secure to ourselves and our descendants the power to exercise the inherent rights of self governance.

Draft
Eco-Cultural Resource Management Plan
Karuk Tribe Department of Natural Resources
September 2009

Background:

The Department of Natural Resources (Department) was established in 1989 after congressional appropriations were allocated to pursue fisheries management and restoration interests. What started out to be primarily Fisheries expanded into Water Quality, Fire and Fuels management, Native American Graves Protection and Repatriation (NAGPRA), Cultural Resources, Air Quality, Watershed Restoration, Environmental Education, and Recycling Program. Currently, the Department is developing a media/publicity and Environmental Justice program. Future direction will likely include development of Wildlife, Forestry, Enforcement, Energy, and Soils/Minerals.

The families from the villages in the Karuk Aboriginal Territory, as well as numerous other Tribal members continue to utilize the cultural/natural resources throughout the territory. There are numerous undisclosed sacred sites, gathering areas, hunting camps and fishing spots and other prehistoric, historic, and contemporary use areas scattered across the entire landscape. Tribal People continue to maintain a unique relationship with the land and value many resources as sacred. This area has been occupied and traditional uses have continued since time immemorial.

The Karuk use of fire as a land management tool was complex and multi-faceted. As with other ceremonial and religious aspects of Karuk culture, the role of fire was one to be contemplated and learned from at the deepest levels. Born in 1904, Johnny Bennett was a Karuk Indian and a lifelong resident of the Salmon River country. In the following statement recorded in 1977, Mr. Bennett discusses his sense of an appropriate relationship of humans to the process of natural succession. He considers the evolution of the forest as a complex process, not entirely comprehensible, but nevertheless subject to penetrating study, one aim being to bring cultural processes into agreement with those of nature. This non-dominating but purposeful relationship to nature is enriched and raised to the level of philosophy by the contemplative quality of his observations. These considerations of the relationship between lightning, biological evolution and cultural practices reflect a uniquely Karuk perspective which is simultaneously sacred and utilitarian.

> *"I'd like to know what the fires for. I'd just like to know what was the fire for in a lightning, why did it have to burn? It's for some cause now. It could storm without that, y'know, but it had to burn. I think about it many times. The old*

> *Indians say the Creator made it that way to clean out the forest. In places where it hit there would be a burn out, y'know, and they never put it out. They'd push it back up the mountain and it would burn, let it go. They wouldn't bother it because they claim it was put there for some cause, and they said it was good because they could sneak up on their game, pick up their acorns, and it generally never damaged much, because you could go to a forest, great big old trees, like redwoods, been burnt once, the bark is black. One time there was fire there and the same way in this country, when the lightning hit they never put it out, push them back, make a fire line, let them go back up the mountain. Take sticks out there, burn up against it."*

Johnny's discussion moves fluidly from metaphysics to warm personal memories, from the utilization of fire in his own boyhood back to the level of generalization with recognition of the elemental qualities of nature as an implacable total system. His defense of natural processes and relationships is coupled with a mistrust of events and perspectives that tend to alter or slice through this complex system of relationships. From long observation of the self-corrective process of the forest, a series of verities has been deduced which may be formulated as follows: all relationships, in human society as well as in the natural ecology, exist within a range of limits analogous to the cyclical limits observable within nature, and are subject to the same processes of nurturement or destruction as are ecological systems; understanding and harmony with these enduring principles exist at levels which include the conscious and verbal as well as the unconscious and non-verbal. Human life and society are affirmed as aspects of a more inclusive system of natural processes by these conceptions of the forest and of the place of the community in relation to the forest.

(Karuk Ethnographic Report 12-14, quoting from Salter 1981)

Karuk Traditional Ecological Knowledge spans across many different ecological processes and includes numerous habitats and the species contained within those environments (Lake 2007). Processes like fire, floods, droughts, and large scale wind events as well as the interrelation between life cycles and the human influence help form self regulated habitat variability. For example, Karuk People see the role of fire touching upon many aspects of their life. Fire caused by natural and human ignitions affects the distribution, abundance, composition, structure and morphology of trees, shrubs, forbs, and grasses (Skinner et al. 2006) which in turn can be beneficial or detrimental depending on habitat or resource needs and condition prior to disturbance.

Certain trees and shrubs utilize water more than others, fire affects this relationship (Fites et al. 2006). The distribution of forests, shrubs, and grasslands, affects the process of infiltration from precipitation and resultant levels of evaporation with how those plants utilized water (DeBano et al. 1998). The balance of water in and water out, leading to the amount of moisture in the soil and the quantity and quality of springs is influenced by fire (Biswell 1999:157).

In looking at areas that remain relatively untouched by fundamental changes in management philosophy, one can notice group populations of old growth conifer species combined with grasses being suppressed by many even aged tree species at the head of year round springs (For example, vegetation composition compared from 1930s to the present using Weislander maps, plot and photography data, See figure__ in Appendix___). These springs form and contribute to stream, creek, and river flow, which in turn provide habitat for numerous aquatic species (Vannote et al., 1980, Ziemer and Lisle 2001, Benda et al. 2001)

With the lack of frequent low intensity fire, the grasses die out and there are reduced evapo-transpiration rates in winter and spring potentially causing higher peak flows. The grasses become suppressed by an over abundance of deeper rooted even aged shrubs and trees that have higher evapo-transpiration rates in the summer and fall potentially causing reduced summer base flows (Biswell 1999). This voids the purpose of the old growth component which has the deepest root systems and holds water at the surface for constant release managing higher summer base flows. This is a phenomenon known as hydraulic redistribution (Brooks et al. 2002).

Densification of vegetation (Skinner 1995) sets the stage for less frequent high intensity fires which can at times remove the old growth component (Skinner et al. 2006) contributing to a perpetually flawed system. Fire affects the plants, which affect the water, which affects the fish, which affect terrestrial plants and animals, all of which the Karuk rely on for cultural perpetuity. Fire, as a gift from the Creator, is believed to be a healing agent capable of producing change to restore balance when respected, understood, and utilized in an appropriate natural/cultural context.

Karuk Tribal members and Departmental personnel hold information critical to the inter-workings of the natural environment. Natural Resources staff is working with Federal and State agency personnel, academia, and the interested public to ensure that the integrity of natural ecosystem processes and traditional values are incorporated into current and future management strategies within our area of influence.

Department of Natural Resources:

The Karuk Tribe Department of Natural Resources (Department) envisions this Eco-Cultural Resources Management Plan to serve as a long term adaptive management strategy for the protection, enhancement and utilization of cultural/natural resources (Berkes et al. 2000, Bormann et al. 1999). It is intended to outline Cultural Environmental Management Practices through the use of Traditional Ecological Knowledge and correlating Western Science. It will be used to direct the programmatic actions of the Karuk Tribe and guide the incorporation of cultural values and principles into the management of lands within and adjacent to the Karuk Aboriginal Territory.

Nearly all of the Karuk Aboriginal Territory is situated concurrent to the Klamath and Six Rivers National Forests (figure__). Past mining, grazing, and logging exploits as well as

other kinds of land uses or management practices have caused extensive unnatural disturbance to our forests and watersheds (Strittholt et al. 1999).

In 1992, the Chief of the Forest Service directed National Forests to apply ecosystem management defining it as the skillful integrated use of ecological knowledge at various scales to produce desired resource values, products, services, and conditions in ways that sustain the diversity and productivity of ecosystems (Robertson 1992).

The Forest Service was directed to restore and sustain ecological conditions for desired resource uses by protecting cultural, spiritual, aesthetic, and environmental resources and values. The challenge of that policy is to sustain natural systems that are diverse, productive, and resilient to short term stress, yet able to respond to long term change.

The Karuk vision of ecosystem management is one that is adaptive, holistic, and sustainable for people and place. Ecosystem management should take care of the land, addresses people's needs, use resources wisely, and practice ecologically balanced stewardship.

Ecosystem management is not a new concept to the Karuk Tribe of California. Traditional land uses have intertwined with natural ecosystems for thousands of years (Fredrickson 2004). Our cultural environmental management practices inherently sustain biodiversity by working with ecological processes and fostering habitat complexity which maintain populations of plants and animals by enhancing the productivity of forest, grassland, and aquatic ecosystems (Lake 2007).

Federal, State, and County Agencies have yet to aggressively address the unhealthy state of our aboriginal watersheds and affected Tribal Trust Resources as a byproduct of non-traditional management practices. Culturally significant resources at risk are: fisheries, sacred sites, traditional subsistence species, and other traditional resource uses. Our ancestral homeland is slowly being stripped of diversity by former and present activities that have depleted old growth forest characteristics, resulted in loss of grasslands and open canopies, decreased fisheries and water quality, habitat loss, as well as increased unnatural abundance and distribution of conifer and shrub species.

Logging disturbances and nearly a century of fire suppression policies (Klamath National Forest 1928), have established landscape conditions in which many are becoming increasingly destined to be incinerated by catastrophic wildfire events (Skinner et al. 2006). Other studies offer differing lines of evidence for the western Klamath Mountains (Odion et al. 2004), but these finding are contested (Creasy pers. com 2007). However these studies do not take traditional uses of fire into account when identifying and analyzing human induced impacts upon fire severity and occurrence data (Miller et al. 2009).

Ideally, collaborative decision making would achieve an open on going dialog for a heightened level of ecosystem restoration (DOI/USDA/Governors 2002). National Forest interaction with the Karuk Tribe at times has been confined to "we have notified the

Tribe and we have fulfilled our legal obligation" (see USDA Forest Service National Resource Guide to American Indians and Alaska Native Relations FS-600 1997 and Consultation with American Indians FSH 1509.13, 2004). Our desire is that Federal, State, and County agencies and organizations be actively receptive, so we can together collaboratively integrate our needs more completely through true and equal partnerships in planning, policy making, and forest management activities (Houde 2007).

As a sovereign first nation we are continuing to reinstate practices which preserve our belief systems and culture. The relationships we have with the land are guided by our elaborate religious traditional foundation (Kroeber and Gifford 1949, Kroeber and Barret 1960). We share our existence with plants, animals, fish, insects, and the land and waters. We are responsible for their wellbeing. Our ancestral landscapes overflow with stories and expressions from the past which remind us of who we are and direct us to implement sound traditional management practices in a traditional, yet contemporary context.

For thousands of years we have shaped the ecological condition within carefully observed natural processes and limits. Strictly enforced natural laws govern how the land should be cared for. Slow low-intensity traditionally set fires sustain multitudes of land management benefits. By the nature of our historic domain we enhance environmental processes to perpetuate natural adaptation and diversity. We modify habitats effecting the movement and selection of animals and we influence genetic structures through selective horticultural practices (Anderson 2005). We have continued to perform religious observances that help ensure the appropriate relationship between people, plants, the land, and the spirit world (Holmlund 2006).

The scientific community until recently dismissed the fact that indigenous people intentionally practiced conservation (Anderson 2005, World Wildlife Fund et al. 2000). Knowledge that tribal elders have acquired about the past, as well as contributions and observations made by the Karuk Department of Natural Resources are essential to gaining a better understanding of the dynamics of the Klamath Siskiyou Eco-region (Senos et al. 2006).

Information collected by Tribal programs can be used to identify, describe, monitor, and assess the cultural and physical conditions that help retain the dynamics and integrity of ecosystems. Oral histories and other ethnographic data are also useful in understanding the variables and safeguards that maintain and promote ecosystems over time (see Anderson 2005 and Lake 2007 with references therein). Without understanding the past and current ecological processes, Federal, State, and County land management policies will continue to be inadequate (Paustian et al. 1999).

As the second largest indigenous Tribe in California we have un-surrendered sovereign rights that provide for the specific protection and sustainability of our traditional uses and needs. As guardians of our ancestral land we are obligated to support practices that emphasize the interrelationships between the cultural elements and physical dimensions of ecosystems.

We support natural diversity as the key means of stabilizing the cultural and ecological components of natural forest, grassland, and aquatic ecosystems. We strongly adhere that recovery of ecological systems are the context for management and not just special or economic interests.

We believe that sustainable ecosystem land management incorporates the best information that is available including scientific, indigenous knowledge, and integrated adaptive management lessons. Adaptive management practices are a creditable and practical approach because management outcomes can be adjusted by implementation and effectiveness monitoring (Berkes et al. 2000, Bormann et al. 1999). Empirical and scientific evaluations can then be used to make adjustments as we better understand the best practices to apply over time accounting for uncertainty and change (Rieman et al. 2003).

In 1992 the Chief of the Forest Service stated that managers of wild-lands must be mindful that science as a tool can describe and address management problems but ultimately all managerial decisions are moral, not technical (Robertson 1992).

We have been entrusted to perpetuate our cultural heritage to recover and enhance our sacred natural resources and traditional uses within our Ancestral Homelands. It is our cultural and moral obligation as an indigenous sovereign nation to consider human and non-human needs of the environment.

Values:

The Karuk Tribe values the health and abundance of cultural/natural resources and balanced ecological processes that once thrived within our ancestral homelands. The sustainable interaction of the human influence on the environment is a value which has been overlooked by administrating agencies in the past (Anderson 2005, Lake 2007). This is the primary value of the Department and is in essence inclusive of everything natural.

Traditional views for the Karuk homeland are essentially fixed to sacred references and prevailing traditional uses (Gifford 1939/1940, Hillman and Salter 1997, Salter 2003, Lake 2007). An important cultural perspective is the role geographic configurations have on cultural practices and the Karuk World Renewal Religion (Kroeber and Gifford 1949). The way things originated and were created, sources of power, and the significance of natural features are all interwoven into the traditional cultural world views and practices.

The unwritten ordinances and practices of traditional ceremonial observances not only have a profound influence on cultural views, but also on how the natural environment was historically managed and should be managed today. This greatly differs from the current management approach of Federal, State, and County Agencies entrusted with the responsibility of sustaining natural resources upon which the Karuk depend.

Traditional subsistence uses; hunting, trapping and fishing, nut and seed harvesting, mushroom and berry gathering, medicinal plant gathering, the basketry-artisan materials, have all but diminished. The quality, quantity and accessibility of subsistence resources have however declined significantly. Of great importance to sustaining traditional subsistence is the reversal of trends leading to what has happened to native anadromous fishery reserves now nearly devastated and severely threatened (Lichatowich 1999, NRC 2008a).

The Karuk have continued to accentuate cultural stewardship concerns and maintain close connections with the land, resources, and sacred uses (Holmlund 2006). Tribal stewardship models can positively enhance the protection and restoration of cultural resources and traditional sacred uses as well as address many concerns and values of the general public.

Principles:

Karuk tradition states that everything in nature has a spirit and deserves the utmost respect preceding the actions of human influence upon nature. This belief structure is the foundation of the Traditional Ecological Knowledge of the Karuk People. All aspects of this document should reflect this principle and any management and/or utilization of resources directed and incorporated herein, correlate with the maintenance enhancement or restoration of cultural resources and ecological processes (Berkes 2000, Anderson 2005).

Non-traditional land management practices have failed to provide for the sustainable flow of resources and cultural uses across the ancestral landscape. The productivity of the anadromous fisheries and oak-dominated forests and grasslands, the axis of our cultural subsistence are now on the fringes of irretrievably.

"*Responsible stewardship maintains the flow of species, materials, and resources while conserving natural diversity and ecological processes within the margins and limits of natural functioning ecosystems. Indigenous stewardship principles are essentially conservation-restoration oriented by leaving something when taking something. Contemporary ecologists also recognize this concept also"* (Anderson 2005)

"*Ecological risk assessment fails ethically, scientifically, and practically whenever reasonable options for least-impact human behavior are not examined for their potential ecological benefits as well as potential ecological harms."* (O'Laughlin 2005)

"*One should not take any creature (plant or animal) without first providing it a healthy environment in which to live, and ample opportunity to reproduce"* (Karuk Tribal Member)

Ethical stewardship is fundamentally committed to promoting all the interrelated functions of healthy sustainable ecosystems. It takes into consideration the consequences of all the direct-indirect, short term-long term, and cumulative effects associated with the

environmental disturbances, hence managing for the unexpected, yet predicted. Based on the best available science and traditional ecological knowledge, adaptive management approaches can be developed as Tribal stewardship models take better care of the land (Berkes et al. 2000).

The *Karuk Module for the Main Stem Salmon River Watershed Analysis, Scoping of Tribal Issues for Karuk Aboriginal Territory* identifies ecosystem restoration objectives including the following elements with recent modifications for clarity:

- restoration of light to moderate underburns (frequent low to moderate intensity);
- enhancement or restoration of the land, water quality and fishery habitat;
- stabilization of plant communities and reversal of invasions, native or exotic;
- recovery of water infiltration and holding capacity of forest and grassland slopes;
- reduction of fire hazards and the risk of stand replacing catastrophic fires to humans, wildlife habitats, and ecosystem services;
- prevention of further species extinction or further threats to population viability;
- recovery of mature and old-growth trees (conifer, hardwood, and riparian) as general forest diversity; and
- Restoration of pre-contact plant composition and distribution patterns, and the animal communities which depend on them.

Specific management recommendations in the *Karuk Module for the Main Stem Salmon River Watershed Analysis* also suggested with recent modification;

- Reducing the rate of forest ecosystem change so opportunities by conservative or non-adventive species for slow evolutionary adaptation are not irretrievably lost.

- Thinning sub-dominant trees or ladder fuels should take priority over high grading in order to facilitate old growth restoration and provide habitat for micro climates (support restoration forestry over short-term economic profit).

- Avoid the further development of dense fuel ladders within fire prone areas. Widely spaced, uneven aged, mixed species forming diverse tree communities are part of the long term solution.

Adaptive management approaches undertaken by the Karuk Tribe will be effective because they incorporate local or Traditional Ecological Knowledge and Western Science that can be monitored and evaluated over time as well as adjusted appropriately when necessary at an appropriate scale, intensity and frequency (Berkes et al. 2000, Bormann et al. 1999).

Cultural management and experimental research practices that are tested and adaptive can lead to more predictable and manageable adjustments to landscape character while enhancing ecological processes (Berkes et al. 2000, Bormann et al. 1999, Paustin et al. 1999). The most ethical management practices should be rooted in applications that

develop from understanding of native reference systems that are feasible, yet account for future climate, environmental, or socio-cultural change (Anderson 2005).

As we integrate what is inherently fundamental to promoting our ecosystems we can apply measures (criteria and indicators) that help restore the functions and integrity of the natural resources that are presently vulnerable (The Montreal Process December 1999, 2nd ed., Karjala et al. 2004, Mater 2005). Adaptive management activities that work with ecosystem processes themselves or mimic their effects are generally the most ethical, sustainable, and culturally definitive.

Mission:

The mission of the Karuk Department of Natural Resources is to protect, promote, and preserve the cultural/natural resources and ecological processes upon which the Karuk People depends.

Authority, Laws and Policies Influencing Management Direction:

The National Environmental Policy Act of 1969 (NEPA), the Federal Land Policy and Management Act of 1976 (FLPMA), and the National Forest Management Act of 1976 (NFMA), require protection and enhancement of the environment, as well as coordination with other federal agencies, state and local governments, and Indian Tribes in the management of public lands. See Executive Order No. 13,175, "Consultation and Coordination with Indian Tribal Governments," 65 Fed. Reg. 67,249, 67,250 (Nov. 06, 2000) (Section 5 requires that agencies have a consultation process that ensures "meaningful and timely input by tribal officials").

Protection and preservation of historic, sacred, and traditional use areas of both indigenous and traditional peoples are dealt with in the National Historic Preservation Act of 1966 as amended in 1992 (NHPA), the Archaeological Resources Protection Act of 1979 (ARPA), and the Native American Graves Protection Act of 1990 (NAGPRA). These acts also mandate consultation with affected groups, as does legislation that reaffirms the right of religious freedom such as the American Indian Religious Freedom Act of 1978 (AIRFA). The Religious Freedom Restoration Act of 1997 (RFRA) and the Religious Land Use and Institutionalized Persons Act of 2000 (RLUIPA) provide that land use decisions that burden the free exercise of religion must be the least restrictive alternative to meet a legitimate public purpose.

Executive Order 13007 "Indian Sacred Sites", 61 Fed. Reg. 26,771 (May 24, 1996), provides for the protection of sacred sites and requires federal agencies to accommodate indigenous and traditional peoples' access to sacred sites and traditional use areas for ceremonial purposes. Executive Order 12,989 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" 59 Fed. Reg. 7,629, 7,632 (1994)(Section 6-608 specifically applies the order to federal Indian programs and tribal values) deals with federal actions to address environmental justice among minority and low income populations. "Federal agencies now manage their work

forces and the public lands under their jurisdiction using the guidelines of this legislation" (Raish et al. 1999:210-211).

Ironically, some of these legislative acts and policies have been in place for over a decade and have not adequately addressed the needs of the Karuk Tribe dependant upon the federally managed lands and waters, specifically the National Forests. Additionally, Secretarial Order No. 3206 "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (June 5, 1997), directs that federal agencies consult with American Indian Tribes over the management and recovery of threatened and endangered species. The Tribe believes that true and equal partnerships can and should be developed in the interest of ensuring adequate Tribal involvement in the management of cultural/natural resources and environmental processes.

American Indian Religious Freedom Restoration Act of 1978 (AIRFA)(42 U.S.C. § 1996); Executive Order No. 13007 "Indian Sacred Sites" (Date), 61 Fed. Reg. 26,771 (EO 13,007):

The purpose of AIRFA is to ensure that the guarantees of the First Amendment religion clauses protect the traditional religions of Indian peoples by requiring that all laws passed subsequent to its enactment take Indian peoples religious practices into consideration. 42 U.S.C. § 1996. The primary impact of this law is that federal land managers must include a tribal consultation policy in their management plans. Forest Service Manual, Chapter 1560 § 1563.01e (consultation for protection of tribal cultural resources and sacred sites).

Likewise, EO 13,007 provides that federal agencies must allow tribes access to sacred sites for ceremonial uses and avoid adversely affecting the physical integrity of sacred sites. The Executive Order defines sacred sites as "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe… as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion: provided that the tribe… has informed the agency of the existence of such a site." EO 13,007, Section 1(b)(iii). The proper procedure for carrying out the policy is adequate notice to Indian tribes followed by timely and effective consultation. Id. at Section 2.

Archeological Resources Protection Act of 1979 (ARPA) (16 U.S.C. §§ 470aa-mm)(36 C.F.R. Part 296):

The primary purpose of ARPA is to protect the physical integrity of archeological sites. ARPA provides criminal and civil penalties for injury, removal, attempted injury or removal, and trafficking of "archeological resources" taken without permission from federal "public lands", including lands within the National Forest System. Archeological resources include "any material remains of past human life or activities which are of archeological interest," that are at least 100 years old. Items of archeological interest are defined by a short non-exhaustive list in ARPA and in the federal regulations governing National Forest System lands. In addition, ARPA requires that if an ARPA permit to excavate an archeological site may result in harm to a tribal cultural or religious site then

the land manager must notify the affected Indian Tribe and provide consultation before the permit is issued.
ARPA is of critical importance to the Karuk Tribe because it provides both a civil and criminal enforcement mechanism to prevent the unpermitted removal or destruction of Karuk archeological sites. In conjunction with the NHPA, NAGPRA, AIRFA, RFRA, RLUIPA, and Executive Order 13,007, ARPA provides for a measured, if not perfect, level of enforceable protection for some of the Karuk Tribe's cultural and sacred resources on federal public lands.

Clean Air Act of 1963 (CAA) (42 U.S.C. §§ 7401 to 7671q); Tribal Clean Air Act Authority (40 C.F.R., Part 49):

The CAA allows for Indian tribes to exercise regulatory air quality authority over lands approved under a Tribal Implementation Plan. The Tribe has not applied for Treatment as a State under the CAA and is not currently applying jurisdictional authority through the Tribal Authority Rule.

The Karuk Tribe's restoration of traditional management practices may require some variance from the National Ambient Air Quality Standards of the CAA. However, the Tribe can reduce the regional and global air quality effects from wildland fires over time. Large scale fires are becoming more of a concern, yet, these fires are exempt from the CAA. By restoring the traditional human influenced natural fire regime, the natural background for smoke emissions in our area of influence can be restored because fuels available for fire will be reduced and far fewer mature stands will burn at high intensity.

Clean Water Act of 1977 (CWA) (33 U.S.C. §§ 1251 to 1387):

The CWA is intended to regulate discharges of pollutants into the waters of the United States and to prevent degradation and spoiling of water sources from point and non-point contaminants. The CWA applies to all waters including those serving as sources of drinking water and wildlife or fisheries habitat.

The CWA is of primary importance to the Karuk Tribe as it pertains to terrestrial (land) and aquatic (water) conditions affecting the chemical, physical, and biological integrity of water for consumption, cleansing/purification, ceremonial, and subsistence uses or those resources affected by water quality and quantity.

Endangered Species Act of 1973 (ESA) (16 U.S.C. §§ 1531 to 1544):

The ESA is intended to ensure the protection of threatened and endangered species from undue impacts or local extinctions resulting from human activities. The Karuk Tribe believes that the ESA is a noble attempt to protect and preserve critical ecosystem components, yet we are concerned that it has become misguided by managerial policies at the agency level.

The Karuk Tribe believes that in order to meet the intent of the ESA, the current direction of compliance needs to change slightly. For example, instead of locating Northern Spotted Owl nesting sites and limiting managerial activity within a quarter mile radius, or 70 acre nest core, these areas need to be identified and all correlating habitats and connectivity for the owl and its food base needs to be restored (Franklin et al. 2000). The main concerns would be to ensure the nesting and roosting trees are not disturbed during project implementation or by high intensity fire, while accounting for other species and situations (Bond et al. 2002). This will ensure the short term impact does not outweigh the long term benefit, and protect from taking no short term action (such as foregoing controlled burns and/or other fuel reduction practices) that results in detrimental long term effects (such as high intensity wildfires).

The clarification of responsibilities offered by the Secretaries of the Departments of Interior and Commerce in Secretarial Order No. 3,206: "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (June 5, 1997) provides that actions taken under the authority of the ESA that affect or may affect Indian lands, tribal trust resources, or the ability of Indian tribes to exercise their rights should be implemented in a manner that avoids placing a disproportionate burden for the conservation of listed species on Indian tribes. The Secretarial Order expressly acknowledges the trust responsibility and treaty obligations of the United State to tribes and tribal members and directs that agency actions taken to conserve and manage listed species that may affect tribes must be done through consultation in accordance with the government-to-government relationship.

Indian Self-Determination and Education Assistance Act of 1975 (ISDEA) (25 U.S.C. § 450 et seq.); Executive Order 13,175 "Consultation and Coordination with Indian Tribal Governments" (Nov. 6, 2000), 65 Fed. Reg. 67,249 (EO 13,175):

The ISDEA, guides Indian self-determination and is the cornerstone of the federal relationship with sovereign tribal governments. Self-determination contracts, grants, cooperative agreements and self-governance compact agreements are authorized by the ISDEA. These agreements between the Federal Government and Indian tribes and tribal organizations allow the tribes, rather than federal employees, to operate the federal programs. The self-determination agreements generally cover individual programs or sets of interrelated programs. The self-governance agreements cover a wider range of federal programs and the tribes have more flexibility to redesign the programs and adjust funding to meet changing needs without amending the compact agreement. Major amendments include: the Tribal Self-Governance Demonstration Act of 1988 (Pub.L. 100-472) providing tribes control, decision making authority and funding for federal programs, services functions, and activities; and the Tribal Self-Governance Act of 1994 (Pub.L. 103-413) that established a demonstration program and authorization for tribes to continue self-governance.

In a similar vein, EO 13,175 provides guidance to establish consultation and collaboration with tribal officials in the development of federal policies with tribal implications. This is intended to strengthen the government-to-government relationship

with Indian tribes, and to reduce the imposition of unfunded mandates upon American Indian tribes.

Native American Grave Protection and Repatriation Act of 1990 (NAGPRA) (25 U.S.C. §§ 3000 to 3013) (18 U.S.C. § 1170):

NAGPRA requires that federal agencies repatriate cultural property that is stored in collections or that is discovered on federal land when a claim is brought by the associated Indian tribe. Cultural property includes American Indian human remains, associated funerary objects, unassociated funerary objects, sacred objects, and cultural patrimony. NAGPRA provides civil penalties for failing to repatriate in a timely manner and criminal penalties for trafficking in American Indian human remains and cultural property without permission granted pursuant to NAGPRA. The Karuk Department of Natural Resources will consult with the Tribal NAGPRA coordinator or their representative to identify department specific repatriation needs.

National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. §§ 4321 to 4370f); Executive Order No. 12,898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (Feb. 16, 1994), 59 Fed. Reg. 7,629 (EO 12,898):

The NEPA requires an analysis of potential negative effects to the human environment, prior to implementation of any federal undertaking. NEPA also provides a good foundation for planning potential restoration activities. Although formats and policies relating to NEPA differ between Federal Agencies, the Karuk Tribe believes that programmatic compliance documents can be developed in the interest of achieving watershed scale restoration efforts while meeting the intent of NEPA consistent with the environmental justice mandates of EO 12,898. See also Forest Service Manual 1500, Chapter 1560, § 1563.01b (consultation with tribes for forest planning and management).

National Fire Plan (2000):

The National Fire Plan is made up of five documents developed by different Administrations and State and Federal entities, (1) Clinton Administration September 2000 Report, (2) 2001 Interior Appropriations Bill, (3) USDA Forest Service Cohesive Strategy, (4) 10 Year Comprehensive Strategy, and (5) Bush Administration Healthy Forest Initiative. The two documents that cover all eight of the Natural Fire Plan goals are the Clinton Administration September 2000 Report, and the 10-year Comprehensive Strategy. The National Fire Plan Goals are to; improve fire suppression efforts, restore fire adapted ecosystems, reduce fire risk, prioritize treatment areas, promote local economic development, comply with environmental laws, utilize collaborative efforts and increase accountability.

The Karuk Tribe's strategy is to restore natural fire regimes through the reduction of fire risk at the landscape scale by minimizing hazardous fuel accumulations, and suppressing fires in untreated areas, utilizing collaborative efforts to prioritize treatment areas,

comply with environmental laws, promote local economic development and increase accountability while reducing, or at least balancing the cost to the taxpayer over time.

The National Fire Plan and all of its components are a stepping stone for the restoration of Karuk Cultural Environmental Management Practices within the Karuk Aboriginal Territory. If annual appropriations can be secured, an opportunity for managing upland resources in a manner consistent with our heritage will be possible. This approach will help weave our past, present, and future into a design symbolizing Karuk People as an integral component of the natural environment. This will enable us to once again uphold our responsibility to assist nature in its processes on a scale consistent with environmental needs, while providing for the wellbeing of people, resources, and for future generations.

National Historic Preservation Act of 1966 (NHPA) (16 U.S.C. § 470 et seq.); Section 106 Regulations (36 C.F.R. Part 800)

The NHPA is intended to preserve the cultural and historical legacy of the United States for the benefit of future generations. The NHPA requires that the affected Indian tribe be consulted when a federal undertaking may affect a property of "traditional religious and cultural importance to [that] tribe" that is eligible for inclusion in the National Register. The Section 106 Regulations provide that the federal agency and the State Historic Preservation Officer must engage the affected tribe in timely and meaningful consultation in order to resolve the adverse effects of the undertaking.

The NHPA is important to the Karuk Tribe because it provides the Tribe with an opportunity through consultation to protect, or mitigate harm to, cultural resources located on federal public lands. In conjunction with the ARPA, NAGPRA, AIRFA, RFRA, RLUIPA, and Executive Order 13,007, the NHPA provides a method of procedural protection for the Tribe's cultural resources.

The Karuk Tribe is applying for NPS THPO designation and funding. Once granted the Karuk THPO will be responsible for NHPA Section 106 and other regulations. The THPO will receive and manage archaeological site records for the Karuk Aboriginal Territory, as well as advise and assist agencies and Tribal departments in the identification and preservation of cultural resources within the Karuk area of interest.

National Indian Forest Resource Management Act of 1990 (NIFRMA) (25 U.S.C. §§ 3101-3120):

The NIRFMA was designed to provide Indian tribes with more active control over the management of their forests by clarifying the objectives and standards associated with the management of American Indian forest lands. The NIRFMA provides authorization of appropriations for the protection, conservation, utilization, management, and enhancement of Indian forest lands. The act also addresses: Indian forest land management, forest and timber trespass on Indian lands (including civil penalties enforceable by tribes), program assessment, support of tribal forestry programs, and

cooperative agreements with tribes to facilitate natural resource planning, education, job training, and land and facility improvements.

The Tribe believes that updates to the NIFRMA should include provisions for direct appropriations, agreements, contracts or other authorities for planning and implementation of programs/projects adjacent to Indian forest lands as outlined in Integrated Resource Management Plans to further meet the intent of the Tribal Forest Protection Act.

Religious Freedom Restoration Act of 1997 (RFRA) (42 U.S.C. §§ 2000bb-1 through 2000bb-4) and Religious Land Use and Institutionalized Persons Act of 2000 (RLUIPA) (42 U.S.C. § 2000cc):

RFRA requires that federal actions resulting in a substantial burden on the free exercise of religion must be the least restrictive means to achieve a compelling governmental interest. RLUIPA provides that the use of real property for religious purposes is a religious exercise protected by RFRA. The Karuk Tribe believes that both statutes afford valuable protection to cultural resources and religious activities that are of great importance to the health, well being and sovereignty of the Karuk Tribe and its members.

Tribal Forest Protection Act of 2004 (TFPA) (25 U.S.C. §§ 3101 Note and 3115a):

The TFPA provides opportunity to complete collaborative stewardship work on and adjacent to tribal trust lands through agreements or contracts. It provides for the protection of trust lands and tribal interests from fires, insects, disease and other threats or are in need of restoration. It also provides for the defining of adjacent to be determined locally. The Karuk Tribe believes that this can be implemented through Tribal/Interagency partnerships that provide for an integrated working relationship in the planning and implementation of watershed scale restoration efforts throughout the Karuk Aboriginal Territory.

Traditional Laws Governing Land Management Practices:

Protocol:

All activities should be conducted with respect and reciprocity. Individuals should be mindful of whose traditional use area they may be harvesting in and/or the site's accessibility and potential use by elders, ceremonial leaders and practitioners.

Usufruct rights should be acknowledged when and where applicable.

Engage in ceremonial or subsistence harvest before pursuing commercial harvesting.

Take only the amount of the resource that can be used, shared, traded and processed without creating unnecessary waste. A two year supply is customary and in some cases not considered in excess when upholding traditional subsistence harvesting techniques.

Ceremonial information will remain unwritten; this is a provision for maintaining Tribal proprietary ownership through traditional oral transmission of key managerial and definitely ceremonial points.

Regulations developed regarding species harvested should be classified as ceremonial, subsistence, or commercial. Generally, any terrestrial animal shall not be harmed, or killed without intentions for ceremonial or subsistence use, and plant products should only be commercial when sustainable collection can occur beyond the level of subsistence, utilitarian and ceremonial use.

The following subsections are examples to serve as guidance in the formulation of future regulations and ordinances. Oral transmission of traditional information includes but is not limited to:

Hunting:

Elk and deer should not be hunted during mating, birthing or rearing of young. Selective hunting of individuals is dependant upon the herd size and age/sex composition. Barren does and cows may be minimally taken during this time when and if readily identifiable. Generally, only those that have had an ample chance to reproduce should be hunted, however historically, the occasional yearling was hunted in specific cases when conditions restricted access to hunting grounds. Hunting regulations for all subsistence species should be developed and enforced in accordance with this principal harvest practice.

"When I was young, I would walk over to the back side of East Peak with my uncle and pass three point bucks all day, they weren't afraid. We would get to the family hunting area and wait for the old buck, they are the most tender… they lived a long life. We would build a blind and wait near the lick. The big one would come in last. Now people shoot them before they can breed." (Harold Tripp, Karuk Tribal Member).

Harvesting of ceremonial species should be allowed and based on unwritten ceremonial principal and practice passed from ceremonial leaders by oral transmission. It is important that if species are harvested for ceremonial regalia they be allowed to dance or otherwise be a part of the ceremony intended, and not be harvested for commercial or subsistence purposes.

Animal species such as porcupines which are utilized for basketry materials (O'Neale 1995) should not be killed but captured with quills being removed by non-lethal methods.
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Fishing:

Salmon harvesting should not occur until a minimum of 20 days after the new moon in April/May, or the end of the Salmon Ceremony at Ammaikiarram. After this time, Ikes falls downriver should be considered fishable for Salmon. Following the July moon, or

the salmon ceremony at Inam, Ishi Pishi Falls upriver should be considered fishable. When Spring Salmon reach the shoots of Wooley Creek the lower Salmon River and the shoots are considered fishable. (Until Spring Salmon populations recover in Wooley Creek, there should be no Spring Salmon fishing in the lower Salmon River or Wooley Creek).

Steelhead shall not be harvested until after the new moon in September or otherwise opened by ceremonial leaders at Katimiin and should stop after the new moon in April. No Salmon or Steelhead fishing shall be conducted from the top of Ike's Falls to the bottom of Ishi Pishi Falls at any time.

Sturgeon shall not be harvested above the rock at the mouth of the Salmon River. Any sturgeon parts not utilized by subsistence or ceremonial fishermen should be discarded above this rock to ensure their spirit will always return to the spawning grounds. Sturgeon harvesting can begin after the little frogs by the creeks (Pacific Tree Frog) begin to sing in the spring (personal communications Brian Tripp and Josh Saxon).

Pacific Lamprey (eels) can be harvested during upstream migration. In river fishing for lamprey can begin after the dogwoods bloom and extend throughout the migration. Gooseberry brush or live oak sprouts (or other vegetation) can be utilized when needed to force the run into fishable channels. This temporary barrier shall be removed nightly to allow for unimpeded passage for spawning populations. All fishing practices should allow for purposefully allowed passage throughout each fishing period.

Gathering:

Acorns should be gathered in the fall. Acorns infested with larvae generally fall with the first rains or significant wind event. Whenever possible these acorns should be burned on a pile where edible mushrooms do not grow. This will reduce the infestation of the stand for the following year while ensuring mycelium connectivity for nutrient transfer and mushroom consumption.

Berries and nuts should not be completely harvested from a site or off vegetation to allow some to remain for others (human and wildlife) and for propagation. Pruning or coppicing following berry or nut harvesting should be employed to remove older dead or less productive stems and stimulate future fruit production and/or use quality.

Indian potatoes (*Brodiaea* spp., *Dichelostemma* spp. *Triteleia* spp. *Calochortus* spp., *Lilium* spp., *Fritillaria* spp., etc.) shall be harvested prior to flowering and after seeds have ripened. Some larger bulbs, and smaller cormlets or scales shall be left in the tilled soil after harvesting. Seeds should be dispersed across the harvest site where appropriate (See Anderson 2005).

Mushrooms should not be over harvested from a particular gathering area, cutting of stocks to keep root systems intact is preferred and raking to remove litter and duff is discouraged. Veils should be allowed to open and larger older rotting tanoak/matsutake

caps may be broken up and scattered around to foster spore dispersal. Some stock bases and body parts of oyster and Hericiums should be left in the log or snag for re-growth and spore dispersal. Most mushroom species reproduce better when subsurface root systems remain intact (see Richards and Creasy 1996, Pilz and Molina 1996, Richards 1997).

Medicines:

Harvesting of leaves, bark, roots, or other plant parts should enhance growth and shall not decrease more than 50% of the rooted population at the site. For rhizominous species, as Prince's Pine and Oregon grape, harvesting should be done on the younger non-flowering/seeding stems, favoring the retention of older deeper rooted individuals. Spring harvesting of leaves and shoots shall be done in a manner which retains some live material to foster re-growth and/or seedling establishment.

Materials:

Harvesting of plant materials shall be consistent with established traditional cultural practices. Different plants may be harvested at different seasons for different purposes. Maple bark should be harvested from only one-third of the tree. Alder bark should be harvested in a manner that does not girdle and kill the tree.

Shoots of shrubs (mock orange, ocean spray, service berry, elder berry, etc.) should be harvested in the fall or winter when tops are dormant and before spring bud formation or sap flow.

Hazel shoots used for basketry should be harvested in the spring for peeled sticks or winter for bark-on sticks. Willow should be harvested in spring during leaf emergence for bark peeling or late summer after growth while the bark can still peel, or winter when shoots are leafless for "bark on" shoots. Willow roots can be harvest at any time.

Management Plan Organizational Approach:

Each Department of Natural Resources Program is organized into individual sections with an introduction, resources concerns, goals, and objectives, followed by the historical, current and future desired conditions. Further integration, planning, and prioritization of Departmental programs and projects will be organizationally scaled from Hydrologic Unit Compartments (HUCs), to comprise appropriate landscape level planning areas. Vegetation/soil and habitat types, as well as slope aspect, elevation range, and management indicators should be considered. Key ecological processes (fire, hydrology, nutrient cycling, etc.) will be addressed as applicable.

DNR Programs:

Air Quality:

The Karuk Air Quality Monitoring Program was established in 1999 in the interest of documenting levels of particulate matter of 10 microns or less in order to quantify the effects of smoke on our local communities. Though this monitoring effort is no longer funded, monitoring equipment should when possible be utilized to monitor local smoke levels in the interest of enabling cultural and prescribed burning activities during times of atmospheric stability. Air quality on the coast and inland valleys can trigger no burn days in the Aboriginal Territory when air shed conditions are actually conducive of burning activities. These potential burn days should not be affected by the national ambient air quality standards when wildland fire events exceed the annual standards. Burn day determinations should instead be based on allowable levels under daily standards with short term trigger points developed to halt burning operations and allow additional burn days to be balanced out in the interest of mitigating health related smoke impacts.

Until the Tribe chooses to develop a Tribal Implementation Plan (TIP) and exercise the Tribal Authority Rule, burn day coordination should be in partnership with the North Coast Unified Air Quality Management District for areas south of Dillon Creek, and with Siskiyou County Air Resources Control Board for areas north of Dillon Creek.

Air quality management should consider the balance of natural background smoke emissions including that of the human interacted natural fire regime of territorial watersheds. Current conditions during wildland fire situations can adversely effect human health and/ public and firefighter safety. Short term effects that help to provide for long term benefits should be considered when restoring fire adapted ecosystems. Actions such as suppressing a fire in the summer and initiating burns on potentially effected ridge systems in the late fall or winter is one scenario that may help to restore the condition class(s) conducive of natural fire regime(s).

Resource Concerns:

Resources affected by the increase in particulate generation from wildland fires range from recreation to human health at the micro to regional scales and may have global implications. Based upon historical level of landscape level burning and resultant emissions it is understood that there will be a necessary tradeoff between dealing with a smaller portion of smoke associated with annual prescribe burns versus that of catastrophic wildfire resulting in large scale higher emission levels (Stephens et al. 2007).

Traditionally, tanoak acorn management utilizes smoke to reduce insect populations and increase the quality and quantity of this staple food source (Klamath River Jack 1916 in Anderson 2005:146). Smoke is utilized for many things both sacred and utilitarian. The free use to practice our traditional, sacred, and utilitarian management practices unimpeded is of great concern as policies are developed with no knowledge, understanding, or reference of these uses being considered.

Goals:

Protect the local communities within and adjacent to the Karuk Aboriginal Territory from long term exposure to high levels of particulate matter. Promote the appropriate use of management ignited fire and pre-burn fuels treatments. Enhance the quality and quantity of cultural resources. Restore fire related natural disturbance regimes and associated natural background smoke emissions.

Objectives:

Monitor particulate matter levels in the interest of quantifying affects to air quality from cultural burns, prescribed fires and wildland fires with and without pre-burn fuels treatments within the Karuk Aboriginal Territory. Work collaboratively with Tribal Clinics to make available portable indoor air treatment devises to the elderly, asthmatic, and children by prescription during periods of long term exposure of high particulate levels from large wildland fire events. Assist in the planning, development and implementation of fuels reductions, utilization of low intensity cultural, prescribed burning, and wildland fire suppression/reintroduction practices. Justify the need for restoration of human interacted natural fire regimes. Utilize biomass for purposes other than pile burning whenever possible, practical, feasible and/or appropriate.

Historical:

Air quality was affected by fires which resulted in there being longer periods of smoke present in local air sheds, with lower particulate concentrations (Stephens et al. 2007). Fire suppression policies implemented in the 1920's and 30's through current times, has removed the human influence on particulate generation from natural disturbances (Klamath National Forest 1928).

Large scale burning practices occurred as part of Karuk World Renewal Ceremonies (Kroeber and Gifford 1949). The Tribe has been attempting to reinstate this practice which should occur every September. Many other traditional use resources have been historically burned at the appropriate time and condition to improve access, quantity and quality of such resources. In more recent years a decision notice was signed that stated the Tribe and Forest Service would work together to work towards this goal. However, policy makers, inadequate working relationships, lack of institutional knowledge, and simple misunderstandings have hampered this process.

Current:

Sources of particulate affecting air quality come from home wood stoves, fire places and, door yard burning during the fall, winter and spring. Additional particulates are generated from limited prescribe burning during the fall and spring. Dirt roads contribute minimally. Lastly, arson, lightning and the increasingly frequent uncharacteristically intense wildland fire, pulses concentrated amounts of particulate matter over large areas during inversions and low wind movement conditions occurring during the summer and

fall (see Blue Sky/RAINS smoke dispersion models). No official emissions inventory has been conducted for the Karuk Aboriginal Territory, but may be included in regional air quality studies (Riebau et al. 2006).

Fuels reduction crews burn piles throughout the fall winter and spring. The Tribe, Forest Service and local community groups conduct burns at varying scales. Smoke management plan development has become an integral part of project level planning (Sandberg et al. 2002, Sandberg and Dost 1990).

Future Desired Conditions:

Longer time periods of exposure to lower concentrations of particulate matter resulting from frequent low intensity prescribed burning and associated fuels treatments during all seasons of the year is desired (Ferguson et al. 2003, McKenzie et al. 2006). This should systematically ensure shorter time periods of exposure to highly dangerous concentrations of particulates resulting from catastrophic fire during the summer and early fall.

The condition class of our ancestral watersheds should be restored to the point that in season lightning fires could burn at relatively low intensity for long periods of time without generating particulate levels that are a threat to human health. Interagency recognition of this concept in policy development and local implementation of this long term strategy could stabilize, if not reduce the ever increasing costs of fire suppression by today's standards.

Traditional cultural burning practices at all scales would be implemented perpetuating balanced ecological processes with greater understanding and support by the entire nation if not the world.

Cultural Resources:

Cultural Resources has been a core program since the Department's inception. Its primary purpose is to ensure cultural perspectives are not only incorporated into every aspect of departmental management practices, but to protect culturally sensitive resources from the management actions of local agencies, organizations and community groups.

The Klamath-Siskiyou Mountains that encompass the ancestral homelands of the Karuk are the most floristically and geologically diverse in the western United States (DellaSala et al. 1999). Natural influences of adjacent geographic provinces, the climate, and the unique geologic, biological, and botanical environments all contribute to the remarkable diversity of the Klamath Siskiyou Mountain province (Whittaker 1960) to which the Karuk culture adapted and evolved with over thousands of years (Fredrickson 2004).

Many federal land management practices have failed to adequately protect cultural resources. Many sacred sites have been decimated (Holmlund 2006). The primary ceremonial lands; Panamaniik, Katimiin, Aamaikiaraam, Helkau, and Inam, as

physiographic cultural settings all have experienced major disturbances from mining, logging (Jewett 2007), road construction, fire exclusion and suppression, fire salvage recovery, and recreational uses (Crosby 1977, Halford 2001, Hanes n.d.). Forest uses overall have negatively affected many sacred, traditional, contemporary, or cultural use areas, values and resources.

Across native territories there has been wide scale destruction to archaeological resources consistent with looting-vandalism and unearthing of burial remains. This started as deliberate destruction of aboriginal villages in 1850 by miners followed by a century of pilferages from the public as well as the deliberate and inadvertent disturbances from logging, road building, fire suppression, fire salvage activities, and public uses. Many significant Karuk cultural artifacts, ceremonial and utilitarian, have been removed from the area as the result of thievery, sale, deterioration, and disposal.

Resource Concerns:

Culturally significant resources are not simply artifacts and anthropological histories. They encompass a wide range of physical, social and spiritual characteristics. The physical resources include, but are not limited to food resources such as deer, elk, salmon, lamprey eels, acorns, berries, and mushrooms. Village sites, artifacts and ceremonial landscapes are also part of the physical characteristics of cultural resources, may also be referred to as "traditional cultural properties" (Banks et al. 2000). Trade routes and gathering areas for these food sources, herbal medicines and utilitarian resources such as basketry, cordage, and/or tool development and the correlating managerial use and availability of these resources compose the bridge between the physical, spiritual and socio-cultural resources of concern.

Karuk ethno-botany is more representative of grassland and mixed hardwood-conifer forests than conifer dominated forests (Davis and Hendryx 2004, Schenck, and Gifford. 1952). Restoring the diversified tanoak, black oak, madrone and other hardwood component that has been affected by past management practices is important to retrieving forested stand dynamics and ecosystem function. Ecological diversity and processes are also important for the perpetuation of subsistence food resources, medicines, and materials critical to maintaining the integrity of Karuk Culture.

The spiritual characteristics of these culturally significant resources incorporate the need for the human influence in management for the perpetuation of cultural resources, practices and knowledge base necessary to maintain Karuk Culture. The spiritual nature behind cultural resources not only validates the cultural principle that humans are the stewards of natural processes, but shows that everything in nature is at some level a significant cultural resource (Holmlund 2006).

Goals:

Protect artifacts and culturally significant sites from the undue impacts of agency, organization, community group, or private landowner ground disturbing management

actions. Promote sound management practices that reflect Karuk ecological/cultural principles at the watershed scale. Enhance the traditional knowledge base of our local youth, Tribal members, and employees. Restore human interacted natural disturbance regimes.

Objectives:

Work with agency, organizations, and community groups to monitor ground disturbing activities to ensure protection restoration or enhancement of cultural resources. Plan projects and ensure they are implemented in a manner that assists and/or enhances natural processes. Work with agencies, Tribal staff, schools, and the local workforce to educate current and future restoration planners, workers, teachers and agency/review personnel in the understanding of cultural management principles. Support the maintenance and restoration of Karuk language, ceremonies, and other cultural practices such as prescribe burning, hunting, fishing, gathering, basket and regalia making and other traditional arts. Support and foster a working relationship with other Tribal programs necessary to implement the goals of the Cultural Resources Program.

Historical:

Karuk cultural resources were managed, utilized and traded at the individual, family, and village scales, as well as with adjacent Tribes and tribal members (Kroeber 1976). Intermarriage, trade, ceremonial and subsistence activities influenced the acquisition, ownership, use and exchange of many cultural resources.

Following European contact, genocide, forced removal, destruction of village sites and ceremonial areas, denied access to and use of subsistence resources, followed by policies essentially outlawing Native American ceremonial and cultural practices (burning, gathering, hunting, and fishing), forced assimilation, poverty, boarding school experiences, alcohol and drug addictions, and reduced abundance, as well as access to and inadequate maintenance of cultural resources, have all contributed to the degradation of health and livelihood of Karuk Tribal members and descendants.

Current:

Many activities which support cultural resources are now limited or practiced less for the above mentioned historical reasons. Current activities which specifically maintain, restore or enhance cultural resources include but are not limited to, language and basketry classes in Yreka, Happy Camp, and Orleans. Annual language and basketry workshops and meetings are conducted. Individuals and families who still conduct subsistence and ceremonial harvesting of wildlife, fish, plant and mushroom species, or make regalia and Tribal art/utilitarian materials, help maintain the sacred need for cultural resources and help to perpetuate cultural integrity.

Traditional ceremonies are practiced at their relevant locations throughout the Karuk Aboriginal Territory. These help guide Karuk managerial practices and are the foundation of cultural principal. The Cultural Resources Program helps to bridge the gap between traditional principal and managerial practice through program development, and agency consultation, coordination, and partnership development.

Future Desired Conditions:

The future of Cultural Resource use and maintenance should be that of those living in and/or those families historically residing within individual watersheds or other identifiable use area(s) assisting with the management of the local ecosystem processes. Traditional management principles backed by natural laws and cultural awareness is a vital component of cultural resource management.

The Karuk Tribe believes that localized management for the abundance and diversity of cultural/natural resources will help to ensure Karuk Culture will remain intact. The Tribe would also like to receive recognition from Federal, State, County Agencies and local communities that Karuk traditional management practices and principles should be incorporated and applied across all, policy, regulatory, managerial and social infrastructural development within and adjacent to, or otherwise affecting the Karuk Aboriginal Territory.

Restored ancestral practices of burning, harvesting, hunting, fishing, gathering and/or freedom to practice our religion and subside upon nature cannot occur at an adequate scale until cultural resource management occurs in the form of tribally driven human interacted natural disturbance regime restoration (Holmlund 2006, Stercho 2006).

Sustainable Energy Resource Use:

The vision of the Karuk Tribe Energy Program is to strengthen sovereignty through energy self-reliance while maintaining cultural and ecological values. The sustainable use of energy resources has many direct and indirect benefits to the Tribe and globally. The responsible use of energy can have broad implications throughout many disciplines. Many aspects of other programs within the department could be coordinated to improve energy efficiency and conservation. Common tribal or local community conceptions of energy could include; heating/cooling and transportation/commerce.

However, the consumption of energy can impact many aspects of our daily lives. There are many applications of improving energy efficiency. For example, improving building codes (green building), food security (increasing reliance on local food products), implementing reduce, reuse, recycle principles, personal behavior modification activities (turning off extra lights, and using blankets or sweaters), plus many additional steps to reduce energy consumption. To achieve energy sovereignty the Karuk Tribe strives

towards a multi-disciplinary approach to reduce energy expenditures and reliance on outside energy sources.

Resource Concerns:

The rural setting of Karuk Aboriginal Territory of western Siskiyou, northeastern Humboldt counties, and southern Oregon generally lacks effective Federal, State, and County infrastructure to support most "Renewable/Green Energy" enterprises such as biomass utilization for energy production.
In 2008, the Tribe completed a Strategic Energy Plan and Energy Options Analysis. The assessment quantified the current and projected energy demands for tribal structures and assessed the potential for renewable energy generation and possible export of excess energy resources. The study identified the Tribal community as having a dependence on imported non-renewable energy resources. Dependence on external non-renewable energy is not sustainable and could have significant financial impacts due to global market instability. The ability of global markets to impact the Tribe diminishes Tribal sovereignty self determination.

The geographic isolation of portions of Karuk Aboriginal Territory contributes additional challenges to developing energy independence. Limited economic opportunities constrain the Karuk Tribe's ability to expand feasible renewable energy resource projects (Energy Plan, 2008).

Goals:

Promote energy resource independence and socio-economic wellbeing within the Karuk Aboriginal Territory. Utilize energy resources efficiently and in a manner that does not degrade or contaminate the environment for future generations. Enhance economic, health, and food security for tribal and local residents within the Karuk Aboriginal Territory.

Objectives:

Establish tribal policies and procedures that reduce energy consumption and increase the use of renewable energy resources to provide diverse economic opportunities. Coordinate with Tribes, Federal and State Agencies, Nongovernmental Organizations, and Community Groups to achieve energy sovereignty within the Karuk Aboriginal Territory. Implement energy projects that manage, and conserve natural resources in an ecologically sound manner.

Historical:

Human labor was the main energy source to procure resources prior to the introduction of goods brought and/or traded by Euro-American settlement. Houses were geographical located to receive solar radiation, and constructed in the soil as semi-subterranean structures with stone paving (Bright 1978) that moderated housing temperature extremes.

Construction materials consisted of wood, rock, and other naturally collected materials. The daily collection of fuel wood for heating and cooking served to supply the needs of Karuk households. Passive solar (i.e. drying) and smoking to dehydrate vegetables, berries, and to cure meats was used for food preservation. Some foods were stored in cold water springs to reduce spoiling.

Energetically effective transportation consisted of walking along trails or uses canoes along rivers. Procurement of foods was local with some dependency on trade with adjacent tribes for outside resources. Latter with the introduction of horses and mules, these pack animals were used for transportation of goods, services and people.

Current:

The tribal government is dependent on non-local energy sources (Energy Plan) and is predominately served by the electric grid as well as propane, kerosene, gasoline and diesel delivery. Currently, tribal homes and offices are under insulated, have inadequate ventilation, and have out-dated appliances (Energy Plan 2008). Weatherization of homes and structures by improving the insulation capacity can be the most effective way to reduce energy waste. Installing or up-grading insulation, windows or energy star appliances can reduce the amount of energy needs and reduce cost. Conventional fuels (propane, kerosene, gasoline, etc.) and firewood are the primary resources for heating and household needs that are utilized in most Karuk family homes and offices. Access to a consistent and reliable energy supply that reduces the amount of fossil fuels or mechanized equipment is desired.

Predominately, tribal homes have electric grid access, however, homes without electricity primarily use generators. Fewer households use alternative energy sources, e.g. micro-hydro and solar. Protection and continuance of in-stream flows, aquatic species are the primary consideration for implementing micro-hydro systems (e.g. Pelten Wheel). Micro-hydro installations above anadromous fisheries with effective screens and water return systems can be effective mitigation practices that reduce the impact of harnessing this energy source. Protection of and continuance of in-stream flows, fish, and amphibians should be implemented.

Currently, the use of bio-mass/cogeneration is not economically feasible. In the future, utilization of forest landscape restoration bi-products or non-timber vegetation would be an ideal energy resource due to geographic proximity and abundance. There is a need for the development of localized infrastructure to facilitate the cost effective utilization of this potential energy resource.

Firewood utilization is the primary method of heating throughout the Karuk Aboriginal Territory. Access to firewood is sometimes made available through strategic hazardous fuels treatment, logging, and restoration activities. In some portions of the Karuk Aboriginal Territory federal rules and regulations prohibit the cutting of standing dead (snags) for firewood. Recent attempts at getting standing dead firewood collection authorized as a means of reducing the workload of future wildland fire management efforts have failed.

There are adequate solar resources for both residential and community scale solar electric development on Karuk ancestral lands (Energy Plan 2008). The potential for utilizing solar power as an available energy source is currently a limited opportunity due to finical constraints. Currently, there is little utilization of solar thermal (e.g. water heating) although there are adequate solar resources for this as well. The most cost effective mechanism to reduce energy use is to improve energy conservation measures prior to implementing renewable energy installations (ibid).

Large scale wind power development and installation is a limited opportunity, although localized small scale wind turbine installations may be a future possibility after feasibility assessments have been completed (Energy Study 2008).

Future Desired Condition:

The Tribe desires to achieve energy sovereignty for the membership and public. This will likely require infrastructure development in the form of grid expansion, utility inter-tie, and stand alone renewable energy systems as well as employment of efficiency techniques and practices. It is desired that the implementation of a combination of cultural environmental management practices could supply some of the resources needed for such energy independence as well as potentially provide for some level of cost benefit to the practice employed.

Reduced reliance on current industrial non-renewable or ecologically unsound electricity sources is desired. This could be achieved with a combination of renewable energy options with consideration of emerging technologies and community/tribal capacity. A majority of homes businesses and public buildings should employ weatherization and heating efficiency measures.

Many potential sources of micro-hydro currently under utilized may be available in the future. Expansion of micro-hydro utilization could be beneficial and ecologically sound when combined with existing personal and municipal water systems. This would be instrumental in providing energy independence and/or utility inter-tie opportunities to more residences and business within the Karuk Aboriginal Territory. Mitigation measures and adherence to practices which protect water quality, wildlife, and fisheries resources will be necessary.

Biomass is an abundant resource that carries potential for achieving energy independence and/or utility inter-tie opportunities. Localized biomass utilization infrastructure should be developed for heating homes, businesses and/or public buildings as well as for providing hot water and electricity. Many of these opportunities are dependant upon the emergence of new technologies, so continual research and communicating peak efficiency needs to developers may be beneficial. Export and/or local sale of processed biomass such as wood pellets to generate program income for project cost offsets may have potential to provide cost savings for other tribal programs such as housing and/or LIHEAP.

Access to a constant supply of firewood may be made available through strategic hazardous fuels treatment and other landscape level restoration work. Firewood collection should include standing dead and down wood sources throughout the Karuk Aboriginal Territory. Such collection should be achieved in a manner consistent with other managerial practices and principles.

The Karuk Tribe desires to expand wind and solar power/thermal opportunities. Financial support for startup installations, materials, and energy distribution will be needed. Where feasible, establish procedures and practices for the reduction of fossil fuel based energy sources and increase availability of energy generated from wind and solar based sources. The Tribe will pursue mechanisms that foster incorporation of wind and solar based energy technologies as available and feasible.

Enforcement/Regulation:

The Department has yet to organize an Enforcement/Regulation Program. A program such as this will be needed in the future to properly manage resource utilization across the broader ancestral landscape. Efforts have begun to formalize a Tribal Fishing Ordinance and Natural Resources Committee. This committee will eventually comprise the primary managerial body charged with development and enforcement of Tribal laws and regulations relating to resource management and utilization.

Other Ordinances and regulations should be developed in a manner consistent with this plan relating to resource utilization such as hunting, gathering, firewood collection, etc. Any such law, regulation or policy developed by said committee shall be approved by the Tribal Council prior to enactment and enforceability.

Resource Concerns:

The rural setting of Karuk Aboriginal Territory of western Siskiyou, northeastern Humboldt counties, and southern Oregon generally lacks effective Federal, State, and County law enforcement. This limited enforcement reduces the protection, monitoring, and proper regulation of Karuk Tribal Trust Resources, as well as social or domestic issues.

The Karuk Tribe and its members retain their aboriginal rights to occupy and use their original Tribal territory, including but not limited to the right to hunt, fish, gather and engage in traditional ecological management of resources (e.g., harvesting, burning, pruning, coppicing) (Goodman 2000). The Karuk Tribe has never relinquished these rights by treaty, Congress has not expressly extinguished the rights by statute, and the rights have not been lost by conquest or any other means. Therefore, the Tribe and its members retain the exercise of these rights unimpeded by Federal, State, or County regulations (see, Mitchel v. United States, 34 U.S. 711, 746 (1835); United States v. Santa Fe Pac. R.R. Co., 314 U.S. 339, 347 (1941). However, Karuk Tribal members and descendants practicing usufruct rights to traditional harvesting practices are often found

to be in violation of, or are disadvantaged by, Federal, State, and County laws regarding season, species, and amount of harvested resource (see Anderson 2005 for a discussion of California Indian usufruct rights).

Traditional Karuk harvesting regulations and harvest limits are often different than Federal or State regulations, placing Karuk Tribal members at risk of violating Federal, State, or County laws for practicing traditional methods of hunting, fishing, gathering, or burning. Furthermore, Karuk Tribal members and community need culturally sensitive, appropriate, and respectful law enforcement services.

Goals:

Protect the resources and social wellbeing within the Karuk Aboriginal Territory. Promote traditional laws relating to resource usage and civil unrest. Enhance the principles of Tribal self governance, self reliance and self determination. Restore ecological and social stability through enforcement and traditional regulation of well established cultural principals involving management practices, resource usage, and other civil actions.

Objectives:

Establish a Natural Resources Committee and Natural Resource Patrol personnel to monitor, regulate, and enforce traditionally appropriate Federal, State, County, and/or Tribal laws, regulations and ordinances within Karuk Aboriginal Territory. Assist in the development of Tribal Ordinances and/or Interagency Policy relating to resource regulation and enforcement. Engage in and/or facilitate the preliminary settlement of civil issues based on traditional conflict resolution formulas.

Historical:

Prior to European settlement, the Karuk People, governed and regulated themselves as family groups having close ties with neighbors through a system of laws, and usufruct rights based on inheritance, resource ownership, stewardship responsibility, and management action (Kroeber 1976, Bright 1978). Civil or resource violations such as damage to property or life, or harvesting resources at an individual or collective group gathering or use site without permission were settled through a system of value assessment and subsequent payment between the involved parties. These negotiations were at times mediated by individual(s) recognized and respected by both parties. Openly practiced physical and/or spiritual retaliation or violence was rare.

Settlement of Karuk Aboriginal Territory by non-indigenous peoples and the subsequent disregard for Karuk social regulatory practices lead to the establishment of regulations, laws, and policies based on European-American social structure (Stephens and Sugihara 2006). Treaties were negotiated and never ratified (Heizer 1973), enforcement agencies clamed jurisdiction and ownership as if they were. Regulatory structures affecting Karuk culture were established with no Tribal involvement or official representation. This

dramatic change caused a rippling effect throughout the Karuk Culture, essentially making it illegal to practice our religious traditions (Holmlund 2006).

"*There is also another source of fires, which I will call the renegade whites and indians in the district, these I am glad to say are in the minority, but they do lots of damage considering their number. They set fires for pure cussedness or in a spirit of don't care a damativeness, they have nothing at stake, and don't care whether the fire damages others or not.*

In good acorn seasons in the Indians will sometimes try and burn off the leaves and humus under the oak trees, to facilitate the gathering of acorns.

My past experience has proven that fires caused by "Indians burning for basket material" are invariably small fires, as the location of the material needed is not productive of large fires.

…In the "'Pure cussedness class"', the only sure way is to kill them off, every time you catch one sneaking around in the brush like a coyote, take a shot at him". (F.W. Harley, USFS District Ranger January, Klamath National Forest, Orleans, Calif. Jan. 30, 1918 letter to Mr. Rider.)

Everything was at stake, over 80% of the Karuk cultural use plants are fire dependant species (Davis and Hendryx 2004, Schenck, and Gifford. 1952, USFS-FEIS data base). These species need frequent low intensity fire as conducive of historical traditionally shaped landscape characteristics. In the letter above, the only reference of native burning was in relation to tan oak acorns and basket materials, so burning for many other purposes as: hunting, medicinal plants, and other sources of food gathering, must have been classified under the "pure cussedness class".

Current:

These historical effects have subsequently caused inadequate landscape conditions, threatened population viability of many culturally significant plant and animal species, degraded water quality and quantity, unbalanced ecological processes as well as an impoverished social structure.

Federal, State, and County laws have been inadequate in maintaining and protecting Tribal Trust Resources and the social wellbeing for our membership. Although the Tribal Government has yet to be approached by lawmakers to alleviate the abovementioned social and/or environmental justice issues, some policy makers are becoming increasingly proactive in seeking Tribal input and collaborative involvement (Raish et al. 1999).

Within the last decade, policy language has begun to make a turn towards ecologically driven resource management. In the last few years we have seen attempts by agency personnel to figure out how to make it happen on the ground.

The Karuk Tribe believes that eco-cultural resource management as a foundation for social infrastructure is vital to the perpetuation of our culture. We recognize that our participation in restoring balanced ecological function and socio-cultural interaction will need to be more than simple consultation for consideration on projects, policy, law development and/or enforcement measures.

Future Desired Conditions:

Establishment of a Tribal Eco-Cultural Resource Protection and Enforcement Program based on Tribal Environmental Knowledge and Cultural Environmental Management Practices would ensure protection of local resources in the same manner that preserved them for thousands of years. Tribal regulation, and enforcement of fish, game, gathering and other managerial or harvesting activities will enhance population viability and habitat productivity. This not only ensures the perpetuation of the resource, but could free a burdensome disconnect with societal changes amongst the minds, hearts, and memories of the Karuk Tribal membership.

Recognizing the un-surrendered rights of the Karuk Tribe within the Karuk Aboriginal Territory is another step towards restoring ecological and civil stability. Tribal and Interagency collaboration, with public participation is essential in restoring social and environmental conditions that are desirable by all occupants, resource users, and visitors within the Karuk Aboriginal Territory.

Tribal ordinances and Tribal – Interagency partnerships/agreements would maintain regulatory direction and authority to enforce resource usage and resolve civil actions.

Designate areas of forests, shrub, grassland, and riparian/river that are monitored, stewarded and utilized by Karuk Tribal members and/or identifiable family groups similar to historical family use/owned resource areas to assist the Karuk Tribe with resource protection and coordinated restoration efforts.

Environmental Education:

Environmental Education has been very important to the Karuk Tribe since program inception. Environmental Education projects serve to inform Tribal and local community members about the Department's mission. Projects such as Fall Salmon Spawning Surveys, during which students collect data that is used by the California Department of Fish and Game, not only give these students hands-on training, but encourage a deeper appreciation of natural resources and ecological processes. The Department's Environmental Education Program provides opportunities for people to correlate current science with traditional knowledge and cultural practices.

Resource Concerns:

It is important for all interested individuals to learn about the basic resources upon which we depend. Water, fish, animals, plants, fire, air and the correlation between

environmental and human health are some of our main focus points. Although Karuk traditions such as basket weaving, Tribal fisheries, hunting, and medicinal plant, acorn, berry, and mushroom gathering are still practiced by some Tribal members, it is vitally important that such traditional knowledge be passed down and preserved. Tribal youth must continue to learn about the life cycles and habitat needs of aquatic and terrestrial species, the names (Karuk, common, and scientific) and uses of common native plants and animals, the importance of fire for maintaining ecosystems, the necessity of clean air, and the role of these processes and/or resources to Karuk culture.

Goals:

Protect cultural/natural resources from uninformed, narrowly focused and/or single species management approaches in the future. Promote traditional environmental knowledge and balanced management practices. Enhance the understanding and integral perceptions of youth, teachers and future land managers within the Karuk Aboriginal Territory. Restore ecologically driven management practices based on the integration of traditional knowledge and western science.

Objectives:

Instill in students and adults a life-long desire to learn about and care for their environment. Provide opportunities for youth to learn from Tribal elders about traditional Karuk land and resource management practices. Work with local schools, agencies, organizations, community groups and Tribal members to enrich student and adult knowledge of local environmental and watershed issues to ensure protection of cultural/natural resources. Implement and assist with projects on recycling, community gardening, salmonid spawning and habitat needs, ethnobotany, and other relevant environmental issues to teach students to be good stewards of their local resources and ecological processes. Train students and adults to put their knowledge into practice by providing hands-on activities both in classrooms and outdoors.

Historical:

Prior to European settlement, Karuk People were trained in specific Cultural Environmental Management Practices as a trade that had correlations with the health and abundance of the resources in which the individual primarily collected, gathered or otherwise utilized as part of their social stature within the village or use area. These traits were established at a very young age though inter-generational oral transmission of knowledge the elders had acquired throughout their lives.

The children would remain with the elders and learn managerial and social principles until they were eight years old. Then they would learn to apply these principles through managerial actions when assisting the adults with the daily action of preparing for survival while sustaining a perpetual livelihood.

Following European contact, this social structure began to change. Social and Managerial principals were still taught in the same manner as before. However, there was a reduction in effective hands-on teaching as children were forcibly removed to boarding schools to learn English. During this time they were beaten repeatedly when speaking their native language or practicing their traditional beliefs (Norgaard 2005, Stercho 2006).

After the boarding school experience, many chose not to move to the reservations and continued the tradition of Cultural Environmental Management Practices. These practices continue today in reduced abundance because in many cases there is the ever-present threat of being jailed.

Current:

The Department has initiated many cultural youth projects. One is Salmon Camp, hosted by the Karuk Tribe in collaboration with other local Tribes. Salmon Camp is an eco-cultural education camp that provides Native American high school students with opportunities to learn about natural resources, water quality and fisheries issues.

Another project is ceremonial trail maintenance. In past years the Karuk Tribe has received funding which was used to hire a cultural youth crew consisting of high school students to clear trails and dance areas for the annual World Renewal Ceremonies. As this learning activity is in the form of a job, participants receive minimum wage rates and an hourly stipend is sometimes put into an account to help them pay for college. During their time on the project, participants learn more about ceremonial principals, specific locations and the purpose of individual traditional practices.

The Department's Environmental Education Program includes a number of projects centered on cultural and natural resource management including but not limited to: Fall Salmon Spawning Surveys, Aquarium Incubators, Gardening and Recycling, Native Forest Plants, Ethnobotany Studies, and Stream Monitoring. All projects promote learning traditional and scientific environmental knowledge and balanced management practices.

Fall Salmon Spawning Surveys allow youth to collect real data that is used by the California Department of Fish and Game. Students learn about the life cycle and habitat requirements of salmonids as well. Aquarium incubators in classrooms and Tribal buildings also help youth and adults learn the life cycles and habitat requirements of salmon and trout.

Community gardens located on or near school grounds give youth and adults an opportunity to learn gardening skills while growing healthy, organic produce. Gardening also promotes a healthy lifestyle through the exercise involved in maintaining the garden area.

Recycling projects include composting and vermicomposting, which help youth learn how to reduce kitchen waste, as well as recycling other household wastes such as plastics.

While participating in Native Forest Plants and Ethnobotany Studies, students and teachers learn the names of local native plants, traditional uses (food, basketry, ceremonial, medicinal), habitats, and the importance of fires for maintaining diversity, and ecological roles from Tribal members and other knowledgeable individuals.

During Stream Monitoring youth learn about aquatic invertebrates and their role in a stream's ecology, water quality, stream flow, and the impacts of human activities upon a watershed.

Future Desired Conditions:

Tribal members and community members will maintain, expand and pass on their knowledge of the cultural and natural resources upon which we depend and of the ecological processes necessary for the preservation and conservation of those resources. Tribes, Agencies, Individuals, and Community Groups will use balanced, ecologically driven management practices based on the integration of traditional knowledge and western science in order to be good stewards of their cultural and natural resources and ecological processes. Tribal youth will be able to use Cultural Environmental Management Practices without restriction or fear of being at odds with current management direction.

Environmental Justice:

The Environmental Justice Program was established with the development of the ECRMP. The history of the Karuk Tribe since contact with Europeans represents a classic example of environmental injustice. In the past 150 years various governmental agencies have made numerous natural resource management decisions resulting in the degradation of the natural resources upon which the Karuk Tribe is fundamentally connected (Stephens and Sugihara 2006).

This fundamental connection is such that the physical, spiritual, social and economic wellbeing of individual Tribal members is tied directly to the proper management of these resources. In most cases, the Karuk Tribe has born a disproportionate share of the burden associated with managerial and policy decisions at all levels. These decisions include the environmental policy, approval of mining operations, fire exclusion and suppression, timber harvest plans, construction of dams and agricultural irrigation projects, among others.

President William Clinton's 1994 environmental justice executive order specifically requires that the unique relationship of Indian tribes with their respective environments be considered in federal land management decisions (EO 12,989, § 6-608, 59 Fed. Reg. at 7,632). Thus, the executive order mandates that federal agency staff consult with federally recognized Tribes to address issues of adverse environmental impact on Tribal

interests, including issues related to subsistence consumption of fish, wildlife and other cultural/natural resources.

Currently, mounting public pressure is encouraging government agencies to redress issues of environmental justice through natural resource management decisions (Shepard et al. 2002). This program is intended to provide assistance in policy development and managerial planning.

Resource Concerns:

Issues of environmental justice span across all manageable natural resources**.** Of particular interest are those threats to Karuk quality of life, health, spiritual and physical wellness, and the integrity of natural resources providing ecological goods and services necessary to sustain the Karuk People as a living culture.

Goals:

Protect the quality of life within the Karuk Aboriginal Territory. Promote the use of traditional ecological knowledge in the development, reform and redress of policy and resource management planning. Enhance landscape productivity and species viability through influencing management direction potentially affecting Karuk People and or resources upon which we depend. Restore traditional resource management and social stability to improve the health and wellbeing of plants, animals and humans alike (Gee and Payne-Sturges 2004).

Objectives:

Advocate based on the best available science and Traditional Ecological Knowledge, for the implementation of Cultural Environmental Management Practices, the removal of the lower four Klamath Dams and Karuk traditional harvest management basin wide as a means to restore the Karuk Tribe's fisheries. Coordinate the development of strategies and educational materials to assist Tribal programs in the utilization of environmental justice issues as a means to achieve programmatic goals. Maintain communication, conveyance and coordination of departmental and/or managerial views and responses to the public through a multitude of media platforms (Shepard et al. 2002). Work with academia and scientific communities to document, study, and/or validate cultural managerial principle and the correlating health impacts on both humans and the environment (Gee and Payne-Sturges 2004). Develop a basic framework of the factual histories of the local area to be incorporated into the curriculum of interested local schools and institutions of higher learning.

Historical:

Issues, like mining during the California gold rush, fire suppression and forest management and state and federal water policy all have had a long devastating impact on the Karuk traditional value system. A greater understanding of tribal management issues

and concerns are needed in order to coordinate and collaborate in relevant processes. Educational outreach is a necessary tool to provide to not only to management agencies but to our tribal members also. After all, history in the current curriculum does not tell the general public about the Red Cap War (Secrest and Secrest 2002), the U.S. Calvary, changes from traditional forest management, the effects of forced assimilation, injustices of the Indian Allotment era, etc.

The Spanish traveled into the area as far up river as Whitmore Creek but turned around when they discovered that the territorial occupants knew they were coming and went up the hill to avoid contact and watch them. They never returned to occupy the land or conquer the Native population within the Karuk Aboriginal Territory. Therefore no valid claim could be made by Spain or Mexico that could constitute extinguishment of Indian Title based on discovery, conquest, or treaty and could not be justifiably relinquished under the treaty of Guadalupe Hidalgo (Cook 1943a). (Jones v. Meeham, 175 U.S. 1 (1899) (intent to extinguish Indian title must be clearly expressed).

The Karuk Tribe has experienced many disproportionate burdens from policy and managerial decisions over the last century and a half. It wasn't until the 1850's when mining claims were established, that this burden truly begun. In many instances the Karuk People were forced away from their villages to live up in their hunting or gathering areas.

Later, the U.S Calvary was ordered to dissolve any conflicts between the miners and Natives (Cook 1943b, Secrest and Secrest 2002). This culminated in many Karuk families being removed to reservations in Hoopa and Quartz Valley, while the youth were separated and sent to boarding schools. The miners were never forced to move, therefore causing Karuk People to hold a disproportionate burden caused by that policy decision.

Not all Karuk families were removed. Many went into hiding within their traditional use areas, some made their way back to the villages where they were shot for managing their resources with fire, or fell into alcoholism. Karuk People were treated very prejudicially during this time and many lied about their blood quantum in the interest of being treated better. This still causes inaccurate blood quantum recognition for many Tribal Members today.

Congress also commissioned the negotiation of treaties in California. In 1851 treaties were signed at three locations within the Karuk Aboriginal Territory. All three treaties had different provisions for the ceding of lands by the Karuk People. The American concept of land ownership (written title) was not understood by the native people of the time; however, the right to maintain occupation and utilization of the land and resources was understood (Gifford 1939). The ratification of the treaties was blocked in the Senate and no right or title was relinquished or extinguished (Heizer 1973). Johnson v. M'Intosh, 21 U.S. 543 (1823) (aboriginal title can only be extinguished by consent of the federal government).

These actions lead to the passing of the California Indian Jurisdictional Act of 1928 (Lea Act). This Act was intended to compensate California Indians for the United States' failure to secure the lands and compensation provided for in the eighteen unratified treaties. In addition, the Indian Claims Commission Act of 1946 authorized claims by identifiable groups of Indians for the loss of aboriginal lands. Several individuals filed claims on behalf of groups that were consolidated into the "identifiable group of California Indians" in Thompson et al. on relation of the Indians of California in Docket Nos. 31 and 37 (8 Ind. Cl. Com. 1 (1959)).

In the Karuk Aboriginal Territory, land claims checks were sent to individuals as a result of the various cases with no explanation of what they were for. This caused purported ceding of ancestral lands without due process or the consent of the Tribe and without the affected parties knowing or understanding the potential effects.

Leading to and following the above actions, there have been numerous policies and managerial decisions that have affected Karuk People. Many of these actions are still unknown, or are misunderstood by Tribal Members; however, the effects are deeply felt by the membership of today.

For instance, Karuk People are family oriented and still do not understand the concept of blood quantum as a means of determining who one is. Another example is individuals forced to a life of poverty are still arrested or cited for utilizing our traditional resources like fish, game and utilitarian materials. Construction of industrial dams for hydropower or irrigation have also effected the purpose of our religious actions in relation to the intent of ceremonial practices designed to ensure salmon reach the spawning grounds before we harvest fish for subsistence.

Compared to other Tribes in the United States, California Natives are disproportionately burdened by policy and managerial decisions. Tribes in nearly every State of the Nation have recognized rights to hunt, fish, or otherwise utilize cultural/natural resources within their traditional use areas (Goodman 2000).

Dr. Kari Norgaard's Altered Diet Report: Denied Access to Traditional Food, points out some significant issues related to federal and state natural resource management and the associated socio/economic risks to the Karuk Tribal Community, The health and economic stability of the Karuk is at great risk because of the institutionalized mismanagement of the resources the Tribe has always depended upon. The management of these resources is a vital component to the Tribe's culture and future existence as an indigenous sovereign nation (Stercho 2006).

Current:

Today, National direction is requiring policy makers as well as land and resource managers to consult with Tribal Governments in the interest of ensuring Tribes are substantially and meaningfully involved in decision making (see USDA Forest Service

National Resource Book on American Indians and Alaska Natives, Executive Order 13175, Hutt and Lavallee 2005). Departmental staff works diligently to ensure a disproportionate burden is not continually placed upon the environment, as well as Tribal and non-tribal people alike.

Given the limited financial resources acquired annually through grant sources, by the Department, we cannot currently participate in all policy development or managerial decision potentially affecting Karuk People today, let alone redress the burdens of past policies and decisions. We do however focus on some major managerial points.

Hydroelectric dam re-licensing by the Federal Energy Regulatory Commission is one of these issues that are of the utmost importance. We are working with Federal and State agencies and non-governmental organizations to remove the lower four dams on the Klamath River system. We believe that removing these dams is necessary if we are to collaboratively restore viable fishery populations in the Klamath (Salter 2003 and 2004, NRC 2008a). Restored access to spawning habitat, coupled with traditional harvesting regulations should ensure over time, adequate availability of this resource for ceremonial, subsistence, commercial and recreational use by Tribal and non-tribal people.

Restoration of Cultural Environmental Management Practices is also vital to the perpetuation of Karuk Culture. We are currently working with the US Forest Service, NOAA Fisheries, and US Fish and Wildlife Service in re-establishing large scale traditional managerial actions or uses and restoration of natural disturbance regimes.

We believe that complying with Environmental Justice Policy may also create a disproportionate burden on managerial agencies because they have no way of knowing or understanding the basis of Karuk Cultural Principles relating to the actions needed to meet their mandates in a successful manner (Shepard et al. 2002). In many cases, this causes the Tribe's concerns to be addressed inadequately or considered insignificant to policy development and/or managerial actions (Houde 2007). This situation in turn perpetuates the disproportionate and devastating impact of these decisions on the Karuk People.

Future Desired Conditions:

The Environmental Justice Program will work towards resolution of many managerial burdens imposed upon the Tribe and its members. The priority achievement is the removal of the lower four dams on the Klamath River, the correlating natural hydrograph, and the subsequent restoration of Spring Run Chinook. The Chinook stocks in the Klamath are in great peril (NRC 2008a) and as such so is the Karuk Tribe's access to this staple food source.

Along with all levels of restoration planning, implementation and effectiveness monitoring, this program will provide outreach and public education through a variety of media platforms. These efforts will help inform the public, agency staff, and

policymakers alike as to the importance basing managerial actions on Traditional Ecological Knowledge (Houde 2007).

This effort should over time, help to regain recognition of Karuk Aboriginal rights, and gain support for the Tribe to equally pursue active managerial duties in Karuk territory with the appropriate jurisdictional authority.

It is important to bring back traditional management practices and principles as they relate to healthy populations of fish, deer, elk, acorns, basketry materials, etc (Anderson 2005). This may provide a short term burden for all resource users, but will provide for long term benefits, as traditional Karuk managerial/harvesting methods have worked successfully for thousands of years.

Fire/Fuels Reduction:

The Fire/Fuels Reduction Program was established in 1994 in the interest of reducing excess fuel loading at the landscape scale. The intent of integrating the fire and fuels reduction programs is to have a well trained workforce that can pre-treat large areas and maintain them with low intensity cultural burning practices while remaining available for local fire suppression efforts.

The continuum of Karuk reliance on forest resources and what now is referred to as "*ecosystem management*", is highly integrated in the land uses and practices of the Karuk People. Prior to European settlement, the forest vegetation character was shaped by lightning fires and by Native American ignited fires (Lewis 1993, Pullen 1996, Whitlock et al. 2003, Skinner et al. 2006). This established use of low intensity fire by the Karuk People helped promote more open forests that were naturally resilient and resistant to ecological disturbances and ecologically productive (Lake 2007).

"Sets fire, that's the way they do. There all time fire and everything grow then like they used to eat here. All those things that they used to eat, y'know, you get in the ground. Now I don't think there is any, too much brush growing. That's only the way they used to grow plants. Lots of green stuff, I used to eat lots of green stuff. There's something that used to grow, looked like parsley. Where there are fire, it great big, great big plant. They used to set fire for everything, acorns too. They set fire, more acorns came back. Fire, no bugs. And that Kishwuf too, we used to eat that. Before, just pick it up, they dig it. I Used to like it, I'd like to eat some, but I can't get there. There was a big patch up here, lots of it too; they'd pick it up. And another kind (of plant) that used to grow around here, but don't grow anymore. That looked like, they call them sunflowers, when they just about this high, that's when they eat it. Nothing grows now because no fire. They grow but they not good to eat, I don't think. And that hazel grow (first the sticks) small, that's what they make baskets with. Next year it be just full of those nuts. I used to have lots of that. There used to be a yellow jacket's nest sometime, (the fire would) cook (the grubs) and (we would dig up) eat it (laughs). That was way up in Wooley Creek."

(Bessie Tripp: Karuk Tribe Interviews)

Recent works have pieced together ethnographic data and traditional knowledge that shows indigenous tribes set fires in the Klamath Mountains (Lake 2007, LaLande and Pullen 1999, Pullen 1996, Blackburn and Anderson 1993, Peri and Paterson 1976). Karuk People historically have viewed wildfire as part of a disturbance cycle that forests depend on and adapt to. Fire was also applied in ways that reflected the sacred character of the land and its life systems. Fire was viewed as an intricate self-regulating system that was maneuvered to promote many agro-forest benefits (Anderson 1993:162, Harrington 1932:63-65, Lewis 1973:50-52, Lake 2007).

The Karuk People continue to value fire as a tool for many purposes at various intervals, affecting the structure, composition, function and productivity of a multitude of habitats which help define the natural fire regime across the landscape. Lower to mid elevation, with some specific higher elevation resource areas historically managed with fire could be better defined as having indigenous or cultural fire regimes (Lake 2007).

The concept of **indigenous fire-regimes** as put forward by Lewis and Anderson (2002:6) is generally described as fire-regimes specific to certain ecosystems and plant communities created and maintain primarily by the specific and intended application of fire by indigenous people which may or may not have been in conjunction with natural wildland fires ignited by lightning.

Similar to the above definition is: Cultural fire regimes which historically affected the "composition and characteristics of particular habitats, and especially the culturally defined resources therein, the distinguishing feature of **cultural fire regimes include**: (1) the alternate seasons for burning different kinds of settings, (2) the frequencies with which fires are set and reset over varying periods of time, (3) the corresponding intensities with which fuels can be burned, (4) the specific selection of sites fired and, alternately, those that are not, and (5) a range of natural and artificial controls that humans employ in limiting the spread of human-set fires, such as times of day, winds, fuels, slope, relative humidity, and natural fire breaks" (Lewis 1982 in Bonnicksen et al. 1999:444).

Burning promotes feed and attracts animals for enhanced hunting. Deer, small animals, and fowl depend on food which is near the ground. Fire releases soil nutrient productivity that promotes nuts crops, fruits, greens and shoots eaten by animals and insects (DeBano et al. 1998, Wohlgemuth et al. 2006, Fites-Kaufman et al. 2006, Johnon et al. 2007). Periodic burning should shift plant communities back toward food-producing plants by favoring a more frequent renewal based on the reproductive cycles of the resource intended for enhancement (Biswell 1999).

Fire was used to improve access to resource areas and for safety by reducing ease of attack from enemies, predators and to defend against destructive high intensity fires during extreme weather or drought events. An excerpt from a letter by Klamath River Jack summarizes a few of the historic fire applications:

"Indians have no medicine to put on all the places where bug and worm are, so he burn; every year Indian burn… Fire burn up old acorn that fall on ground. Old acorn on ground have lots worm; no burn acorn, no burn old bark, old leaves, bugs and worms come more every year… Indian burn every year just same, so keep all ground clean, no wood or brush, so no bugs can stay to eat leaf and no worm can stay to eat berry and acorn. Not much on ground to make hot fire so never hurt big trees where fire burn"

(Klamath River Jack 1916:195).

In collaboration with other agencies, organizations, and/or landowners the Karuk Tribe desires to reinstate the application of cultural burning following pre-treatment fuels reductions as a means of restoring a condition class conducive of the historical human interacted natural fire regime within the Karuk Aboriginal Territory.

Resource Concerns:

Ecosystem function is the primary resource concern for this program. Healthy fire adapted ecosystems are critical to the wellbeing of all cultural/natural resources. With the declining presence of abundant traditional use plant and animal resources in the Karuk Aboriginal Territory there is an essential need to restore natural fire regimes at the landscape scale. Regular collection of downed woody debris and human interacted burning cycles of low intensity fire, will keep lightning caused fires from adversely affecting the resources that are valued by both native and non-native peoples.

In the 1930s fire suppression activities began to increase the forest vegetation density and the accumulation of forest fuels (Skinner et al. 2006, Lake 2007). Logging activities have also contributed to the high fuel conditions. These activities have increased fire intolerant shade tolerant conifers that dominate many forest settings today. Fire adapted species such as ponderosa pine and black oak have declined over the past century (Frost and Sweeney 2000, Skinner et al. 2006).

Now highly flammable forests when ignited, burn with such high intensity it can damage soil productivity, and/or kill entire forested stands (McNabb and Cromack 1990). Catastrophic fires drastically increase watershed erosion which can undermine the capacity of ecosystems to resist further disturbances (Biswell 1999, Wohlgemuth et al. 2006).

The suppression of traditional burning practices of the Karuk Tribe has also added to increased forestland fuels that contribute to severe wildfires. Karuk People enhance their many basketry materials by burning them. Not burning sufficient amounts of basketry resources has reduced the quality and availability of these utilitarian resources (Anderson 1999).

Modern agriculture practices can strip the forest land, deplete the soil, and cause extensive erosion either due to plowing, cultivating, mining, overgrazing, or over-cutting the forest. Karuk fire based management however promotes life and helps protect the

forest from severe fires. It is culturally beneficial and highly essential to sustain the ecology of our local forest systems.

The primary natural disturbance process for promoting healthy forest ecosystems in the Klamath-Siskiyou Mountains is frequent low intensity fire, with occasional moderate to high severity events contributing to landscape heterogeneity (Frost and Sweeney 2000, Odion et al. 2004, Skinner et al. 2006). Fire as a natural ecological process promotes a diversity of succession stages, fire dependent species, reduces vegetation density and forest debris, contributes to nutrient cycling and reduces the probability of catastrophic fires (Skinner et al. 2006).

Catastrophic fires have been proven to have adverse effects on aquatic and terrestrial ecosystems (Gresswell 1999, Bisson et al. 2003, Dwire and Kauffman 2003, Burton 2005). High intensity fire can damage stream channels as well as other aquatic environments and tend to turn upslope terrestrial areas into fields of brush. The Karuk Tribe believes that a combination of fuels reduction treatments and traditional burning practices completed at the landscape, watershed, stand, habitat, and/or resource scale(s) will reduce fire intensity eventually allowing natural fire to occur with minimal suppression efforts (Graham et al. 1999, Graham et al. 2004, Agee and Skinner 2005, Peterson et al. 2005, Lake 2007).

Goals:

Protect cultural/natural resources from uncharacteristically intense wildland fire. Promote fire and fuels management actions that achieve multiple resource objectives. Enhance the interconnectivity of microhabitats and improve ecosystem function. Restore traditional human interacted natural fire regimes at the landscape scale.

Objectives:

Work with Agency and/or Tribal staff to plan and implement fuels reduction and cultural burning projects based on Karuk Environmental Management Practices and principals. Coordinate with Karuk Community Development Corporation to build capacity and develop infrastructure in the interest of utilizing restoration byproducts to reduce overall treatment costs. Establish and maintain expanding wildland fire use areas within individual watersheds. Initiate/implement the appropriate management response during emergency wildland fire situations. Systematically reduce the taxpayer cost burden of wildland fire suppression activities.

Historical:

Historically, the Karuk People have utilized fire for many purposes (Harrington 1932, Lewis 1993, Pullen 1996, Lake 2007). European settlers claimed that controlled burning by Indians was irresponsible but most tribes have centuries of experience knowing and understanding the benefits of controlled burning (Klamath National Forest 1928). While early accounts are unspecific, burning would destroy ticks, fleas, lice, insect pests, and

harmful fungal poisons which live in ground surfaces (Klamath River Jack 1916, Williams on-line bibliography). Low intensity fires release mineral nutrients from ash, and promote nitrogen fixing bacteria in the soil, as well as promoting the establishment of nitrogen fixing plants (Wohlgemuth et al. 2006, Fites-Kaufman et al. 2006). It also can increase the overall pH of the soil and the productivity of all plants and trees (Debano et al. 1998). Aboriginal burning also helps to diminish fire intolerant conifers (Skinner 1995, Skinner et al. 2006).

With fire suppression policy implementation (Harley 1918, Klamath National Forest 1928, Stephens and Sugihara 2006), came the suppression of traditional management practices (Lake 2007). Native people were shot for performing burning activities as an integral component of the living culture or natural environment (Harley 1918). These traditional practices are a vital component of the natural fire regime (Anderson 2005, Lake 2007).

As low intensity indigenous fires were intentionally set, the soil was moist and protected so fire would consume only the dry grass, needles, leaves, litter, and small proportion of duff. A semi-moist environment would help confine fires within the natural features of streams and ridges. Blackened surfaces would help absorb heat in the daytime, reduce frost damage, and keep soil temperatures higher to promote bacteria activity for spring plant growth (Fites-Kaufman et al. 2006).

Other cultural fires require a dryer environment. One example is the ceremonial burning of Offield Mountain (Gifford 1939). This burn was historically ignited annually in September as part of the World Renewal Ceremony (Gifford 1939, Kroeber and Gifford 1949). This occurred immediately before the first significant rain event of the season which falls after the new moon in September and is an important component of Karuk religious practice.

This burn was planned for re-establishment in the mid 1990's. NEPA was completed and a Decision Memo was signed triggering the collaborative re-establishment of this important cultural practice on Offield Mountain. The Tribe completed over 300 acres of pre-burn fuels treatments in preparation of the initial burn. There was a shift in local Forest Service leadership, and differing opinion and/or lack of institutional memory caused the project to stop and our crew was threatened with arrest while performing fuels reduction treatments.

Current:

The characteristic fire regime of the Klamath Mountains is frequent low-severity fires at lower to mid elevations and a mixed fire severity regime with moderate to high severity at higher elevations (Skinner and Chang 1996, Frost and Sweeney 2000, Skinner et al. 2006).

The landscape characteristics and/or condition class of our watersheds today are contributing to increasing fire severity at all elevations (see Odion et al. 2004 for

differing conclusions). This in turn is causing more expensive suppression efforts (Crosby 1977, Moton et al. 2003). This trend is increasing exponentially and there may eventually be little opportunity to utilize commercially valuable resources to offset the costs to the taxpayer for restoration activities (Baker 1994, Dombeck et al. 2004).

At this point in time, it is vitally important to shift efforts to a proactive approach of restoring natural fire regimes in combination with the current reactive approach of fire suppression. The Karuk Tribe believes that there will be an increase in cost for the short term which can be offset by marketing restoration byproducts if the new stewardship authorities can be utilized locally through Interagency/Tribal agreements (see Tribal Forest Protection Act 2004 authority). In return, the nation should eventually receive a reduction, or at least a balance in the costs associated with fire suppression/regime restoration efforts and the Tribe can once again have access to traditionally utilized resources.

Policies relating to this vision are beginning to come into place; however, there is a long way to go to make the programmatic infrastructure behind the Karuk Fire/Fuels Reduction Program a model for success throughout the Nation.

Future Desired Conditions:

Fire has a complex role in creating diversity. Frequent mosaic burns would enrich the areas unique biodiversity (Agee 1993, Skinner et al. 2006).

The restored role of both humans and fire upon the landscape is the condition in which the Karuk Tribe Fire/Fuels Reduction Program is steering its management direction towards for the future. We envision an Interagency/Tribal and local community collaborative planning and implementation effort at the landscape scale.

Interagency Representatives/Tribal Resource Specialists would comprise a planning body that examines large areas for prioritization of implementation efforts based on achieving multiple resource objectives while meeting a broad range of restoration needs systematically.

Utilization of a local workforce is a key component of implementing this strategy. Fire/Fuels crews working in conjunction with other specialized work forces would cooperatively accomplish planned activities within and adjacent to landscapes defined by reasonably identifiable control features. This will help to prepare for cultural burning practices, and establishment of areas available for managing fires for resource benefits in the interest of restoring natural fire regimes and reducing the cost of needed suppression efforts.

This would ensure that the workforce and equipment needed would be readily available to respond to a wildland fire, while maintaining the necessary institutional knowledge to determine where to let fire burn, when to ignite fire, and where to suppress wildland fires when they occur (Resource Innovations 2006).

Fisheries:

The Fisheries Program was the first environmental program established by the Karuk Tribe. This program conducts monitoring, research and planning in regards to projects protecting, promoting enhancing and restoring Klamath River Basin fisheries resources. Projects are planned and implemented independently and cooperatively with other agencies, Tribes and community groups within the Klamath Basin.

The Karuk Tribe believes that healthy fisheries resources are in actuality the keystone indicator species showing successful managerial practices. If core fisheries resources are in decline, the underlying management of all resources is failing.

"A profound unity emerged from the concerns of Karuk individuals with (the) core elements of water quality and fish at two levels. First, these were issues that concerned every person interviewed. Secondly, there was a remarkable consistency between these Native concerns… and those of the technical experts addressing the state of the Klamath River from the perspectives of biologists, geomorphologists, and other professionals examining the same range of issues."

(Karuk Ethnographic Report 82, Salter)

Resource Concerns:

Fisheries used for ceremonial and subsistence purposes by Karuk People are affected by land, water, and fisheries harvest management practices in the Klamath River Basin as well as surrounding ocean waters. Past, current and future management practices have a profound effect to the fisheries resources valued by the Karuk People (National Research Council 2004 and 2007). These practices include, but are not limited to; agricultural dams and diversions, forest and fire management, hydroelectric dams and reservoirs, de-watering wetlands, road construction, commercial and recreational fishing policies, fish hatchery operations, and fisheries restoration practices.

The health of the Tribal Membership is also of major concern. With declining access to abundant fisheries and other traditional food sources, there are correlating health concerns amongst the Tribal population. These food sources are important to reducing the effects of high cholesterol and adult onset diabetes (Norgaard 2004).

Goals:

Protect the health and abundance of Tribal Trust Fisheries Resources. Promote an understanding of ecological processes that allow for the abundance and availability of fisheries resources to the Tribal and local communities that depend on them for a healthy subsistence diet and/or recreation. Enhance the quality, quantity, and availability of correlating microhabitats upon which fisheries resources depend. Restore traditional fisheries harvest management practices and make them applicable to all resource users and managerial organizations claming concurrent or parallel jurisdictions or uses.

Objectives:

Establish Tribal Ordinances relating to traditional harvest methods, timing, and area closures. Educate agencies, interested publics and youth of the importance, foundation, and purpose of traditional fishery management from both cultural and biological perspectives. Work with agencies organizations and community groups to plan, prioritize, and implement emergency and long range projects relating to fish passage, habitat improvement, holding capacity, population augmentation and monitoring.

Historical:

Fish species historically significant to the Karuk Include but were not limited to: Spring and Fall Chinook, Coho, Summer and Winter Steelhead, Pacific Lamprey, and Sturgeon. To a lesser extent resident trout, suckers, freshwater mussels, crayfish, sculpins, and catfish were harvested and consumed (Kroeber and Barrett 1960).

For each fish and run, the Karuk developed unique methods of harvesting, processing, preservation and consumption (Kroeber and Barrett 1960). Harvesting methods involved platform based lifting nets and dip nets, weirs and other similar fences constructed in rivers and creeks, basketry traps, seine and gill nets, gaffs, harpoons, and gouges (Kroeber and Barrett 1960). Historically fish derived protein provided a significant source of nutrients for the Karuk diet (Baumhoff 1963, Norgaard 2005).

Karuk traditional fisheries management, like all other culturally significant resources, is based on the life cycle of the species managed. Spring Salmon have always been considered the most important species to protect. This is the species that triggered traditional harvest regulations. Once the first salmon was caught (in April or May) at Ammaikiarram (where salmon are made [Ikes Falls]) the end of steelhead season was triggered and following a twenty day period salmon fishing could begin downriver of that point.

Another ceremonial practice approximately thirty five miles upriver then takes place on the new moon in July. This triggers the beginning of salmon fishing season from Ishi Pishi Falls upriver. Still no Steelhead was to be caught. There was an area in between (approximately one mile), including the mouth of the Salmon River where there was no salmon or steelhead fishing allowed at any time. Steelhead fishing could then resume after the Fataveenan (Medicine Man) ate the first one for the year just prior to the New Moon in September.

Individual family groups had additional ceremonial practices that managed other fishing areas which were based on the same managerial principals. For example, there was one fishing area on Wooley Creek; this is thirteen miles up at Dead Horse Creek. Shortly after salmon passed that point, fishing could begin there and in the lower Salmon River.

After California was made a State, the Department of Fish and Game created policies and regulations based on the recreational and economic needs of the public, and failed to include or understand the basic environmental needs of fish as they relate to harvest

timing. Though Karuk Tribal members continue to practice traditional fishery management practices, many others go by the regulatory policies of the California Department of Fish and Game.

Changes in harvest practices have not been the only action that has had a detrimental impact to fish runs in the Klamath River system. The construction of dams, clearcutting of mature and old growth forests, road building, fire exclusion and suppression, beaver trapping, and agricultural practices, have also contributed to the decline in fish species populations throughout the Klamath River Basin (National Research Council 2004 and 2007).

Current:

Today fish are still harvested by Karuk Tribal members. Aquatic species harvested include but not limited to; Fall Chinook Salmon, Fall Winter and early Spring Run Steelhead, Coho Salmon, Crayfish, Trout, Muscles, and Pacific Lamprey. Many of the listed fish are harvested at Ishi Pishi Falls, while all are harvested to a lesser extent at many locations throughout the Karuk Aboriginal Territory. Ishi Pishi Falls is currently the only place traditional salmon fishing methods are consistently practiced and known by management agencies and the general public.

Current fishing regulations imposed by the State of California are formulated the in manners opposite of traditional Karuk Fishery management. Some salmon fisheries are not utilized because of reductions or elimination of local runs. Spring run salmon are not abundant enough in the Klamath River above the Trinity for Karuk Tribal members to successfully sustain the intent of traditional fisheries management without cooperation and acknowledgement from all fishery managers and/or user groups affecting the species.

Many Tribal members use non traditional methods such as hook and line to harvest Salmon and Steelhead throughout the ancestral homelands. In many instances, individual Tribal members refuse to purchase fishing licenses when subsistence fishing by any method available.

Some families have chosen not to fish at their traditional fishing areas because of declining populations, not because it is considered illegal by management agencies. For example the Traditional Wooley Creek fishery has not been utilized for many years because the returns are inadequate for a sustainable harvest.

Karuk Tribal members believe in having equal fishing rights as do other Klamath Basin Tribes (see US Supreme Court: Ninth Circuit: No. 95-1311, 1995). At minimum, Tribal members should be allowed to harvest enough fish annually to sustain their families. Fish should also be available for trade and other economic purposes of Tribal members when there are enough to sustain a viable population and maintain commercial uses for tribal and non-tribal entities.

Karuk Traditional Ecological Knowledge and Cultural Environmental Management Practices are being planned and implemented within the Klamath River that includes direct fishery management and indirect forest management benefiting the fishery holistically. This approach is time tested and can be developed into a more contemporary strategy to achieve ecological balance through entire watersheds.

The Karuk Tribe is the original steward of the mid-lower Klamath River fishery, we have never given up these rights and we never will. Protecting Spring Salmon is an integral part of our religion, and the future of collaborative ecosystem management relies upon recognition of this fact.

In the eyes of the Karuk People, Spring Salmon are the most important of management indicator species. If this population can recover, then we may be well on our way to achieving the goals of every Tribal natural resource management program.

Future Desired Conditions:

Karuk Tribal members should have recognized fishing rights as do other Klamath Basin Tribes. At a minimum, Tribal members should be allowed to harvest enough fish annually to sustain their families. Fish should also be available for trade and other economic purposes of Tribal members when compliant with traditional harvest management and will allow for sustainable population viability.

In order for this to become possible, traditional Karuk harvest management principals, need to be practiced throughout the entire Klamath River Basin. These same principals need to be incorporated into ocean harvest of Klamath River runs.

Karuk traditional management practices should be implemented within the Klamath River that integrates direct harvest, habitat and population management with indirect forest management benefiting the fishery holistically. Karuk Cultural Environmental Management Practices are time tested and proven to be a sustainable management process.

Forestry:

A Forestry Program has yet to be officially established by the Karuk Tribe. The functions of a forestry program have been taken on by other program staff and have consisted mostly of consultation and coordination with agency staff, participation on project level Interdisciplinary Teams (as an “observer”), and NEPA documentation. With new national policies relating to forest stewardship there is need to develop Karuk forestry management practices and principles into an integrated departmental program.

Resource concerns:

The Karuk Tribe believes forest conditions within the Karuk Aboriginal Territory are currently not in the proper distribution, composition, and structure with properly

functioning ecological processes. The distribution and composition of conifer, hardwood, shrub, forbs, and grass species today differ from those forest habitats historically, circa 1850, which better supported the Karuk culture (Odion and Sarr 2007, Lake 2007).

The establishment and implementation of fire suppression policies and correlating suppression of cultural management practices continues to cause the loss of critical ecosystem components by means of conifer encroachment establishing monocultured ecosystems (de Rijike 2001, Cultural Solutions 1999, Lake 2007). The general composition and structure of forest, shrub and grassland vegetation across much of the Karuk Aboriginal Territory is currently incompatible with the reintroduction of fire as a cultural management/ecosystem maintenance tool.

Federal forestry programs, though not at such a large scale today, implement logging practices that focus on economics rather than ecosystem restoration and therefore have a narrow view as to the integration of environmental needs into resource management (Karuk views versus the Healthy Forests Restoration Act 2003). Through consultation and coordination with the agencies involved in timber harvesting programs, we are beginning to convince local agency personnel to look more closely at diversity in the form of integrating fire, wildlife habitat, water budget balance, fuels reduction, and/or cultural resource management into the forestry related project planning and implementation (Clinton 2000 Executive Order 13175, USDA 1997), although true "collaboration" with the USFS has proven difficult (Healthy Forests Restoration Act 2003 authorities under the Orleans Community Fuels Reduction and Forest Health Project 2007).

Though these principals, with help from the Department, have made their way into some planning and policy documents (USFS OCFR 2007), the proper perceptions of these principles have not made there way into the actual implementation of agency forestry programs.

The Karuk have a fire dependant and adapted culture, and as a result of economically driven forestry management, the local forest structure no longer provides on an adequate scale the diversified resource access that is vital to the perpetuation of Karuk culture (Lake 2007). Although Timber harvesting is not a Karuk traditional cultural practice, it has become a necessary management action if completed in a fashion that augments and enhances cultural management practices in the interest of restoring fire adapted ecosystems.

The Karuk Tribe believes there is now a need to manage forest habitats in a sustainable manner which can result in the restoration of human interacted natural disturbance regimes while providing abundant cultural/natural resources, balanced ecological processes, as well as local economic opportunities and reduced cost of management activities to the taxpayer.

Goals:

Protect territorial watersheds from being adversely effected by economically driven single resource timber management. Promote sustainable timber management practices based on achieving multiple resource objectives (Kimmins 1997). Enhance the integrity of forest stand dynamics and cultural/natural resources. Restore diverse fire adapted ecosystems and correlating natural fire regimes at a reduced cost to the taxpayer.

Objectives:

Utilize silvicultural, mechanical, or hand methods to modify the composition, structure, and morphological form of forested habitats to be enhanced and maintained by a culturally defined human interacted natural fire regime. Integrate traditional ecological knowledge, western science, and departmental program objectives into forest management activities. Implement a stewardship based approach to integrated management practices at the watershed, scale. Ensure any economic benefit from management activities transfers to additional landscape restoration actions. Plan forest stand improvement treatments to accomplish fuels reduction, wildlife habitat enhancement, cultural basketry material improvement, and traditional foods production.

Historical:

Prior to European contact, forest habitats comprised a diverse mosaic of tree, shrub, forbs and grass species (Whittaker 1960). Climate, lightning fires, fires set by native people, regular collection of fire wood and utilization of resources influenced and shaped the abundance, distribution, structure, and composition of vegetation species (Lake 2007). Frequent burning maintained openings, reduced ground fuels, and reduced fire-intolerant conifer populations (Cultural Solutions 1999). Open forests consisting of grass, fire resistant pine, oaks and other hardwoods dominated south and west facing slopes (Weislander 1930 mapping in Kelly et al. 2008). On north facing slopes and in drainage bottoms mixed conifers were more common and the canopy was less open. Lower elevations were covered by scattered groups of hardwoods and conifers with an under-story dominated by chaparral, grasses and forbs (Frost and Sweeney 2000). All these vegetation zones, habitats and unique plant communities were utilized, managed, and culturally important to the Karuk People (Schenck and Gifford 1952, Baker 1981, Davis and Hendryx 2004, Lake 2007).

Timber harvesting and road construction has notably reduced the availability of mature forests by clearing and fragmenting large blocks of the forest, (nearly 60%) outside wilderness and roadless areas (Noss et al. 1999, Odion et al. 2004). The regions steep slopes, unstable soils, even-aged forests and are not ideally suited for low impact economical timber production.

Historic logging practices have caused monocultured environments. Plantation maintenance prescriptions aimed at hardwood suppression have further degraded natural succession in the regeneration of these managed stands (Beardsley and Warington 1996). Cutting of the hardwoods in these areas increases fuel loading exponentially, causing a

need for multiple entries that can cost more than the original timber receipts and the value of timber produced combined. This type of management practice can cause additional loss on "investment" and/or critical ecosystem components, in the event a wildland fire burns though managed stands.

Federal reforestation efforts have for the most part emphasized conifer forest conversions which have reduced the population and/or health of native hardwoods. Once timber stands are harvested with even-aged prescriptions they may take up to a century to mature. Former clear-cut areas are costly to maintain because early seral stage vegetation competes with replanted conifer establishment and growth and is in essence the exact opposite of natural forest succession. Wildfires that burn through clear-cut plantations tend to be stand-replacing and have a high severity fire effect which can drastically interrupt the regeneration of these areas (Odion et al. 2004).

Current:

Today there are insufficient amounts of open spaces with larger fire tolerant species (Skinner 1995). Fire intolerant conifers, younger Douglas firs (10-100 years) and shrubs have increased in density in areas formerly experiencing higher fire frequencies with lower severity. Shade intolerant species are not only declining in health and abundance from conifer encroachment, but are also being impacted from increased fire intensity. These are both directly related to the suppression of fire and cultural management practices.

Local forestry practices of today are increasingly becoming hardwood tolerant in the planning phases. However implementation remains economically driven and contract development fails to maintain the principal vision of tribally influenced planning documents. Although policy relating to integrating resource management practices is becoming more open to change, agency guidelines and programmatic implementation actions are not meeting the intended objectives of ecological stewardship (USFS OCFR 2007).

The Karuk Tribe continues to try to integrate traditional management philosophy into current management practices, but fundamental differences in policy interpretation and perception of authorities tend to perpetuate an elementary barrier to truly integrated Interagency/Tribal problem solving and collaborative management actions.

Future Desired conditions:

Karuk Environmental Management Practices are consistent with natural processes that encourage native hardwoods and conifers that promote stands and mosaics of different age classes from young to mature, to old growth trees, with standing dead trees, downed trees, and logs in riparian zones and streams. Park-like forest surroundings are historically consistent with natural variations that promote landscape diversity.

Successions of hardwoods and conifers are dependent on natural disturbances. Disturbance regimes, like fires, floods, landslides, wind events, and heavy snow help to regulate natural ecosystem processes and functions (Kimmins 1997). Timber harvests as part of a holistic management strategy that mimics natural disturbance regimes and enhances the life cycles of flora and fauna should provide significant protection against disrupting natural diversity as well as ensure management actions remain ecologically sustainable within the historic range of variability under which forested environments evolved (Kohm et al. 1997, Gustafson 2007, Kerns and Ager 2007).

Watershed scale planning and implementation efforts that integrate programmatic objectives into sustainable multi-entry management practices are key elements to restoring ecological systems. Removing short term economic gain as an underlying objective will enhance long term cost reduction, and should allow for sustainable stewardship at a reduced cost to the taxpayer while increasing the local tax base.

Solid Waste:

Proper waste management has short and long term consequences on the environment and directly affects the health and wellbeing of the Karuk People. Solid Waste Management and education is an important component of long term environmental planning. Incorporating an Integrated Solid Waste Management Plan (ISWMP) and waste education program we will create the needed infrastructure (Coordinator, Codes and Ordinances, enforcement guidelines, and educational materials) to evaluate the types of wastes generated, identify areas of concern, and implement changes to resolve these concerns (US-EPA 2003). This process will allow the Karuk Tribe to continue to build internal capacity, technical ability and a stronger environmental protection capability.

A component of the ISWMP development will be to assess the types and amounts of wastes generated by Tribal activities (all aspects of Tribal business and services, new housing construction, grounds maintenance, health and medical clinics, etc.). Identifying the types of wastes generated will allow the Tribe to target sources of waste that can be reduced, recycled and/or avoided (US-EPA 2003). Education will enable the Tribe to be informed when making disposal and purchasing decisions. Research will provide options for sustainable alternatives (less toxic or produce less waste).

An important component of waste reduction is community and Tribe wide education. Presenting community members (Tribal and non-tribal) with objective, scientifically sound information produces an educated community that is aware of the issues that affect the environment and human health. Education stimulates critical thinking, which allows individuals to make informed decisions, weigh various sides of an issue, and enhances their own problem solving and decision making skills. Increased public awareness and knowledge also helps to foster stewardship, develop a proactive community base and leads to responsible actions. The waste education program will research, develop, produce and distribute educational materials focusing on sustainability, environmental and human health concerns regarding proper disposal of wastes and waste reduction including green purchasing and recycling options. The program will be coordinated with

the existing in-school Karuk Environmental Education Program and Pilot Recycling Program.

Resource Concerns:

As world population increases and resources become even more limited, the need to conserve and reuse resources becomes even more critical. Impacts to the environment directly affect human health, economic viability and sustainability (Satchell 1993). Resources that simply become garbage are not available for future generations. The creation of garbage presents many issues that can have long term environmental impacts. Even if we implement solid waste management programs that reduce the amount and toxicity of garbage, the toxicity chemicals can still find a way into the environment during the extraction, production, transportation, use and reuse. Even in small amounts, persistent, bioaccumulative and toxic chemicals released into the environment can present long term risks to human health and the environment.

Goals:

Protect the environment, resources, health and wellbeing of the Karuk Tribe. Promote reduction of the environmental, health and economic impacts of the waste generation activities of the Tribe. Enhance the Departments ability to assist with integrated problem solving throughout the Tribal and local communities. Restore the social, environmental, and physical wellbeing of the local population and the environment within the Karuk Aboriginal Territory.

Objectives:

Establish a Karuk Integrated Solid Waste Management Program. Facilitate the development of a waste education program and an Integrated Solid Waste Management Plan (ISWMP). Focus the waste education component on a community based waste education campaign to adopt waste reduction and/or proper disposal principals in conjunction with the Environmental Education Program. Incorporate all tribally owned and operated businesses, services, housing, future ventures partners into planning and implementation. Assist in developing ordinances and policies intended to ultimately reduce the environmental impacts of the waste generation activities.

Historical:

Prior to European contact, that the Karuk did not generate any true garbage. All solid wastes were comprised of quickly biodegradable materials or natural materials (bone and rock). In most cases there was no waste as every part of everything harvested was utilized as food, tools, glue, clothing, etc. There was very little or no long term impact of any the waste generated. There were no unnatural substances created, even human excrement was dealt with by dispersing the concentrated nutrients through decomposing wood (Gifford 1939).

Following European contact, waste consisted primarily of cans and bottles, and battery cells that were discarded in concentrations around homesteads, mines, or any area where commercial products were utilized. After construction of roads and the influx on vehicle traffic, landfills were created throughout the Karuk Aboriginal Territory. These disposal sites continued to operate well into the 1990's when the last landfill was finally capped.

A few of these disposal areas were not landfills by definition. They were basically placed where people dumped their garbage over a cliff. In many cases, a good portion of this trash ended up below the high water mark and was redistributed during flood events. Most of these areas have been cleaned up of the solid waste. However, there are no testing wells at these sites to monitor for potential chemical contamination.

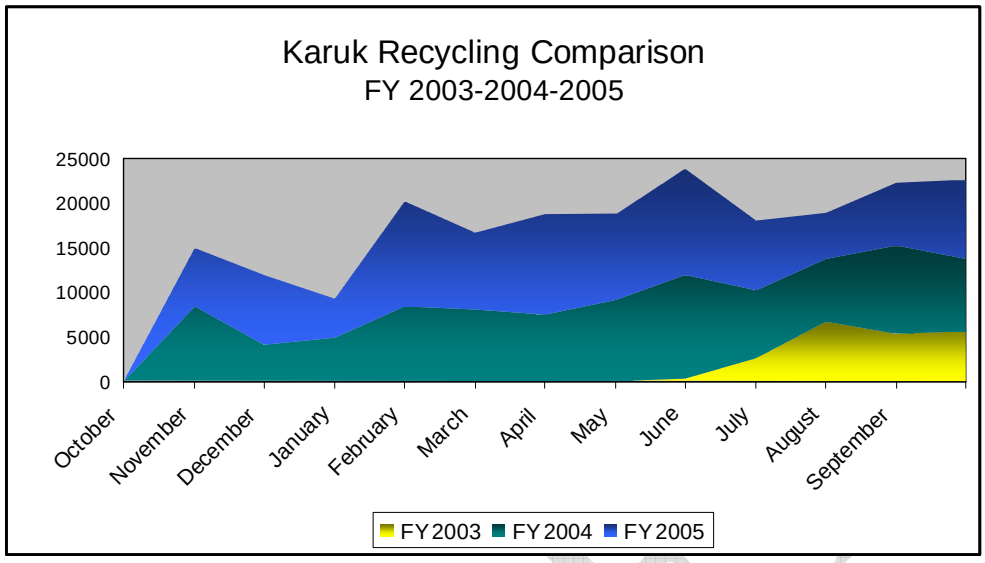
There are many personal accounts locally of Forest Service Personnel being asked to dispose of 2-4-D, and 2-4-5-T directly into the landfills following the herbicide ban in the late 1970's. This could be causing great harm to ground water quality, and may be going unnoticed as the testing of the wells do not look for these contaminates (Alam et al. 2000, USDL-OSHA on-line index).

The management of human excrement changed drastically thorough this time period as well. This went from the traditional nutrient cycling through the use of decomposing wood, to outhouse pits, to the individual septic systems that are in use today in most areas.

Current:

Waste generated by the Karuk Tribe is primarily managed by the Grounds Maintenance Department, although each Department is responsible to develop protocols specific for their field of expertise. Tribal facilities are served either by a collection service or by Tribal Grounds Maintenance crews that collect waste generated by our offices and facilities and take it to the local disposal facility.

The Orleans, Somes Bar, Happy Camp and Forks of Salmon communities (Tribal and non-tribal) are serviced by the Karuk Mobile Recycling Trailer Pilot Program. The Program began in 2003, and since then, we have successfully averted 108 tons (215,720.7lbs) from landfills, burn barrels and illegal dumping, an average of 36 tons per year! This program is currently unfunded, but when finding is available we regularly recycle 13 items (glass, cardboard, magazines, white paper, office pack, newspaper, steel, tin, plastics (#1, #2, #3-7), batteries, aluminum, packing peanuts, and telephone books. We also host recycling events such as the American Automobile Association (AAA) Battery Round-up, multi-area abandoned vehicle collection, and white goods recycling events (appliances, etc). Each year the program was funded our recycling program grew.



The current Mobile Recycling Trailer Pilot Program has had outstanding success, but revenues from the recyclable materials are not enough to support this program. The success has emphasized the need for the continuation of this program and the goal is to expand and create a cost effective, if not self-supporting, permanent program. The focus of the current program has been data collection and infrastructure development.

There are some remaining illegal dumping sites scattered throughout the Karuk Aboriginal Territory. Some of these still end up in watercourses. The Tribe participates in annual River Cleanup events that help to alleviate, but does not prevent this problem entirely.

Future Desired Conditions:

Given the complexity of coordinating the resolution of solid waste issues amongst all Tribal departments, affiliates, and local communities, this program is pursuing its own Integrate Solid Waste Management Plan. This plan will be incorporated into this document as an attachment.

For the purposes of this document the desired future conditions that should be addressed in the ISWMP include but are not limited to; increased reuse/recycling opportunities locally, affordable disposal, waste reduction, eliminate illegal dumping, cleanup of illegal dump sites, and litter removal/aversion strategies.

The department envisions being actively involved in all aspects of solid waste management. However the ISWMP should identify to what extent our involvement will be.

Soils/Minerals:

A Soil/Minerals Program has yet to be officially established by the Department. Some functions of a soils program have been taken on by other program staff in Watershed Restoration. The department's role has consisted mostly of consultation and coordination with agency staff, participation on project level Interdisciplinary Teams, and NEPA documentation. Geologists and soil scientists' consultants have been utilized when specific skills for planning and analysis are needed. With national federal policies relating to mining and aggregate development there is need to develop Karuk soils and minerals management practices and principles into an integrated departmental program.

Resource Concerns:

Past and current mining activities have destroyed and degraded the environmental quality Karuk People depend upon for cultural survival. The effect of past hydrologic mining has resulted in many areas that are in need of geologic stabilization and reconfiguration, vegetation management, and toxic clean up to remove mercury, acid mine drainages, cyanide spills and other contaminates (Sierra Fund 2008).

The recent onslaught of recreational suction dredging activities can threaten fisheries habitat quality, water quality and produces foreign materials and substances known to be harmful to the environment (Moyle in Bacher 2007).

Aggregate and rock material sources need to be inventoried and developed and preferably implemented in the interest of restoring areas covered with old mine tailings with methods that prevent damage to off-site natural resources or that are consistent with natural disturbance regimes.

Locations of culturally significant minerals need to be protected from extensive mining and/or monitored to prevent excessive damage to habitats or water quality, examples midden soils, white and blue clay, soap stone, serpentine and nephrite or "jade" quarries. Soil erosion associated with management activities need to be inventoried, monitored, and mitigated or formulated in the interest of resource protection and habitat restoration.

Goals:

Protect water quality and fisheries from mining, mineral extraction, quarry, and soil disturbance activities. Promote intensive regulation and evaluation of mining or mineral extraction methods and practices that can potentially degrade other resources. Enhance knowledge through monitoring of impacts and effects to the environment associated with past and current mining or aggregate activities to improve operations. Restore degraded areas affected by mining, aggregate, quarry, or road related soil disturbance, that include but are not limited to recovery and removal of toxic contaminants, reduce soil erosion, improve natural hydrologic function, re-vegetation, and protection of cultural/natural resources.

Objectives:

Implement restoration measures that mitigate damaged areas affected by past hydrologic mining to minimize soil erosion, reconfigure topographic contours and drainage, and manage vegetation to enhance the structure and composition to accommodate natural processes (fire, hydrologic connectivity, and nutrient cycling). Remove and/or reduce the presence of toxins such as mercury, sulfuric acid and cyanide in sediment deposits and watercourses. Monitor and reduce the effects and activities associated with suction dredge mining along the Klamath and Salmon River watersheds. Inventory rock sources and mitigate for erosion potential and off site sediment delivery. Develop economically and environmentally low impact methods of aggregate removal to supply for local upgrade, maintenance and restoration activities. Work with Federal, State, and County Agencies, and community groups to ensure cultural/natural resource protection measures are adequate and in place.

Historical:

Prior to mining in the 1850's, the Karuk practiced limited amounts of mineral extraction. Soap stone was extracted from boulders or collected from sources resulting from natural landslides. Other minerals, primarily salts, and materials for paints were collected on the surface. Obsidian traded from other Tribes was sometimes buried to maintain use quality.

With the discovery of gold the 1850's non-Indian settlers began to establish claims and develop mines along rivers, creeks, terraces, and upslope areas. The diverse geology and minerals of the area allowed diversified mining of gold, silver, cooper, and other economically valuable metals and minerals (Irwin 2003). Hydraulic mining and the use of mercury and cyanide to recover gold, resulted in the wide spread removal of vegetation, erosion and pollution (Alpers et al. 2005).

Hardrock mines in many cases exposed sulfite deposits to water and oxygen causing them to change to sulfates and subsequently caused chronic acid mine drainage. This has also occurred in tailing disposal areas that were improperly placed in wet areas.

Many Karuk villages, houses, and cemeteries on river terraces were washed away as result of mining operations sometimes with people still in the house (Bright 1978). The subsequent damming, moving of river channels, dredging and suction mining impacted river courses, fisheries and aquatic habitat quality. After World War II, increased road building and associated aggregate development further impacted watershed values, wildlife and fisheries habitat.

Current:

Degraded watersheds have slowly recovered from initial mining, road building, and aggregate activities. Many areas still have unstable slopes and higher than normal erosion rates resulting from formal mining, road building, and aggregate projects. Restoration of

degraded mining sites which have re-vegetated remain to be issues of concern. Properly functioning hydrologic connectivity in some watersheds is impaired from former mining ditches, diversions, and tailings.

Roads traversing highly erosive and unstable soils result in degraded water quality and fisheries habitat. Suction dredging, recreational and commercial, impact fisheries habitat and water quality. Small localized surface and placer mines for minerals or rare stone (nephrite-jade and/or serpentine-type) can have potential impacts to water quality resulting from off-site sediment transport, but are a small percentage of the overall impacts associated with mining, roads, or aggregate activities.

Future Desired Conditions:

The Karuk Tribe desires the implementation of methods to limit and/or mitigate for the sediment transport or delivery of materials which degrade water quality and fisheries habitat. Where feasible, areas contaminated with mercury or other toxins should be located, decontaminated, and restored. Additionally, in-active mines should be properly contained to prevent off-site transport of material or contamination of ground and surface waters. Limit the use and methodology of suction dredging in rivers and creeks at times and locations that may threaten fisheries or water quality.

There is also a need to restore hydraulic mine areas in many instances, these areas are directly adjacent to watercourses. These areas do not maintain a significant vegetation component and subsequently can contribute to excess heating of adjacent streams.

Some stream channels have been significantly altered due historic mining and agricultural activities. These areas should be restored to the point that hydrologic functions such as sediment deposition along stream banks and riparian habitat cycling can naturally occur.

Watershed Restoration:

The Watershed Restoration Program was established in 1996 in the interest of developing a programmatic approach to watershed restoration in the Karuk Aboriginal Territory. In collaboration with various partners, we have established a framework to identify, plan, and implement projects that benefit water quality and quantity. Redefining and expanding the role of the Karuk Tribe in managing traditional cultural/natural resources has brought about the development of a watershed restoration partnership between the Karuk Tribe and the Forest Service. Building the Tribe's capacity to play an integral role in ecosystem management is an effective means by which the Mid-Klamath and Salmon River sub-basins will be restored and integrated resource management achieved.

Resource Concerns:

Environmental degradation within the Karuk Aboriginal Territory affects water quality, forests, fisheries, and cultural sites important to the Tribe. Anadromous fish species are culturally valuable, and the restoration of riparian, aquatic, and upslope habitat is crucial for their survival.

Current watershed conditions are influenced by various disturbances in combination with a large percentage of unstable or erosive land and soil types. Road systems were developed to provide access primarily for timber extraction, and subsequently for fire suppression. Studies in the Mid-Klamath Region have shown that roads are a primary contributor of sediment into stream courses. Sediment input from source roads has two generic causes; landslide derived sediment and surface erosion. Landslide mechanisms in territorial watersheds are primarily debris flows and torrents. Surface erosion takes the form of rills, gullies and dry raveling from steep road cutbanks. Many of these problems are triggered or compounded by excessive water channeling, inter-drainage water transfers, and exposure of cutbanks to frost, wind, and rain splatter (USFS LMKWA 2003).

The Karuk Tribe has determined hydrologic restoration of problem roads and instream habitat connectivity to be a high priority within the within the Karuk Aboriginal Territory. The vast majority of roads and culverts were designed and constructed utilizing a 20-year flood standard. These culverts do not meet current design standards (100-year flood standard) or regional policy. It is predicted these culverts will fail during large storm events.

Roads that are in the upper segments of watersheds, specifically affect the mid and lower portions of creeks. A declining road management budget has decreased road maintenance leading to degenerated road systems. The majority of Karuk territorial drainages do not meet fines or embeddedness values for the Northwest Forest Plan, National Marine Fisheries Service Matrix of Factors and Indicators, or reference streams.

Excessive fines and substrate emdeddedness can decrease embryo emergence, fry survival, invertebrate populations that serve as a food base, rearing habitat available for juvenile salmonids, and pool frequencies (Hicks et al. 1991). High sediment levels also contribute to the impairment of the Klamath River effecting temperature, nutrient and dissolved oxygen levels reducing refugial capacity. At risk fish populations have been severely impacted by this impairment. Restoration of these quality habitats has been deemed critical and necessary as having valuable water quality benefits when hydrologically restored.

Many parameters of water quality in the Klamath River are maintained or notably improved as the river flows downstream of Seiad Valley and is diluted by cool high quality water from the numerous tributaries of the Lower Mid Klamath. Water originating from the Upper Klamath Basin, Shasta and Scott valleys are often poor quality in the summer due to agricultural use, dams and industrial discharge. The pure cool water from these tributaries is important and critical in maintaining water quality in the Klamath River and providing thermal refugia for anadromous fish species.

Other activities affecting the Karuk Aboriginal Territory include past hydraulic mining operations and massive flood damage. Hydraulic mining has left stream channels unbalanced and often disconnected from the Klamath River. In addition, major flooding following dam construction and wetlands reclamation in 1955, 1964, 1997 and 2006 compounded past land use problems and significantly altered many tributaries. Efforts should concentrate on restoring form and function to these areas.

Preliminary estimates of restoration activities needed would include:

1. Road upgrading/decommissioning and slope stabilization across jurisdictional boundaries
2. County and State highway upgrades
3. Fish Passage
4. Streambank Stabilization
5. Refugia Enhancement
6. Riparian Planting

7. Restore connectivity, and refugial capacity of tributaries along the Klamath Mainstem.
8. Instream habitat protection and enhancement

Goals:

Protect watersheds from road related erosion, water quality and/or habitat connectivity problems. Promote activities in tributaries that contribute to the quality and availability of spawning, rearing and migration habitat, for Threatened and Endangered, anadromous, and resident fish populations. Enhance the quality and quantity of water and correlating microhabitats in territorial watersheds as they relate to road related impairments. Restore road related hydrologic function within and adjacent to high priority roads and/or watersheds.

Objectives:

Establish and maintain beneficial partnerships through collaboration with Agency staff to plan and implement watershed restoration projects. Implement watershed restoration projects while providing job training opportunities, and community economic development. Build capacity and develop infrastructure in the interest of reducing restoration costs, while providing for timely habitat recovery. Coordinate with departmental program staff to achieve maximum planning integration and coordinated implementation of multiple resource objectives.

Historical:

Historically the Karuk People utilized a system of trails within the Karuk Aboriginal Territory for travel, trade, ceremonial and subsistence uses as well as a link to neighboring tribes (Gates 1995, Lake 2007). These trails are predominately located along the river corridor and ridgelines (Gates 1995). Some of these trails are utilized to this day for a variety of purposes. Other portions of this trail system were incorporated into the USFS trail and transportation system (Gates 1995, Lake 2007).

Post World War II, an extensive road system was developed to provide access to private property, gold mines, for fire suppression, and extended to timber extraction. In limited cases, short spurs were created for recreational river access. This road system now provides access to many parts of the watershed for a variety of human uses, e.g., timber and fire management, recreation, access to wilderness trailheads, hunting, woodcutting, gathering, sightseeing, etc. These access points can cause resource impacts on streams, riparian areas, and to wildlife. A declining road management budget has decreased road maintenance throughout the Aboriginal Territory (USDA-FS SRNF 2003a).

Current:

Naturally occurring erosion rates within the Karuk Aboriginal Territory have been greatly accelerated by human activities, especially federally managed timber harvest and road building (Irwin et al. 2006). Today, the Aboriginal Territory contains approximately

3,615 miles of road and over 4,400 perennial stream crossings, most of which need to be addressed in some manner. These roads need to be upgraded, including culvert replacement and road out sloping, and in some instances need to be decommissioned in the interest of restoring hydrologic function and increasing water quality (Luce and Black 2001, Madej 2001, USDA-FS SRNF 2003a).

State Highway and County road systems have become primary fish passage barriers on many streams in the Klamath River system (Taylor et al. 2002). In many cases construction of these roads has created velocity barriers and changed the natural hydrology of streams (Flannigan et al. 1998). This has reduced the quality and quantity of habitat upon which anadromous and resident fish species rely. In many areas within the Karuk Aboriginal Territory, culverts are failing during peak flood events, causing additional sediment input into the mainstem Klamath.

Current policy relating to emergency flood repairs is hampering the ability to upgrade these problem areas that are failing during every major flood event. Upgrades cannot currently occur as part of emergency work under these policies. The cost of upgrading these areas to allow for fish passage and natural hydrologic function is minimal compared to the emergency work that is needed during every 10, 50, and 100 year storm event. This is especially true when accounting for the value of a perpetual fishery resource.

Future Desired Conditions:

To achieve a future desired condition the initial step would be to perform a territory-wide analysis on a watershed scale that will identify current road system uses, impacts, and resource concerns, and recommend strategies for future transportation system management; decommissioning, hydrologic restoration, and maintenance (Luce et al. 2001, Luce and Blacke 2001). This analysis would also identify other collaborative restoration opportunities to mitigate the negative ecological impact of post-contact management activities on the landscape and be prioritized based potential achievement of multiple resource objectives.

The end result of these restoration activities would reduce the impacts of the current transportation network, and post contact management activities while still allowing for the management and utilization of cultural/natural resources within and adjacent to the Karuk Aboriginal Territory.

Water Quality:

The Water Resources Program was established in 1993 to conduct monitoring, research, and convey Tribal concerns relating to watershed management activities in the Klamath River Basin with particular focus on issues affecting water resources within and adjacent to the Karuk Aboriginal Territory.

The Karuk Aboriginal Territory has over 1,900 miles of perennial streams, thousands of acres of wetlands and riparian areas, and approximately 107 lakes. The Klamath River is

the primary water body that exists on the Karuk Aboriginal Territory. Approximately 90 miles of the Klamath River transects the Territory. Several major tributaries flow into the Klamath within the Karuk Aboriginal Territory.

The Klamath River is on Oregon and California's 303(d) list for impaired water bodies. Specifically, the Klamath River is listed as impaired for temperature, nutrients, and dissolved oxygen. Some of the major tributaries to the Klamath are also listed: the Shasta River for temperature and dissolved oxygen, the Scott River for temperature and sediment, and the Salmon River for temperature. Total Maximum Daily Loads (TMDLS's) are being developed for the Klamath River and tributaries listed above and development should be complete by 2007. Implementation of the TMDL's is a lengthy and costly process. A variety of stakeholders need to be involved in TMDL implementation in order to achieve a successful outcome.

In 2000, the Karuk Tribe developed interim water quality standards. In order to support beneficial uses and Tribal Trust Resources associated with COLD waters, a maximum temperature of 21°C and a maximum seven-day average of 15.5°C was established. These temperatures are often exceeded in hot summer months in both the Mainstem River and major tributaries. For example, it is common for temperatures to reach 26 and 27 C in July, August, or September. High temperatures are detrimental to sensitive Tribal Trust Species such as steelhead, Chinook salmon, Coho salmon, green sturgeon, and lamprey (Karuk Water Quality Report 2008).

Resource Concerns:

Temperature, dissolved oxygen, sediment, nutrients and toxins are all major concerns relating to water quality within and adjacent to the Karuk Aboriginal Territory. Water quantity can compound the effects of these problems. All of these issues can and do have lethal implications to Tribal Trust Species. Temperature, flow, and nutrients effect dissolved oxygen, which can weaken fish stocks and make them susceptible to disease and parasite intrusion.

The Karuk Tribe relies on a healthy fishery for subsistence and ceremonial uses. In recent years Tribal members have been concerned as to the health affects that may be associated with consumption of sick fish. In September 2002, close to 100% of fish caught for consumption had symptoms never before seen at the Tribal Fishery. It was noted that within one week after increased water release from Irongate Dam, there was a noticeable reduction in symptom severity. By this time however, over 68,000 adult salmon had died. This event can be directly tied to water quality and quantity related problems. Aside from this major fish kill, there are juvenile fish kills annually that are also directly related to the above issues.

There are other concerns that are specific to Tribal Ceremonies. Some ceremonies not only involve bathing in the mainstem Klamath, but require consumption of Klamath River water. The current condition of the waters in the Klamath no longer allow for this important practice. This places an undue burden on our rights to freedom of religion.

Toxins have recently become a major water quality concern. In 2005 the toxin microcystin was discovered in the Klamath Basin (Kann and Corum 2006). This toxin is caused by the decomposition of the algae *Microcystis aeruginosa* (Kann 2006). There has been one human death that has been linked to potential microcystin poisoning from consumption of blue-green algae diet supplements harvested within the Klamath system. This toxin causes cumulative degenerative liver failure and can be contrived through consumption and inhalation. Numerous dogs have also died in the area where this toxin was discovered.

Comment [MSOffice1]: The death is unconfirmed to be caused by the toxin.

Goals:

Protect the health of human, aquatic and terrestrial species from water quality impairments within and adjacent to the Karuk Aboriginal Territory. Promote sound water management practices that improve water quality conditions. Enhance the quality and quantity of waters within the Klamath River Basin. Restore water quality conditions so Tribal and local communities can safely use water bodies for ceremonial, subsistence, and/or recreation needs.

Objectives:

Work with Tribes, Federal and State Agencies, Nongovernmental Organizations, and Community Groups to achieve water quality goals for the Klamath basin. Establish and implement federally recognized water quality standards for Karuk Aboriginal Territory. Coordinate with stakeholders in the basin to monitor water quality trends in the Klamath River and major tributaries. Participate in processes independently and with stakeholders to plan and implement the enhancement, protection, and restoration of water quality and quantity. Coordinate research efforts in the basin to address issues related to water quality and watershed health.

Historical:

Historically, the Klamath River and its tributaries supported a healthy fishery which in turn reflects and supports a healthy ecosystem. The flow regime in the river was dictated by natural processes including winter rains, snow melt and wetland recharge. Karuk upslope management practices encouraged healthy water quality conditions by supporting large wood in riparian areas and maintaining balanced evapo-transpiration rates through vegetation manipulation. This allows for large woody debris recruitment into the creeks which can increase pool depths and decrease water temperature while decreasing winter peak flows and increasing summer base flows.

The hydrology of the Klamath River Basin prior to European contact created the habitat and maintained the water quality in which anadromous and resident fish species evolved. The natural fluctuations in flow regimes were regulated naturally by the terrain surrounding the Klamath system. During peak weather events, flows below the current location of Keno Dam were regulated by the flooding of the Tule Lake Region. When peak flood events occurred (10, 50 and 100 year events) a narrow natural reef at the

current location of JC Boyle Dam pushed thousands of acre feet of water into Tule Lake until it overflowed back into the river above another narrow reef at Keno (Gannett et al. 2007).

This caused a minimal increase in flows below Keno during the storm event. When the Tule Lake Region filled with water the river flowed backwards back up to the location of JC Boyle towards the end or after the storm event. This water recycled through this region in circular motion as the water slowly increased below Keno. As the flows began to increase from Keno the creeks below this area would start to recede. As flows from Keno began to receded, the spring snow melt would begin and the creeks below this area would once again rise while flows from keno would be maintained. Ground water flows from wetland recharge helped to maintain spring fed flows throughout the summer months (Gannett et al. 2007).

Karuk Ceremonies relating to fishery management began during the spring peak (Roberts 1932). This natural balance in flow regime peaked during the spring influx of salmon and the out-migration of adult steelhead and juvenile salmonid in April or early May. This flow regime allowed for the passage of salmon above the current location of the Klamath Dams and spring salmon were allowed to pass undisturbed through the Lower and Middle Klamath Sub-Basins during this time (Hamilton et al. 2005).

Since European contact, water quality conditions have been drastically impaired as witnessed by the decline of fisheries resources. These changes are due to draining wetlands, building dams, agricultural runoff and land conversions, water diversions, fire suppression, nontraditional forest management practices, mining, and road building.

Current:

Current water quality conditions flowing into Karuk Aboriginal Territory do not meet the Karuk Tribe's interim water quality standards for several parameters in the mainstem Klamath River. The most commonly monitored of are temperature and dissolved oxygen. When these levels are not met, they may become stressful and potentially lethal to Tribal Trust Fish Species. Also, flows that are regulated by upstream users are frequently not adequate to allow natural physiological processes to occur in the river. This may increase frequency of disease, increase water temperatures, and limit the river's ability to clean itself of excessive nutrients.

Drastic increases and decreases in water release from the dams cause stranding of juvenile fish in side pools disconnected from the mainstem Klamath. Extremely low releases in the summer force fish into minimal cold water refugia areas until the first fall rains. Salmon in this watershed that were once abundant in this system throughout the summer are now reduced to a minimal spring run and a late fall run as conditions are currently inadequate to support the life cycles of these fish (National Research Council 2007).

Future Desired Conditions:

Increased water quality and quantity in the Klamath River basin and particularly in the Karuk Aboriginal Territory is desired. Increasing these conditions will enhance fisheries, ceremonies, and subsistence activities, as well as every day activities such as recreation and the general health and wellbeing of all people living on the river.

To increase water quality and quantity, management practices should be adjusted. For example, to increase stream shade, large woody debris recruitment, refugial capacity, and summer base flows, it would be best to integrate Karuk Cultural Environmental Management Practices. This management was successful for thousands of years and could help return the landscape to a healthier condition.

Flow management and water conservation needs to be incorporated so that flows mimicking natural hydrologic function are reinstated throughout the Klamath River basin (National Research Council 2007a). This will encourage healthy populations of Tribal Trust Fish Species and allow for natural processes in the river to enhance water quality.

Other water quality improvement actions that should be addressed are the reduction of roads, dam removal, wetland restoration, natural fire regime restoration, and other watershed restoration activities. This will balance sediment and nutrient input into the streams while allowing fish passage and maintaining adequate base flows which will enhance fishery habitat, water quality and quantity conditions.

Wildlife:

The Karuk Tribe currently has no official Wildlife Program. There is critical need to have a wildlife biologist position to serve as a wildlife program coordinator. This position would be responsible for achieving the research and surveys needed in order to comply with the NEPA process when planning watershed scale restoration and species conservation activities. Compilation of Biological Opinions and conveyance and documentation of important life cycle information for various species is needed when planning and monitoring projects designed to achieve multiple resource objectives.

Resource concerns:

The Karuk culture relies upon various wildlife species as food, medicine, materials, and ceremonial regalia. Many wildlife species once historically abundant are now rare, threatened, endangered, and extinct or have experienced degradation of their population levels and correlating habitats (Noss et al. 1999).

Of greatest concern in terrestrial environments are the management and population viability of elk and deer and the restoration of habitats needed to support these animals. Also important is the reintroduction of eliminated or extirpated species. Habitats that support the diverse multitude of culturally significant wildlife species are dependant upon fire and fire induced habitat changes at the landscape level. Elk, deer and other foraging

wildlife help to maintain vegetation re-growth in between fire events (Klinger et al. 1989). In turn, these fire events help to maintain viable populations of foraging wildlife.

The Karuk Tribe believes that the lack of landscape level management of wildlife habitat through cultural burning practices and natural ignitions is what threatens most wildlife species. Natural wildland fire events and free practice of low intensity cultural burning is needed to restore the composition, structure, function, and productivity of wildlife habitat necessary to increase the distribution, and abundance of wildlife species populations.

Goals:

Protect wildlife and correlating habitats from further degradation, caused by post contact management practices. Promote sound management practices based on Traditional Ecological Knowledge and Western Science. Enhance wildlife habitat and population viability. Restore the interconnectivity of correlating habitat types and traditional eco-cultural maintenance schedules.

Objectives:

Coordinate wildlife species habitat management and population monitoring with Tribal Federal, State, and County, governments, non-governmental organizations, and local community groups. Manage wildlife through forests, shrub, and grassland habitat restoration activities utilizing hand and mechanical treatments in conjunction with identifiable fire ignition strategies. Focus restoration activities on culturally significant forest, shrub, and grassland habitats through landscape level planning to support holistic ecosystem management (Hillman and Salter 1997). Re-establish inter-connectivity between various habitat types across the landscape to foster gene flow and dispersal of wildlife necessary to sustain viable wildlife populations. Where appropriate, manage for single/indicator species in an effort to prevent further habitat loss, degradation, endangerment, local extinctions, or allow for reintroductions.

Historical:

The Karuk historically managed wildlife habitat and populations through the judicious use of fire and harvesting practices (Lake 2007). Central to Karuk wildlife management philosophy, practices employed facilitated and sustained productive wildlife habitat and protected species during vulnerable life stages. The Karuk belief system charges humans with the responsibility to manage and care for wildlife in a reciprocal and respectful manner.

Historically, many culturally significant wildlife species primarily used for food, materials, tools and ceremonies had special laws or rules governing the harvesting and utilization of those species. Since the suppression of Karuk traditional management, regulation and harvesting practices, wildlife habitat and populations have been severely degraded to the point of local extinctions of some species.

Mining, over-hunting, fire suppression, timber harvesting, road building, herbicide programs, urbanization and other Federal State and County resource management objectives have further degraded wildlife habitat populations. Species such as grizzly bear, wolves, condor, elk, porcupines and other mega fauna requiring large tracks of diverse habitat have gone extinct or in many cases have been locally extirpated. Porcupines, from which the quills are used for regalia and basketry overlay, were reported to have been rare or locally scarce prior to extensive logging (Yocom 1971).

Current:

Past and current land management activities have facilitated a current condition of fragmented wildlife habitat and threatened wildlife population viability (Noss et al. 1999, Noss 2000). Extensive road networks, reduced frequency and extent of low to moderate landscape level fire intensities and poor regeneration of mature/old growth fire resilient forest structure, composition, function and ecological processes have an impact on wildlife (Smith in Higley [on-line]).

Roads impact wildlife dispersal routes, core reproductive and rearing habitats, and increase negative human-wildlife interactions (Noss 2000). Reduction in the frequency and extent of low to moderate intensity fires across the landscape, particularly at low to mid elevation areas has resulted in densification of forests (Skinner et al. 2006). Reduced surface water (springs and creeks) due to increases in vegetation water use, and post fire induced productivity resulting in the loss of diverse habitats can be attributed to these past management practices.

Generally, grasslands, oak and pine dominated forests habitats have been reduced (Reigel, et al. 1992, Salazar et al. 2002, Skinner et al. 2006). Homogenization of forests types has resulted in lower wildlife forage quality (feeding), and smaller breeding and rearing areas. Ungulate populations, primarily black-tail deer have declined, and Roosevelt Elk had to be re-introduced. Neo-tropical/migratory bird populations have decreased (Robinson 2005). Fur bearers, such as, fishers, pine-marten, ring tail cat, fox, mink, river otter, porcupine and beaver have all declined (Noss et al. 1999, Schempf and White 1977). Porcupines are tribally recognized as being an important prey species for fishers, were actively poisoned by federal and state forestry programs and as a result of eradication have been come scarce. Western scientific studies in to the prey-diet base of fishers reports that porcupines are an opportunistic prey of fishers (Golightley 2006).

The Karuk Tribe is currently interested in establishing a wildlife program with qualified staff to survey, monitor, analyze, plan, prioritize and facilitate the restoration of key fire dependant wildlife habitats and extirpated species re-introduction.

Future Desired Conditions:

The Karuk Tribe desires to regain the rightful entitlement to manage and restore wildlife habitat, populations and harvest culturally significant wildlife species. Restoration of traditional management practices with the use of fuels reduction, prescribe fire and

wildland fire use should significantly improve wildlife habitat and correlating population densities.

These practices can restore fire adapted, dependant, and resilient habitats of grasslands, oak and pine forests, selected riparian zones, mixed conifer/hardwood forests, and high elevation meadows. Traditional human interacted natural disturbance regimes will increase the productivity and diversity of grassland and forest habitats through the use of landscape fire planning, implementation and appropriate management response.

Restored habitat and species composition will increase production and population viability which in turn will assist in the maintenance of restored landscapes and help reduce the threat of uncharacteristically intense wildland fires.

Collaborative Framework:

The collaborative framework needed to appropriately identify, plan and implement watershed scale restoration priorities, as well as maintain treated areas, will require collective vision and long term dedication. The National Fire Plan calls for local planning and implementation to handle local problems (see: A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan December 2006). The five documents that comprise the National Fire Plan should help to focus the collective vision, which will benefit all aspects of ecological stability through restored fire adapted ecosystems.

This leaves successful collaboration reliant on long term dedication and agreement between planning partners. The Karuk Tribe believes that in order to maintain long term effectiveness there is a need to incorporate a diversely unified approach involving Tribes, agencies, local business, non-profit organizations, community groups, academia and local citizens. When conclusive or established scientific findings are lacking, or available science is contrary to TEK, mechanisms should be in place as to how differences in opinion or profession judgment can be resolved. A collaborative framework to improve scientific investigation for increasing what is understood of species-habitat relationships to other ecological processes (e.g. hydrology and/or fire effects) could assist in resolving disagreements over the consequences of various management actions (Sherry et al. 2005).

This approach can be formulated in a manner consistent with the Karuk Environmental Management Practices Demonstration Area Concept Paper, developed by the Karuk Tribe and USDA Forest Service Six Rivers National Forest. The Karuk Tribe believes that in formulating such structure into a true Interagency/Tribal Partnership between all parties claiming concurrent managerial responsibility over lands or resources would be the most effective in ensuring long term dedication to collaboration and participation in a co-managerial context and/or as true partners in stewardship.

"This commitment by the Forest Service and the Karuk Tribe extends beyond our standard governmental relationships to one of a dynamic interactive partnership that seeks to meet cultural, spiritual, and environmental needs of the Karuk and other local

communities by utilizing traditional ecological knowledge as a base for decision-making in the Karuk Environmental Management Practices Demonstration Area." (KEMPDA 2005)

The Karuk Tribe believes that looking at the ecological restoration needs at the appropriate scale will help to localize prioritization based on potential for achievement of multiple resource objectives, while ensuring integration of the local knowledge base. Numerous field trips and meetings with community groups, local citizens, and interested participants will help in the transference of understanding between interested parties, managers, and the implementation workforce.

It should be understood that such partnerships need to include Interagency/Tribal fire crews as a significant workforce in many aspects of stewardship based restoration efforts. Other efforts should occur as co-administered (Agency/Tribal) contracts or agreements for other specialty work, while providing a local boost for small rural businesses and providing supply for larger industry. This will increase accountability and beneficial value of federally funded fire crews while restoration byproducts would retain more value to reduce the costs associated with additional ecological stewardship work.

Adoption of Interagency/Tribal adaptive co-management partnerships/authority across jurisdictional boundaries is the preferred method of managerial operations within the Karuk Aboriginal Territory (Dietz et al. 2003, Olsson et al. 2004, Houde 2007). However, if this operational infrastructure cannot be developed and accepted as mutually beneficial to all involved parties, the Tribe may choose to implement other means to achieve recognition of jurisdictional authority and/or managerial responsibility in the interest of meeting the intent of this plan.

Prioritization Framework:

Prioritization should occur on differing levels and geographic scales. The first geographic scale would be the Karuk Aboriginal Territory. This area should be broken down to planning landscapes in coordination with collaborative planning partners. Agency policies, regulations, and management plans, should be developed and/or revised to accommodate coordination with the planning efforts of the Tribe, NGO's, and Community Groups. This would enable true collaborative working relationships across multi-jurisdictional boundaries.

The next level of prioritization would be at the planning landscape scale. Hydrologic Unit Compartment(s) most representative of local firesheds would most likely comprise this planning scale. This is where planning efforts should be accounting for: fire histories, wildlife populations, anadromous fisheries, management indicator species, habitat connectivity, impaired wetlands, cold water refugia, natural/cultural fire regime, condition class, vegetation type, slope, aspect, elevation range, cultural and recreational uses/values, CEMP's, and programmatic resource objectives. Areas within this scale would then be broken down into manageable resource areas and prioritized based on

potential for achieving multiple resource objectives while restoring natural disturbance regimes.

The third level of prioritization would be at the resource area scale. The resource area scale is considered to delineate as implementation areas specific to individual CEMP's within a particular landscape or management designation. Consideration of programmatic implementation timing having to do with weather, elevation, cultural treatment windows, limited operating periods, and maintenance schedules as well as funding availability, would drive implementation priority. This level is more of a logistical prioritization utilized both pre and post planning. For example, areas with NEPA coverage that are nearing expiration could become an increased implementation priority in the interest of ensuring planning efforts and associated costs are accountable. .

Implementation and Effectiveness Monitoring:

Integrated programmatic effectiveness monitoring should occur in multiple forms at different levels. Monitoring for effectiveness will not only determine success or failure, but assist in implementation and integration of adaptive management principals. Management Indicators that are directly tied to Cultural Environmental Management Practices will be the foundation for a success, failure or adaptation determination. This monitoring strategy is intended to serve as a long term planning tool and may help identify additional resource management objectives through visual or scientific validation of increased quality of the land and resources.

Multi-party monitoring is welcome and encouraged. This level of implementation and effectiveness monitoring will help to ensure community participation and maintain a heightened level of increased collaboration locally. It can be implemented either through some established protocol developed by the other parties, or by community field trips before during and after management activities occur. This monitoring strategy should assist with long term planning and implementation efforts through generation of community support, identification of additional concerns to be addressed, and/or additional resource management objectives to achieve.

Multi-party monitoring should also include an element of scientific study to support actions, identify additional considerations and/or develop missing modeling inputs (see HFRA 2003). Partnerships with Agency/Tribal research teams, private contracting firms and/or academia would be beneficial in integrating traditional ecological knowledge with future actions and developments in western science. This monitoring component will be critical to establishing the understanding of Karuk managerial principles and how closely they relate to scientific principles. The difference between these two cultural backgrounds is in relation to variations in recognition and adaptation principles between oral transmission (TEK) and written record (western science) through time.

There is a need for developing procedures for having TEK assist land management strategies and practices. The effectiveness of implementing the Cultural Environmental Management Practices can be evaluated with western scientific methods using a set of

criteria and indicators, as well as feed-back from tribal community members as to the effectiveness of such practices (Sherry et al. 2005). Ecological criteria and indicators provide a broader framework for assessing how well and at what scale culturally relevant goods and services are being maintained, enhanced or degraded (Sheil et al. 2004, Sherry et al. 2005).

Cultural Environmental Management Practices

Karuk Cultural Environmental Management Practices are intended to more efficiently employ tribally driven restoration needs across broader landscapes. They are based on actions the Karuk Tribe wishes to achieve, while providing a baseline for prioritizing treatment areas and outlining success, failure, and the need for adapting site specific prescriptions. Though many of these practices will employ similar prescriptions, there may be minor differences in resource objectives and indicators for success, failure or adaptation determinations. The following practices and indicators should be whenever possible, combined, interconnected, or systematically prioritized at the watershed or landscape scale in order to achieve landscape level restoration of natural disturbance regimes while insuring valid site specific indicators are in place.

The following practices are to be implemented on Tribal Trust Lands, Individual Trust Allotments, and Indian owned fee lands. However, given the fact that these lands are too finely delineated to achieve success or effectively meet the intent of this plan; appropriate mechanisms need to be institutionalized to ensure extension of these practices and partnerships to include Cultural Management Areas, Traditional Cultural Properties, Ceremonial Districts, and areas critical to achieve consistency across multi-jurisdictional boundaries.

Management Practice 1

Reduction of Fuel Loading in Tan Oak Stands

Tan Oak stands and adjacent threats within prioritized treatment areas will be managed through the reduction of ground and ladder fuels. Fuels will be cut, gathered and piled with any appropriate materials removed for commercial cost offset, biomass supply and/or firewood. Tan Oak is very susceptible to high intensity fire, snow down and wind cast in overcrowded stands (USFS-FEIS data base). Only natural selection is to be utilized for removal (if any) of mature Tan Oaks. Not all large down trees should be taken as they are a host to many fungi, build soils quickly, and are in general a critical ecosystem component at natural (pre-contact) levels. Tan oaks have variable responses to disturbances, especially to different intensities of fire (USFS-FEIS). If mature tan oaks experience significant crown damage, burl sprouting will result. Younger tan oaks are may be top killed by surface fire of low to moderate severity. Larger diameter/mature trees can usually survive moderate-severity fires (USFS-FEIS, Agee 1991). High severity ground or surface fires can kill larger/mature trees (Roy 1957, Tappeiner et al. 1990) Season of burn, fall versus spring, is an important factor in the amount of tan oak mortality, with spring burns having been found to increase mortality (USFS-FEIS). After

thinning or wildfire, exposure to full sunlight can cause leaf scorch and crown die-back (Niemiec et al. 1995).

This tree species rots fast when on the ground and produces a lot of smoke and ash when burned. During high intensity wildland fire events there is an abundance of particulate matter generated and distributed into the atmosphere with potential global effects. When burned at a moderate to low intensity, this thick smoke settles into the valleys potentially causing human health issues. When burned traditionally, smoke generated remains local and reduces insect infestations, while reducing burn intensity, duration and subsequent severity during wildland fire events in these stands (USFS-FEIS).

Resource Objectives

1. Air Quality - Promote beneficial air quality management and restore the natural background of localized smoke emissions in this stand type during fire events.

2. Cultural Resources – Enhance the abundance and use quality of tan oak acorns**.**

3. Energy

4. Enforcement / Regulation – Promote development of subsistence, ceremonial, and commercial use ordinance.

5. Environmental Education - Enhance the traditional ecological knowledge base relating to tanoak and associated vegetation types.

6. Environmental Justice – Restore traditional resource usage and land management principals.

7. Fire/Fuels Reduction – Restore low intensity cultural fire management practices**.**

8. Fisheries – Promote watershed health and resilience.

9. Forestry – Enhance biodiversity and species composition.

10. NAGPRA – Protect physical cultural artifacts from detrimental fire intensities/burns.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals - Protect soil composition from hydrophobic conditions through the reduction of uncharacteristically intense fires.

13. Watershed Restoration – Enhance water quality through reduced potential for large scale sediment transport and deposition.

14. Water Quality – Promote balanced hydrologic function.

15. Wildlife – Enhance vegetative food base and habitat interconnectivity.

Management Indicators

1. The Tan Oak Acorn is the primary Management Indicator for this CEMP. A success, failure, or adaptation determination should be weighted heavily toward the use quality of this traditional food source. The reduced population of seed pest/worm infestations is the determining factor for this species [see Anderson 2005, and specifically for tan oak moths/pests]. However, the total absence of these worms should also trigger a failure and/or adaptation determination. In untreated stands these infestations serve a vital purpose of reducing acorn sprout production which limits brush accumulation. In treated stands the acorns should be gathered during the treatment activities. These acorns can then be utilized for ceremonial and subsistence purposes as well as commercial cost offsets when in abundance and markets are identified.

2. Sugar Pine population is another primary Management Indicator for this CEMP (van Mantgem et al. 2004). These trees need to be protected when existing within and/or adjacent to Tan Oak stands. Sugar Pine is a significant cultural resource at all life stages including snags and downed trees. The presence of sugar pine at all life stages may need to be re-established. This is a long term Management Indicator Species for many stand types. Excessive damage and/or removal of this species at any life stage in areas where the population is not in abundance should constitute a failure or adaptation determination. Sugar pine is not only utilized for ceremonial and subsistence purposes, the snags consist of high quality "black pitch" which is not only a traditional form of money, but is also utilized in the ignition of cultural burns. The remaining or restored presence of this species located even sparsely throughout individual firesheds, especially near probable cultural ignition points is grounds for a success determination.

3. The Tan oak/Matsutake mushroom is a secondary Management Indicator for this CEMP. This indicator will be hard to measure but is entirely necessary for the purposes of exercising care in fuel pile placement and ensuring minimal fire use intensities. Variables that make this a secondary indicator for this practice include commercial harvesting which may significantly effect the ability to monitor the species populations before, during and after treatment (Pliz and Molina 2002). A success or adaptation determination should be made based on the presence and abundance of the species following pile burning and wildland fire events. Relating to this indicator specifically, a failure or adaptation determination should be made if it is found that burning activities or wildland fires in treated areas cause a significant loss in site production (Hosford et al. 1997, Weigand 1998, Pliz and Molina 2002).

Management Practice 2

Reduction of Fuel Loading in Previously Managed Stands

Plantations threatening life, property, or cultural/natural resources within prioritized treatment areas will be managed through the reduction of ground and ladder fuels. Thinning of plantation conifers will be completed in the interest of releasing the existing hardwood and/or grassland components. Special attention should be given to maintaining shade in early entries to suppress brush and promote additional restoration byproducts for offsetting the costs of future management practices. All activity fuels should be removed, hand piled and burned, or chipped, with any appropriate materials removed for commercial cost offset, biomass supply and/or firewood.

Plantations are very susceptible to high intensity fire, snow breakage and are not conducive of developing wind firmness utilizing past management practices (Odion et al 2004). Conifer selection should be based on the ability to minimize damage to leave trees during operations while reducing potential damage in future entries (Smidt and Blinn 1995). Proper management of previously managed stands is critical to the restoration of fire adapted ecosystems. Plantation restoration may be the most appropriate way to reestablish and/or maintain diversity, healthy forest structure, and fire adapted ecosystems while supplying a sustainable yield of restoration byproducts.

When vegetation fires burn during high intensity wildland fire events there is an abundance of heat generated distributing particulate matter into the atmosphere (Houghton et al. 2000). When burned at a moderate to low intensity, plantations can still experience excess mortality reducing the potential to extract value added restoration byproducts to offset costs associated with future managerial practices [Pers. Com. Sue Daniels: USFS-KNF 2007].

(Above Left, Katimiin Plantation Thinning Project before treatment.) Note the abundance of contiguous ground and ladder fuels. In this condition, plantations can experience excessive mortality during wildland fires and are not readily accessible to many wildlife species.

(Above Right, Katimiin Plantation Thinning Project 3 years after treatment) Note the reduced fuel loading and minimal re-sprout. Enough shade component at ground level to reduce solar insolation and brush growth, yet enough light to canopy to protect shade intolerant species until next entry. Stage is set for restoration of species and age class diversity.

Resource Objectives

1. Air Quality – Promote fire resilient stand conditions, reducing the potential for extreme air quality impacts during wildland fire events.

2. Cultural Resources – Restore natural stand composition and associated cultural use species.

3. Energy

4. Enforcement / Regulation – Promote positive change in national management direction.

5. Environmental Education – Promote educational opportunities relating to restoration of balanced ecological systems.

6. Environmental Justice – Restore traditional resource management principals relating to ecological diversity.

7. Fire/Fuels Reduction – Restore fire adapted ecosystems.

8. Fisheries – Promote watershed health and resilience.

9. Forestry – Restore biodiversity and species composition through responsible timber harvest management.

10. NAGPRA – Protect physical cultural artifacts and/or restore site integrity.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Restore soil composition and structure.

13. Watershed Restoration – Protect water quality through road management, placement, maintenance and/or decommissioning.

14. Water Quality – Promote balanced hydrologic function and ensure compliance with Tribal Water Quality Standards and Federal Clean Water Act.

15. Wildlife – Restore access to food resources and habitat connectivity for a diverse range of species.

Management Indicators

1. Maintainable diversity of conifers, hardwoods, and shrubs within plantations is a primary Management Indicator for this CEMP. Preference to retain and enhance species such as, Sugar Pine, Black Oaks, Oregon White Oaks, Chinquapin, Hazel, Elderberry, and other shade intolerant species should be incorporated into management actions or prescriptions. Plantations currently hold the largest, most viable population of Black Oak trees that maintain the health and vigor that is conducive of restoring old growth Black Oak trees over time. Of course, this indicator only applies to plantations where this species is present. Plantations with Black Oak may also contain Hazel. A determination of success, failure or adaptation should be weighed heavily on the health of Black Oaks, as well as use quality of Hazel when co-existing on an individual basis. If plantations contain riparian habitat, retention, protection and/or enhancement of pacific yew, maple, Port-Orford cedar, mock orange, mountain willow, ferns, and other culturally utilized riparian species should be incorporated into management actions and/or prescriptions had hold weight towards success, failure and/or adaptation determinations.

2. Hardwood re-sprout and correlating ladder fuels accumulation is a primary indicator for this CEMP. Whenever possible, a shade component should be maintained in plantations and hardwood species should be pruned instead of cut completely. More light should be transferred to the canopies of individual shade intolerant species with less light being transferred to ground level during the first entry. After fire can be reintroduced, or sprouting potential has otherwise been mitigated, additional thinning should occur as needed. In the event that hardwood sprouting causes a significant increase in required maintenance intervals a failure and adaptation determination should be made based on individual species reactions to managerial disturbance. When actual re-sprout rates are effectively suppressed for long durations, treatments enacted should receive a success determination. Even with a success determination made, it is possible that adaptations to future prescriptions may achieve greater ecological benefit while maintaining success under this Management Indicator (McDonald and Vaughn 2007).

3. Non-native invasive species are a secondary Management Indicator identified for this CEMP. As the nature of previously managed areas suggest, there has been extensive unnatural disturbance regimes occurring over the past century (Brooks et al. 2004). This may have set a foothold for these species to potentially take over and create virtually unmanageable populations of highly flammable or competitive vegetation when restoring natural disturbance regimes. As a secondary indicator it is intended more as a trigger for an adaptation determination for incidental discovery, yet a requirement for success relating to this CEMP. Effectively suppressing spread of existing populations would qualify for a success determination as the mere presence of preexisting populations should not cause negative repercussions on restorative actions. However, the incidental discovery of populations should weigh towards an adaptation determination. Non-native invasive species which have established in plantations can modify or increase fire susceptibility and compete with native species (Brooks et al. 2004, Keeley et al. 2005)

Management Practice 3

Reduction of Fuel Loading Along Traversable Ridge Systems Interconnecting with Reasonable Control Features

Traversable ridge systems within prioritized treatment areas will be managed through the reduction of contiguous ground and ladder fuels. Fuels will be cut, gathered and piled with appropriate materials removed for commercial cost offset, biomass supply and/or firewood. Ridge systems are some of the most prominent features that are capable of confining, containing, or controlling wildland fires, but are in many cases incapable with excess fuel accumulations since fire suppression began.

Prominent ridge systems are very susceptible to severe fire behavior and reactive management practices during wildland fire events (Odion et al. 2004). Many ridges within the Karuk Aboriginal Territory have cultural and/or spiritual significance (Lake 2007). Large scale wildland fire events generally trigger suppression and/or management response efforts that have a tendency to denude the vegetation in preparation for back burning or burnout operations. These activities can cause flame lengths to triple whenever two flame fronts converge which can in turn increase fire severity. In many cases we are left with large tracts of land that are covered with brush re-growth and these suppression activities inherently become perpetual management practices.

Interconnecting treatment areas at the watershed scale can help to reverse this trend and maintain a safer working environment for firefighting personnel. It can allow more variance in the implementation of the appropriate management response and reduce the need for management ignited converging flame fronts. Utilization of management ignited fire within designated maximum management areas could then be in the form of blackline burnout rather than backburning, which may potentially reduce suppression rehabilitation and Burned Area Emergency Rehabilitation needs. Management and maintenance of these traversable ridge systems can enhance access and use quality for wildlife and cultural activities.

(Above left, Geary Fire 2005) Main ridge on west flank prepped for back burn, trigger point never reached, fire controlled at natural barrier. Excess suppression activity fuels remain untreated and vegetation re-growth will now be 30 years behind adjacent fuels potentially increasing future suppression/restoration complexity and/or cost.

(Above right, Geary Fire 2005) Adjoining ridge on east flank prepped for blackline burnout operations, flame lengths under 1 foot, future oak overstory remaining, shade left to reduce ground level insolation factors influencing fire behavior and suppress re-sprout potential. Stage now set for age class diversity and reduced costs for restoration efforts. Unfortunately, this treatment only occurred on approximately 200 yards of fireline.

Resource Objectives

1. Air Quality – Promote reestablishment of natural fire regimes and restore natural background smoke emissions to pre contact conditions.

2. Cultural Resources – Protect and enhance the integrity of spiritual sites and associated sacred trail systems.

3. Energy

4. Enforcement / Regulation – Promote positive change in national resource management policies.

5. Environmental Education – Promote educational opportunities relating to restoration of balanced ecological systems.

6. Environmental Justice – Restore traditional fire management regimes and promote sustainable socioeconomic development.

7. Fire/Fuels Reduction – Enhance reasonable control features for implementation of appropriate fire utilization strategy and/or other appropriate management response when can be completed safely and effectively.

8. Fisheries – Enhance our ability to reduce potential for high intensity wildland fire events that are confined to within appropriate watershed areas.

9. Forestry – Promote species biodiversity through enhanced variation of vegetation types and improved stand structures along treated ridge systems.

10. NAGPRA – Protect physical cultural artifacts in areas of high potential for impact, by pre-recording site locations for use by heritage consultants during wildland fire events.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Protect soil composition and structure, through reduced need for dozer lines and excessive soil disturbance during fireline construction.

13. Watershed Restoration – Protect water quality by isolating potential high intensity wildland fire events and reducing the extent of ground disturbing activities during wildland fire events.

14. Water Quality – Promote balanced hydrologic function and ensure compliance with Tribal Water Quality Standards and Federal Clean Water Act during emergency fire suppression activities.

15. Wildlife – Enhance wildlife migration habitat corridors, access to food resources and diversified habitat structure.

Management Indicators

1. Species/habitat diversity is the primary Management Indicator for this CEMP. Although this should be a significant factor in any treatment area or CEMP, it is intended for this practice in particular. Ridge systems interconnect wildlife use corridors; are significant travel routes to and from gathering/hunting areas; and are critical to the proper managerial use of fire. This indicator was selected as specific to this CEMP because of the interconnectivity to other treatment areas that are associated with this practice. It may be difficult to achieve increased species diversity in previously managed stands, riparian areas, and tanoak stands alone. In interconnecting treatment areas a success determination should be made when there is a notable increase in species/habitat diversity or assurance that shade intolerant/fire dependant species/habitat types are protected, enhanced, or re-established. A failure and/or adaptation determination should be made when it is found that the combined treatment areas are focusing on single species/habitat types or there is no notable increase in population viability of shade intolerant/fire dependant species over time.

2. Roosevelt Elk transitional habitats are a secondary Management Indicator for this CEMP. This is a secondary species as they are currently not present or are not physically adapted to the prevalent landscape characteristics of some territorial watersheds. As a reintroduced species, elk have not as of yet returned to their entire historical range. As a secondary indicator, they would not necessarily trigger a failure determination, but should be considered in managerial prioritization as benefits to this species are universal to the intent of this plan. Elk browse, calving, rubbing and migration are a significant natural disturbance regime and/or manager of forest and grassland ecosystems. Improvements made through this CEMP that increase and/or establish interconnected use corridors for winter range, calving habitat, and summer range should be construed as a success. An adaptation determination could be made to modify the prioritizations or prescriptions/descriptions in the event unforeseeable negative or beneficial factors are identified. This determination could also be made when treatments trigger heard splitting into unoccupied watersheds with significant habitat improvement potential (Kie et al. 2005).

3. Princes Pine also a secondary Management Indicator for this CEMP. This species was selected as it is present at most elevations, slopes and aspects throughout the Karuk

Aboriginal Territory. It is more prevalent in areas that have not been previously managed and can handle minimal ground disturbing activities. This species needs filtered light to proliferate. It does not do well in areas denuded of vegetation or areas with 100% canopy closure. It can take decades for preferential stand conditions to come back after high intensity fire but low to moderate intensity fire can help aid germination and sprouting. Moderate or higher severity fires which deplete duff, can cause mortality or decrease Princes Pine abundance and/or reproduction while maintaining symbiotic vegetation characteristics (USFS-FEIS). For this CEMP success should be heavily weighed towards notable increases in individual populations. A Failure determination should be made if existing populations are eliminated or treatment activities significantly decrease the population over time. An adaptation determination should be made if there is no notable increase in population viability or use quality.

Management Practice 4

Reduction of Fuel Loading in Riparian Areas and Drainage Headwalls

Riparian areas and drainage headwalls within prioritized treatment areas will be managed through the reduction of ground and ladder fuels. Focus will be on small diameter dead fuels, contiguous large diameter dead and down fuels, and shallow rooted small diameter conifer species. Fuels will be cut, gathered and piled with some appropriate materials removed for commercial cost offset, biomass supply and/or firewood. Piles will be located a minimum of 25 feet from the high water mark. In the transition from spring head to headwall, focus should be on releasing and/or establishing deep rooted old growth trees while reducing potential crown fire intensities. Priority for retention of yew wood, dog wood, azalea, maples, or other hardwoods and shrubs should be given.

Riparian areas and drainage headwalls are very susceptible to severe fire behavior and can trigger catastrophic fire intensities (Taylor and Skinner 2003, Skinner 1997, Skinner 2002). High fuel loading in these areas can cause a chimney effect increasing fires potential for movement into other watersheds (Skinner 2002). This can in turn make it nearly impossible to contain, confine or control a fire to within an established perimeter without implementing backburn or burnout operations which can cause a potential increase in fire intensity and subsequent burn severity.

Treating these areas should help to protect water temperatures, and may increase summer base flows (NRC 2008b) while providing for a safer working environment for firefighting personnel (pers. com Fites 2006). It can allow more variance in the implementation of the Appropriate Management Response and increase the effectiveness of correlating fuels treatments at the watershed/landscape scale. These areas can in some cases be maintained as effective natural barriers or other reasonable control features during prescribed burning projects and wildland fire events. Ignition should avoid the use of liquid petroleum base fuels, such as diesel-gasoline mixes that are detrimental to water quality and aquatic species (Jacobs et al. 2000). When possible the use of propane torches and/or naturally occurring pitch/fuels should be used.

Resource Objectives

1. Air Quality – Promote reduced long range transport of smoke emissions during wildland fire events by reducing the potential for high intensity fire generally occurring from the "chimney effect" in riparian areas transitioning to the drainage headwall.

2. Cultural Resources – Protect riparian cultural use species from the impacts of potential high intensity wildland fires.

3. Energy

4. Enforcement / Regulation – Promote beneficial results in the implementation of new fire management authorities and policies.

5. Environmental Education – Enhance educational opportunities relating to management of riparian areas and the beneficial uses of fire.

6. Environmental Justice – Promote managerial activities based on cultural uses, values, and balanced ecological processes.

7. Fire/Fuels Reduction – Enhance firefighter safety by reducing potential for large scale high intensity fire runs on ridge system reasonable control features.

8. Fisheries – Promote low to moderate fire intensities in riparian ecosystems, protect the integrity of riparian habitat structure and promote the use of riparian areas as potential reasonable control features.

9. Forestry – Enhance species biodiversity and protect stand structure in riparian areas and headwall springs.

10. NAGPRA – Protect physical cultural artifacts from high intensity fire evens in riparian areas and other associated food/utilitarian material processing sites.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Protect riparian soils from hydrophobic conditions that can be triggered by potential high intensity fire events.

13. Watershed Restoration – Protect water quality by reducing the potential for high intensity fire events and associated sediment transport.

14. Water Quality – Protect riparian areas from increased sedimentation and increased water temperatures caused by high intensity fire and denuded vegetation.

15. Wildlife – Enhance access and use of riparian habitats by a diverse range of wildlife species.

Management Indicators

1. Water temperature is a primary Management Indicator for this CEMP. Significant changes in the diurnal fluctuation curve should indicate a problem with, or a benefit of the management in a watershed. Regardless of ambient air temperature, the diurnal fluctuation curve should not change much when conditions change slightly. However, drastic changes like denuded watersheds, total loss of riparian canopy, excess sedimentation filling pools, and/or loss of old growth components, can cause the range of fluctuation to increase and degrade the refugial capacity of territorial watersheds (Gresswell 1999)

A success determination should be made when treatments can occur at the landscape/watershed scale and the cumulative effects on water temperature are not detrimental or are noted to be beneficial and the fluctuation signature for any given monitoring site remains balanced and non-lethal to species utilizing such water course. There is a high probability that even though shading may be slightly reduced, summer base flows may actually increase thereby maintaining balanced disturbance related diurnal fluctuation and potentially reduced mean water temperature (Olson et al. n.d.).

A long range success determination should be triggered when a fire occurs and stand replacing fire is subsequently avoided within and adjacent to treated riparian areas and drainage headwalls. A failure and/or adaptation determination should be made when treated areas experience a notable and lasting detrimental change in the measurable site specific temperature signature.

2. Old growth Trees are another primary Management Indicator for this CEMP (Abella et al. 2007, Kauffman et al. 2007). In many areas where this practice will be implemented there has been a severe decline in the old growth component of differing stand types (Odion and Sarr 2007). This indicator is important as to the health and functionality of spring-fed wetlands and watercourses. This can be planned and visually interpreted by the presence of large stumps in areas void of an old growth component, as well as the condition and species present in areas to be treated. Seasonal seeps and springs should be monitored for potential flow balance as the old growth component is restored. Success should be weighed heavily towards old growth recruitment trees remaining undamaged after each entry. Treatments around these areas should occur with multiple entries to ensure wind firmness of the future old growth component while ensuring that they will not be killed by fire. Failure and/or adaptation determinations should be made when overcrowding or excess removal of recruitment trees cause seeps/springs to dry up or otherwise hamper old growth and correlating age class diversity restoration.

4. Port-Orford Cedar is a secondary Management Indicator for this CEMP. It is considered a secondary indicator as not all riparian areas have this species present. With the potential for inter-watershed transfers of Port-Orford Cedar Root Rot Disease during treatment activities and/or wildland fire events it is critical that all areas containing this species be protected from infection. Any infection triggered by this management practice

should automatically constitute a failure and adaptation determination. Equipment should be washed thoroughly before and after treatment activities within uninfected areas. Specific equipment should be designated and utilized exclusively within infected areas. This equipment should also be cleaned thoroughly before and after treatment activities (Roth et al. 1987).

Management Practice 5

Reduction of Fuel Loading in Burned Areas

Areas burned within and/or adjacent to prioritized treatment areas will be managed through the reduction of contiguous ground/surface and ladder fuels. Fuels will be cut, gathered and piled with appropriate materials removed for commercial cost offset, biomass supply and/or firewood. Burned areas within and/or adjacent to areas treated or planned for treatment should be prioritized for follow up treatment and/or maintenance activities beyond potential BAER recovery efforts. If fire does not naturally occur, or fires are suppressed within or adjacent to these areas, priorities should shift towards utilizing prescribed fire with the intent of maintaining the natural human interacted fire return interval.

Wildland fires have been increasing in burn intensity and severity since the beginning of fire suppression (Odion et al. 2004). One can only imagine a time when fires burned over large areas with beneficial effects to cumulative stand dynamics. With the suppression of multiple fire return intervals, fuels accumulations have caused many recent wildland fires to burn entire drainages, leaving them void of vegetation (See fire severity maps for the wildfires within Karuk aboriginal territory). In many cases large tracts of land are left to regenerate from brush fields. This is a difficult cycle to interrupt or influence. When fire return intervals change, correlating watershed conditions become more conducive of repeated stand replacing fire occurrence.

A combination of fuels reductions, prescribed fire, selective harvest, wildland fire confinement strategies, and wildland fire use, is what is needed to reverse this trend and may in many cases, be the fastest and most cost effective way to restore fire adapted ecosystems across broader landscapes. In most cases, areas should not be considered condition class I until fuels treatments are completed, stands are nearing pre-contact levels (circa AD 1850), and multiple fire return intervals occur throughout the burned area.

With traditional Karuk tobacco management, burning of course woody material, e.g. 1000 hour fuels or greater, was achieved by burning clusters of log or fuels in the years after the initial fire (Harrington 1932, Gifford 1939). In the years following wildfire the Karuk traditionally burn as a treatment in areas that had formerly burned after snags fell to the ground (Harrington 1932), or in other places at higher elevations in the mountains (Gifford 1939). A combination of fuels reductions, prescribed fire, selective harvest, wildland fire confinement strategies, and wildland fire use, needed to reverse this trend and may in many cases, will be the fastest and most cost effective way to restore fire

adapted ecosystems across broader landscapes. In most cases, areas should not be considered condition class I until fuels treatments are completed, stands are nearing pre-contact or pre-fire suppression conditions, and multiple fire return intervals occur throughout the burned area.

Following fire disturbance, a schedule of follow-up burns should be planned and implemented. In areas identified to have experienced high and/or mixed severity, burning should be implemented to reduce 1,000 and 10,000 hour fuel accumulations. These treatments should be in accordance with traditional burning methods and timing associated with Karuk tobacco management. Pockets of overstory trees that experience fire induced mortality begin to fall out within two years following a fire but can take significantly longer. Follow up burns should occur many times as fallout takes place to reduce these fuels while maintaining a large woody debris component. It is critical that these activities take place regardless of land use designation (such as wilderness or Research Natural Area) when utilization of fire killed trees cannot otherwise occur. If these fuels are allowed to accumulate, fire intensity, duration and subsequent severity in adjacent stands can be significantly increased, thus threatening soil-forest productivity.

In the late fall, limbs and branches should be collected, placed along pockets of downed logs, and ignited to allow for burning down to white ash. If desired, tobacco seeds can be spread in the ash to inoculate over winter and sprout in spring. These activities should take place as often as can be implemented safely and without escape until the only snags standing in the burned area are sun-bleached white and will remain in place for a long period of time.

Resource Objectives

1. Air Quality – Restore natural background smoke emissions relating to more frequent lower intensity, and/or lesser extent of potential high intensity fires in previously burned areas.

2. Cultural Resources – Restore fire adapted ecosystems and diversified cultural use species.

3. Energy

4. Enforcement / Regulation – Promote successful implementation of new fire management policies and balance costs associated with wildland fire management activities.

5. Environmental Education – Promote educational opportunities relating to fire adapted ecosystems and human interacted natural fire regimes.

6. Environmental Justice – Restore cultural use species populations and access to such species that have been systematically altered by fire suppression policies as well as other past management practices.

7. Fire/Fuels Reduction – Restore natural fire regimes in manageable firesheds by establishing condition class I in previously burned areas.

8. Fisheries – Promote balanced ecological processes such as frequent low intensity fire and associated "smoke shading" of the river corridor for reduced water temperatures during critical hot/dry periods.

9. Forestry – Promote nutrient cycling and fertilization of forested ecosystems through localized smoke dispersal and fire assisted breakdown of organic compounds.

10. NAGPRA – Restore natural disturbance levels and protect physical cultural artifacts through the reduction of dead fuels accumulations during the transition to condition class I within previously burned areas.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Enhance decomposition of organic compounds for diversified soil structure and porosity for balanced infiltration and groundwater recharge.

13. Watershed Restoration – Promote balanced sediment transport and reduced debris flows, minimizing potential for culvert plugging and associated road failures.

14. Water Quality – Promote balanced hydrologic function, nutrient cycling, sediment transport, reduced peak flows, increased summer base flows and associated water quality characteristics.

15. Wildlife – Restore the historic occupational range, diversity of species, habitat infrastructure, and escapement potential provided by fire adapted ecosystems.

Management Indicators

1. Fire Suppression Cost Containment in the primary Management Indicator for this CEMP. Over time, a notable reduction in per acre costs should be realized as this practice is employed over large tracts of land. With the majority of dead fuels generated by wildland fires being treated within recently burned areas, the condition class is restored and the fire return interval can be re-established without uncharacteristically intense fire. This should in turn reduce the quantity of suppression resources required to implement the appropriate management response when fire occurs within these areas.

A success determination should be made when fire can be returned to previously burned areas upon the next fire return interval and the excess fuels have been reduced to the point to where the fire achieves resource benefits with fewer suppression/fire management resources assigned. There is a high probability that this practice combined with others, will eventually balance fire management costs to a point that they are annually predictable and increasingly manageable from a budgetary standpoint. A failure

and/or adaptation determination should be made when wildland fires within treated areas have a notable increase in cost or budgetary predictability associated with the multiple fire entries is unbalanced (Stephens 1998, Stephens et al. 2009, Hartsough et al. 2008).

2. Another primary Management Indicator for this CEMP is the restoration of fire adapted ecosystems. As the successful re-introduction of multiple fire return intervals occurs, and follow up treatments take place, a multitude of maintainable fire adapted habitat structure should emerge. With reoccurring fire in these areas, food sources for humans and wildlife will be enhanced and available in unsuppressed quantities. Subsequently, correlating wildlife populations coupled with traditionally influenced human interaction should help to achieve balanced fire adapted ecosystems.

A success determination should be made when there is a notable increase in wildlife and/or endangered species habitat interconnectivity that is maintained or enhanced by multiple fire intervals. Habitat interconnectivity should benefit all species occupying the fire influenced area as the habitat for one species may provide a food source for another that without fire is inaccessible by predators, thereby limiting population expansion of certain species. A failure and/or adaptation determination should be made when establishment of these interconnected habitats does not occur after multiple fire entries. It should be noted that under this scenario, more fire return intervals should occur before making these determinations.

3. Retention/recruitment of course woody debris is a primary management indicator for this CEMP. Develop planning areas by water/fireshed boundaries. The proportion of burn area by vegetation type that needs to be burnt by percentage of severity class can provide management guidelines. Burn area within existing fire perimeter designated by culturally significant habitat/vegetation type is a system that can assist with assessing impacts to cultural use quality. A success determination is attained when high severity areas are treated to reduce excessive fuels loading and/or desired vegetation coverage is achieved. Failure determination is indicated by the presence of excessive residual fuel (1000 hrs load) remaining at next fire occurrence the increase susceptibility to high severity fire again, that is not appropriate for the vegetation type/community or loss of larger fire resistance trees leading to a reduction canopy cover and in soil productivity. Adaptation can be made regarding the retention of or utilization of course wood material, e.g. down logs. In some instances, it may be culturally desirable to have full consumption of logs for ceremonial-wild tobacco management (Harrington 1932), in other instances the charred or unburned logs can serve as important wildlife habitat (Brunell et al. 1999).

Management Practice 6

Reduction of Fuel Loading Within the Wildland Urban Interface

Excess fuel loading around homes/property will be managed through the reduction of contiguous ground, surface, ladder, and some canopy fuels. Fuels will be cut, gathered and piled, or chipped. Fuels within 30 feet of homes/structures should rate the highest priority. Fuels within 100-300 feet should receive the next highest, followed by fuels

extending to and/or beyond property boundaries (Board of Forestry 2006). Access/egress routes to safe locations should also be considered a high priority for treatment.

Rural communities have a high potential for homes or related property being lost from fire. In treating adjacent fuels this threat can be significantly reduced. Protecting life is of the utmost importance in approaching a wildland fire situation. Many people elect to not leave their homes until the last minute when fire occurs. Landowner education regarding fire prevention, fuels reduction, fire-safe landscaping, evacuation, and post-fire rehabilitation/maintenance is needed (Haines et al. 2008). Public and firefighter safety can be better achieved when homes, properties, and access/egress routes, as well as other natural features can be enhanced in anticipation of wildland and/or prescribed fire occurrence.

As a condition of tribally assisted treatment around homes, GIS mapping of all structures, outbuildings, fuel storage, turnaround areas, water sources, treated areas, hazards and maintenance intervals should be made for the property. This critical pre-planning/fire occurrence response needs assessment, should be held locally at tribal, agency, volunteer fire departments that could potentially participate in initial attack so structure protection ability can be improved. Fire Safe Councils can also be a reliable source for accessing this critical information during an emergency situation. Principles and practices of structural triage: where, what and how to treat property should be described, documented and readily available to the public and fuels reduction workforce. The prioritization of treatment prior to and during wildfires that threaten property can then be assessed and implemented. During the 2008 wildfire season this information was collected and utilized extensively using computer based software (see Red Zone.com).

Some species such as Himalayan Blackberry need annual maintenance by the property owner. Total eradication for this exotic species near structures and control features is preferred. Special attention should be placed on long term effectiveness when completing treatment activities. The location of non-eradicated populations of species such as the Himalayan Blackberry should be identified as a hazard on the protection map as there may be time to affectively mitigate this threat if known up front.

Resource Objectives

1. Air Quality – Promote natural smoke emissions through the reduced potential for the burning of chemically altered man made materials, such as those found in building construction, during a wildland fire situation.

2. Cultural Resources – Protect cultural resources from high intensity fire occurrences triggered by structural fires.

3. Energy

4. Enforcement / Regulation – Promote fire friendly landscaping, and ensure federal, state, county, community, and/or tribal requirements for fire safe homes and communities.

5. Environmental Education – Promote educational opportunities relating to fire safe homes and communities.

6. Environmental Justice – Enhance the ability to restore fire adapted ecosystems through ensuring protection of homes and properties throughout the reintroduction of natural fire regimes.

7. Fire/Fuels Reduction – Protect homes and properties and community infrastructure, from being negatively impacted by wildland fire management activities.

8. Fisheries – Enhance the ability to restore natural disturbance regimes and implement maintenance treatments throughout entire watersheds.

9. Forestry – Promote the restoration of forested ecosystems across jurisdictional boundaries.

10. NAGPRA – Protect the integrity of physical cultural artifacts within and adjacent to treatment areas on private lands.

11. Solid Waste - Promote utilization of biomass resources and facilitate potential cleanup activities (toxic substances, junk vehicles, appliances, etc.).

12. Soils / Minerals – Promote soil stabilization through the use of fire safe ground cover on private lands.

13. Watershed Restoration – Enhance managerial opportunities for cumulative benefits at the watershed scale.

14. Water Quality – Promote the use of drought tolerant vegetative species in a fire resistant condition to reduce the need for excessive water consumption.

15. Wildlife – Promote contiguous landscape level treatments that improve habitat for a variety of wildlife species.

Management Indicators

1. Public and firefighter safety during wildland fire events is a primary Management Indicator for this CEMP. When wildland fires occur, and firefighters have safe access to and can effectively protect structures, avoiding homes being lost a success determination can be made. In the event that homes or lives are lost from wildland fire due to excess vegetation and/or unsafe access/egress or inadequate pretreatment causing abandonment of structure protection actions then a failure or adaptation determination should be made.

In some cases where a unique combination of weather, topography and adjacent fire behavior cause the abandonment of the home by residents and/or protection forces, a site specific adaptation to prescriptions and/or priories should occur to mitigate for such unforeseen circumstance in the future.

2. Protection of permanent residences, outbuildings and other high valued resources important to the landowner which are identified on the structure/resource protection map are a primary indicator for this CEMP. Firefighting personnel make onsite determinations during structural triage of what can be protected at a glance. If firefighting forces determine that everything on the map can be safely and effectively protected a success determination should be made. If it is determined unsafe to protect any identified resource concern or land owner value within the previously treated area, a failure and/or adaptation determination should be made. These determinations should when possible be made prior to a wildland fire event so as to implement site specific adaptations when needed to increase the potential for successful protection of these high valued resources during wildland fire events.

3. Natural/cultural resources are a secondary Management Indicator for this CEMP. Treatments should be mindful of other resources valued by the property owner or protected by law. Property owners should be consulted onsite and any resources that they do not want disturbed should be flagged and avoided. Archaeological resources may also be present. If this is the case mitigations should be in place for non disturbance of such resources. In the event that archaeological resources are disturbed, displaced or destroyed as a byproduct of a project or if high valued resources identified by the land owner are destroyed during project implementation, a failure determination should be made. Since many land owner(s) may have different values, projects within the wildland/urban interface will be constantly adapting to suit individual property owners needs. Some land owners may prefer that hardwoods be protected while others may want conifers protected. In any case treatments should strive to meet their desires while performing treatments that will be effective with as little maintenance as possible. If all parties are satisfied at the end of the project, no archaeological resources have been damaged, displaced, or destroyed, and resources identified can be protected during a wildland fire event, a success determination can be made.

Management Practice 7

Reduction of Fuel Loading Along Forest Roads

Forest roads provide access/egress for gathering cultural resources, forest visitors, and recreational enthusiasts as well as firefighting personnel. A minimum 300 foot treatment area along each side of forest roads will help to ensure safe access/egress during wildland fire events. Ridge system roads should receive the highest priority as these are generally utilized as control features during fire events. Pretreatment of these areas can help to reduce costs and increase effectiveness of firefighting efforts as crews will be less likely be dedicated to the improvement of forest road control features.

Forest roads transect many other areas identified for treatment. To ensure effectiveness, interconnectivity of treatment areas along road systems should also be considered in prioritization. Contiguous ground, surface, and ladder fuels should be cut, piled and burned, or chipped, with potential restoration byproducts removed for utilization or commercial cost offset when ecological benefits can be achieved. Forest roads slated for decommissioning should also be considered in prioritization, as limited access for treatment will increase fuels reduction costs and reduce cost offset opportunities after selected roads are hydrologically restored (Luce et al. 2001).

In many cases topography may limit the width of treatments, and in other cases, adjacent fuels conditions could be cause for extending the width beyond the 300 foot standard (Agee et al. 2000, Brown et al. 2004). Variations in prescription should consider site specific effectiveness as a reasonable control feature over standard planning widths. Along roads that are scheduled for decommissioning, the width of treatment should expand to a minimum of 300 feet beyond the external edge of the cut and fill slope. Whenever possible, fuels in these locations should be chipped and located in accessible areas and utilized for erosion control and exotic species mulching following decommissioning activities (Husari et al. 2006).

Resource Objectives

1. Air Quality – Promote reduced smoke emissions from wildland fires by increasing effectiveness of firefighting personnel in suppressing small human caused fires along road systems and in the wildland urban interface.

2. Cultural Resources – Enhance the ability to actively utilize cultural burning for enhancement of cultural resources in easily accessible areas.

3. Energy

4. Enforcement / Regulation – Promote policy changes to include the utilization of standing dead trees along roadways for firewood collection.

5. Environmental Education – Enhance access for educational opportunities relating to a variety of treatment types, management practices and/or resource usage.

6. Environmental Justice – Promote safe access/egress for remote residents in the wildland urban interface/intermix than have been impacted by previous federal land management practices and policies.

7. Fire/Fuels Reduction – Enhance public and firefighter safety during wildland fire events while reducing fire rate of spread and burn intensity along road systems.

8. Fisheries – Promote mulching of exposed cut/fill slopes and provide sediment filtration and energy dissipation in rolling dips, with onsite materials for reduced road related sediment transport.

9. Forestry – Promote low impact multiple entry timber harvest opportunities along road systems while enhancing ecosystem function and forest health.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and mitigate past site damage along road systems.

11. Solid Waste - Promote utilization of biomass resources and chip mulching of noxious weeds along road systems.

12. Soils / Minerals – Restore fire adapted vegetation composition adjacent to road systems and reduce potential for catastrophic failures caused by high intensity fires and correlating hydrophobic soil conditions.

13. Watershed Restoration – Promote utilization and onsite collection of chip mulching materials, may or may not be feasible for road decommissioning projects to provide for stabilization of disturbed soils while increasing effectiveness of road systems as reasonable control features. Utilization of native grass seeds when and where feasible is preferred.

14. Water Quality – Restore openings along road systems where there may be potential sedimentation problems, to promote grasses for long term storm water energy dissipation and sediment distribution/stabilization.

15. Wildlife – Restore habitat conditions adjacent to roadways to mitigate the long term effects of road related habitat fragmentation.

Management Indicators

1. Re-sprout potential is a primary management indicator for this CEMP. Fuels treatments should be formulated to reduce potential for re-sprouting throughout many different vegetation types, elevations, slopes and aspects. Some degree of re-sprout will help to enhance wildlife forage, but in excess can nullify the effectiveness of treatment prescriptions in less than a decade. Multiple stem hardwood species should only be pruned or thinned to enhance productivity and maintain a shade component to suppress re-sprout and reduce ground level insolation influence. Root grubbing and/or frequent follow up burns may be needed in some instances to ensure long term effectiveness of treatment prescriptions. Herbicide application should be avoided at all costs nor utilized.

Conditions of treated areas that are conducive of maintenance with fire within 3 to 10 years should trigger a success determination. If a contiguous ladder fuel component is reestablished in less than a decade, a failure or adaptation determination should be made. Consideration should be given for pockets of brush to remain for wildlife cover and successional habitats. Multiple entries may be needed in areas that are primarily dominated by early mature stands, brush, or are in need of conversion to oak woodlands or meadow habitats.

2. Improved access to high quality traditionally utilized medicinal, edible, and basketry materials is another primary Management Indicator for this CEMP. Pruning coppicing and/or burning of species such as hazel, bear grass, mock orange, deer brush, redbud, iris, live oak, etc., should be utilized for increased use quality whenever found within treatment areas. In many cases, resource specific cultural burning prescriptions should be included in planned treatment activities. Maintenance schedules should be formulated to coincide with the burning cycles for such species. Roadside access to areas with enhanced high quality materials should be mapped and distributed to basket weavers, as use intervals are necessary for proper treatment and maintenance of these cultural resources.

Increased use quality over time as determined by traditional utilization should trigger a success determination. A failure and/or adaptation determination should be made when use quality is not increased or of optimal consistency. It should be noted that multiple entries may be needed in order to re-establish the proper balance of light, nutrient transfer, and accessibility without receiving a failure determination from Management Indicator 1 for this CEMP.

3. A Secondary Management Indicator for this CEMP is the effectiveness of the roadside treatments in the event of a wildland fire. As a linear control feature that potentially spans many elevations, vegetation types, slopes and aspects, these treatments may not enable firefighting personnel to safely control, contain, or confine all wildland fire events, especially on steep mid-slope sections. These sections are generally not utilized by suppression forces as control features, but can serve as safe access to more reasonable control features. Treated mid-slope sections of road systems can however slow if not stop a fuels and topography driven fire and can therefore make good trigger points for appropriate management actions.

With this particular secondary Management Indicator, a failure determination is usually not made. However a success or adaptation determination can be made in conjunction with indicators 1 and 2 if the outcome of treatments assist firefighting personnel to safely access and control a wildland fire event. In some cases an adaptation determination should be made prior to a fire event. For example, treatment prescriptions may need to be extended to 1000 feet or more on the downhill side of the road; or if treating the entire extent of a ridge system or chimney is needed in order to effectively bring a fuels and topography driven crowning fire to the ground before reaching the road. This extension may also be needed if it is determined that the steep midslope road segment can be safely and effectively utilized as a reasonable control feature by burning out a blackline adjacent to the road system.

Management Practice 8

Fire Management, Preparedness, Work/Rest and Mobilization

Fire management activities are and have always been a part of traditional management since time immemorial. Though most traditional Karuk actions are in the form of preparing for when fire comes, wildland fire was also suppressed in a utilitarian fashion. Contemporary fire suppression actions will have to fit into the national fire management infrastructure. This CEMP relates to readiness for when fire comes, mobilization to fire incidents, and Tribal/Interagency partnerships in cooperative decision making and implementation.

Through the development and maintenance of Cooperative Agreements, Memorandum of Understanding, Interagency Agreements, direct appropriations, and/or other agreements, the organizational infrastructure of collaborative decision making and implementation mechanisms can be maintained. The key to a successful Tribal Fire/Fuels Management Program infrastructure is primarily the availability to respond to fire and/or all risk incidents locally. In order to remain available to efficiently achieve integrated fire and fuels management objectives, Tribal Fire/Fuels Reduction Crew(s) need to work throughout the appropriate fire management season(s) implementing requesting agency or CEMP projects. Ideally, five person fire/fuels modules would be strategically completing high priority project work in multiple Fire Management Units (FMU) or Fire Workload Areas (FWA) with 1 module consistently rotated to the designated dispatch location.

With multiple fire/fuels management modules spread out to different Fire Workload Areas the probable travel time from the dispatch location should be reduced for at least one module. This should improve the operational speed for initial size up and spot weather forecast reporting to assist in the timely determination of the appropriate management response, especially when dispatched to multiple ignitions. Initial management actions can then be implemented in a timely manner while backup forces (if needed) are in route. Upon arrival of additional forces or achievement of management objectives, the modules would come together to form the appropriate task oriented fire management implementation force within their realm of qualifications to achieve remaining priorities. Depending on Lightning Activity levels and or likelihood for human caused fires, safety and effectiveness may be improved with modules regrouping at the designated dispatch (or other assigned) location prior to 3:30pm.

While on traveling severity assignments in unfamiliar terrain, Karuk Type II IA hand crew or module assigned will stay together and be available to complete project work within ½ hour of their designated dispatch location or as identified in requesting agencies Land or Fire Management Plans. This work location will be reported to and tracked at the appropriate dispatch center and designated by the location coordinates (e.g. lat and long) for the nearest known point. In the interest of maintaining adequate rest for an initial attack assignment, squads of various sizes will consistently achieve progress, rotating the workforce(s) every ½ to 1 hour during these periods.

When unassigned, no preparedness funds are provided, and projects are unfunded, crew(s) will remain available for 8 to 24 hour dispatch. With preparedness funds provided, at least one 20 person type II IA crew will remain 5 day effective, and all fire

personnel will maintain a minimum of 2 consecutive days off for each 14 day assignment period. As the Tribal Fire/Fuels Management Program expands and adequate funds are appropriated, the preference would be to remain 7 day effective throughout the fire season and 5 day effective throughout the cultural fire/fuels management seasons (February – April and September – November).

The Designated Dispatch centers should be Yreka Interagency Command Center and/or Fortuna Interagency Dispatch Center, working in conjunction with Northern California Geographic Area Coordination Center. The Karuk Tribe's area of mutual interest extends across multiple jurisdictional boundaries and would be dispatched based on the location of work assignments and/or dispatch location assigned at any given time.

Training and readiness inspections will occur during the cultural fire management seasons in the interest of ensuring availability for dispatch where needed when other crews are unavailable. Tribal crew(s) will not be available for immediate dispatch when performing cultural burns or other forms of prescribed fire, but can be available for 8, 24, 36, or 48 hour dispatch depending on the duration and complexity of burning activities and required rest periods.

As program infrastructure is developed fuels modules may be dispatched as 20 person type II IA crew(s), 10 person fire use module(s), FEMO (or equivalent) squads, engine crew(s), Chipper Module(s), single resource(s), or any other combination of task oriented resource needs as qualified under red book, blue book, or other approved interagency standards.

Resource Objectives

1. Air Quality – Promote increased effectiveness of wildland fire management activities for balanced smoke emissions.

2. Cultural Resources – Enhance the ability treat and/or burn large areas in the interest of cultural resource management and restoration of fire adapted ecosystems/fire dependent cultural use species.

3. Energy

4. Enforcement / Regulation – Promote effective traditional wildland fire management and provide additional prevention measures for reducing and/or suppressing human caused fires.

5. Environmental Education – Promote educational opportunities relating to an appropriate capacity building and effectiveness strategy for restoring fire adapted ecosystems.

6. Environmental Justice – Promote meaningful jobs in local poverty stricken communities.

7. Fire/Fuels Reduction – Enhance efficiencies in the national emergency preparedness infrastructure to provide a template for local people handling local problems.

8. Fisheries – Promote effective workforce that will help to protect fisheries values and restore natural disturbance regimes.

9. Forestry – Enhance the ability to ensure the implementation of additional treatments of natural and/or activity fuels following timber harvest activities during deficit market conditions.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and reduce potential for site disturbance.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Promote reduced need for large scale soil disturbance from dozer line construction during wildland fire events.

13. Watershed Restoration – Enhance workforce availability for high priority project implementation.

14. Water Quality – Promote the systematic reduction of potential large scale disturbances with the ability to significantly impair water quality characteristics.

15. Wildlife – Enhance the potential for implementation of a wide range of wildlife habitat improvements.

Management Indicators

1. The primary Management Indicator for this CEMP is the systematic, cost effective implementation of requesting agency projects and/or Cultural Environmental Management Practices requiring the use of hand labor. This is one of the most labor intensive, and time consuming portion of any project or CEMP. Integration of this managerial infrastructure into stewardship based, or other priority projects should enable consistent progress toward programmatic goals while achieving multiple resource objectives.

In most cases, stewardship based utilization of restoration byproducts will not cover all costs associated with watershed scale restoration of natural disturbance regimes. While such utilization will reduce this burden on the taxpayer, integration of wildland fire preparedness, suppression, and fuels reduction funding to effectively implement restoration actions can reduce this burden even further.

For example, funds collected from the Hazel Timber Sale generated $225 per acre for jackpot prep, under stewardship authorities this figure would be approximately $360 per

acre (225 + 60%). In the interest of completing ecologically sound follow up treatment this figure should be closer to $600 per acre. If all or portions of these treatments can be completed by implementation forces specifically placed for this purpose, these existing human resources can be utilized to offset restoration activities in and adjacent to the project area while improving the effectiveness and efficiency of preparedness, suppression, fuels reduction, and/or fire management forces. These types of projects can also assist in receiving felling qualifications for fire and fuels reduction personnel while enabling stewardship funding to be extended to accomplish additional unfunded or under funded stewardship activities.

If sufficient cost savings can be achieved and excess byproduct receipts are retained at the end of a stewardship endeavor, a portion of these funds could then be utilized to offset the reduction in payments to States revenues to support local schools and volunteer fire departments with the remainder being available for additional stewardship projects to further reduce the taxpayer burden.

Success would be determined by quality and quantity of work performed that would not have otherwise occurred, compared to costs vs. resource benefits achieved, and value of retaining available qualified initial attack and/or appropriate fire management forces locally. Failure and adaptation determinations would be made based on inability to respond to an initial attack, appropriate management response or all risk incident in a timely manner and/or inability to utilize shared fire management forces across jurisdictional boundaries within and adjacent to areas of mutual interest or where otherwise needed.

2. All other Management Indicators apply to this CEMP dependent upon which practices are incorporated into individual projects performed by this workforce. It is important to remember that quality of work and long term effectiveness is more beneficial and cost effective than just meeting short term single resource objectives. Especially when utilizing funds that would otherwise be spent achieving little if any progress toward restoring natural disturbance regimes.

Management Practice 9

Reduction of Fuel Loading Post Fire Suppression Rehabilitation Activities

Fire suppression actions can have environmental impacts in many shapes and forms. These actions are mitigated through suppression rehabilitation activities when the fire is controlled, contained or declared out. Generally speaking, these rehabilitation efforts are mitigations for the negative impacts caused by suppression activities. As these mitigations are outlined by resource professionals from the local unit and approved by line officer and/or agency administrator, this CEMP is focused on further mitigating for the effects of excess fuel loading following suppression rehabilitation (or suppression repair) activities.

Typical treatment of excess fuels created by fire suppression activities are "quick fixes" relating to fuels and erosion or other unforeseen impacts. In most cases treatments consist of loping and scattering or piling of these fuels. This CEMP is designed to treat remaining fuels left after suppression rehabilitation actions are over, and the goals of correlating mitigations are achieved. Burning of piles and piling of fuels scattered for erosion control mitigations are generally not achieved during or following suppression rehabilitation actions.

In the interest of restoring, enhancing or maintaining the effectiveness of established firelines for use during future fire events, these fuels should be burned or chipped after erosion control objectives are met. In many cases, this will occur when fire season comes to an end, if not in the following year. If left untreated, these fuels can increase the workload and reduce the safety, efficiency, and/or effectiveness of firefighting personnel during future emergency situations in these locations.

The best time to burn these fuels, are after the first rains, but before major fall precipitations and snow events. This will allow time for sediments to settle, fuels to dry for burning and allow for access to burn before major snow events or occupied by salamanders, and/or other wildlife. With the amount of dead fuels generated in many instances, covered windrows may need to be created and covered during suppression rehabilitation. This will not only make ignition during the wet season easier, but will decrease ignitions needed and improve cost effectiveness during additional efforts. Excess scattered fuels should be added to the piles or windrows as they are ignited and chunked.

Resource Objectives

1. Air Quality – Promote reduced fuel loading and associated smoke emissions generated from fire suppression activities, in the interest of utilizing the same control features during future fire events.

2. Cultural Resources – Enhance the effectiveness of previously utilized control features and promote viable populations of cultural use species, while ensuring protection of spiritual sites during future fire management activities.

3. Energy

4. Enforcement / Regulation – Promote appropriate mitigations for increased dead fuel concentrations generated during wildland fire management activities.

5. Environmental Education – Promote educational opportunities relating timely maintenance of reasonable control features improved during emergency wildland fire management practices.

6. Environmental Justice – Promote beneficial change in current managerial shortfalls that can reduce the long term effectiveness of reasonable control features.

7. Fire/Fuels Reduction – Enhance the effectiveness of established control features, and increase firefighter safety during future wildland fire management activities.

8. Fisheries – Promote reduced fire intensities along previously utilized control features and allow for the appropriate reintroduction of natural fire regimes.

9. Forestry – Promote stable forest structure and stand diversity along established reasonable control features.

10. NAGPRA – Promote increased potential for protect of physical cultural artifacts during future wildland fire management activities.

11. Solid Waste - Promote utilization of biomass resources and reduced accumulations of managerial fuels accumulations.

12. Soils / Minerals – Restore natural disturbance levels of low intensity fire along reasonable control features, while balancing the amount of ground disturbing activities needed during wildland fire management actions.

13. Watershed Restoration – Enhance the ability to reduce sediment transport following fireline construction.

14. Water Quality – Promote the systematic reduction in need for the utilization of aerial applied fire retardants that can impair water quality characteristics

15. Wildlife – Enhance long term utilization of reasonable control features as wildlife migration corridors.

Management Indicators

1. Ridge system erosion control is the primary Management Indicator for this CEMP. Erosion control measures normally in place following suppression rehabilitation need adequate time and moisture to settle loose sediments created by fireline construction. Adequate moisture is also needed before safely burning piles and windrows. If piles are burned prior to adequate settling of sediments and significant erosion occurs as a result, a failure and/or adaptation determination should be made. Adaptations such as burning these fuels in the spring and/or touching up water bars as piles are burned could be good mitigations for achieving a success determination in the event late fall/early winter burning does not meet erosion control objectives.

Additional erosion control measures like creating small sediment catchments below water bar outlets that have been experiencing high erosion rates may further ensure a success determination for this Management Indicator. It should be noted that additional erosion control measures should be attempted before delaying burning until spring, to reduce the

chances of occupation of piles by salamanders or other wildlife that may be incapable of escape when burning occurs.

2. A secondary Management Indicator for this CEMP is improved access and efficiency of fire suppression and/or fuels reduction forces. Approximately 10 to 20 years after suppression activities occur, a re-entry may be needed if the fireline is not utilized for additional suppression activities. This CEMP will reduce the quantity of dead ground/surface fuels making it possible to more efficiently achieve future entries whether for suppression or fuels reduction activities. In the interest of ensuring long term effectiveness of these ridges as reasonable control features, brush re-sprout will need to be cut to maintain a minimum of one stem per clump in hardwood stands. Improved access and efficiency is hard to definitively measure over long periods of time by any other means than photo points which may or may not be readily identifiable over the long term. Adaptations such as increased treatment intervals, or expanding treatment areas to be maintained by prescribed fire, may be the most efficient and cost effective means of ensuring locations where suppression/rehabilitation actions occur continue to serve as reasonable control features for future management actions.

Management Practice 10

Timber Harvest as a Means of Reducing Fuel Loading and Ensuring Ecological Diversity

Timber removal is a practice that should occur when appropriate during implementation of other CEMPs (Agee and Skinner 2005, Odion and Sarr 2007). This should be completed with minimal ground disturbance when the continuity of fuels can be more widely distributed and is needed to enhance, promote, protect, restore, or maintain, ecological systems. Locally led community based stewardship principals should be applied whenever this practice is employed in conjunction with projects intended to achieve multiple resource objectives/practices (Brown et al. 2004).

To the largest extent possible, local resources should be utilized to achieve stewardship based tasks (PL 108-278:TFPA 2004, ERI 2006). Agreements/implementation mechanisms should be formulated in the interest of ensuring meaningful collaborative local involvement in the definition and achievement of the long term end result. Selection of individual trees for removal should achieve some level of ecological benefit in addition to fuels reduction objectives (Agee and Skinner 2005, Peterson et al. 2005). Selection of individual trees for retention and/or protection during managerial operations and implementation should also be carefully considered and monitored for compliance.

When this practice is employed, it is important for harvest revenues to be combined with project funding, at a level commensurate with ecological benefits and treatment needs, as opposed to timber covering total treatment costs. This will provide for more sustainable and cost effective managerial opportunities in the future. Treatment cost offsets can be more valuable over time than one free entry, as sustainable yields of timber can contribute to the costs of necessary future practices that serve as integrated maintenance

intervals. Ideally this practice should maintain a balance of cost contributions to ecological benefits in a sustainable yet cost effective manner.

Resource Objectives

1. Air Quality – Promote fire resilient forest stands by reducing potential for large scale stand replacing fires in the interest of minimizing the elevation and correlating distribution and transport of wildland fire smoke emissions.

2. Cultural Resources – Promote timber management as a means of balancing ecological benefits and cost contributions for the enhancement of site specific cultural resources.

3. Energy

4. Enforcement / Regulation – Promote balanced managerial regulations and policy development to protect tribal resource values from the excessive resource extraction and inadequate implementation potential of follow up treatments.

5. Environmental Education – Promote educational opportunities relating to understanding a managerial process capable of balancing the cost to the taxpayer in the protection, promotion, enhancement and/or restoration of cultural/natural resources and environmental processes.

6. Environmental Justice – Promote a balanced approach to restoring the impacts of past management practices, policies and regulations to the resources, uses, and quality of life of the Karuk people.

7. Fire/Fuels Reduction – Restore viable populations of shade intolerant species while increasing the utilization of byproduct receipts to offset fuels reduction treatment costs and enhance efficiencies in wildland fire management activities.

8. Fisheries – Promote a reduction in ground disturbing impacts from resource extraction while ensuring ecological diversity and balancing ecological processes.

9. Forestry – Enhance stand structure, forest health, and biodiversity throughout a variety of vegetative environments, while reducing potential loss of site specific values from large scale stand replacing fires or excessive single entry timber harvest.

10. NAGPRA – Promote a minimized potential for site disturbance during timber harvest and wildland fire management activities in the interest of protecting physical cultural artifacts.

11. Solid Waste - Promote utilization of biomass resources and offset costs associated with treatment needs.

12. Soils / Minerals – Promote reduced soil disturbance from excessive skidding and ground compaction during each managerial entry.

13. Watershed Restoration – Promote timber extraction methodology and justifications that will achieve resource benefits while the reducing typical timber removal impacts and providing additional funding for implementing additional CEMP's.

14. Water Quality – Promote the systematic reduction of potential large scale disturbances with the ability to significantly impair water quality characteristics.

15. Wildlife – Enhance diversity of wildlife habitats and species productivity while providing protection from the undue impacts of total stand conversions and habitat loss from wildland fires, monoculture forest environments and loss of open space.

Management Indicators

1. Shade intolerant and open meadow species are a primary Management Indicator for this CEMP. Conifer encroachment since fire suppression has initiated a significant reduction in the health and abundance of shade intolerant species and open meadows (Skinner 1995). The systematic implementation of reducing crown continuity over time can assist in the protection or reestablishment of shade intolerant species present in any treatment area (Agee and Skinner 2005). A multiple entry approach should be considered when reversing this trend (McDonald and Vaughn 2007). The first entry should focus on allowing additional light to the crown of shade intolerant trees and/or to the ground where there are indications of suppressed grasses or other shade intolerant ground level vegetation. The next entry should ensure effective low intensity fire during the third entry of prescribed or natural fire. Additional entries should be based on site specific needs following these initial treatments.

Success determinations should be based on shade intolerant grasses, forbs, trees, or shrubs being the primary growth in the lighted areas. In some cases an adaptation should be made for additional entries to enhance the population of the pre-fire suppression population, and or remnant seed source. In many cases, adaptations will need to be made for additional entries to reduce conifer seedlings and/or eradicate noxious weeds following treatments. This is most easily accomplished when they can be pulled by hand and left on the ground so as to reduce the need for pile burning as part of this entry. A failure or adaptation determination should be made when shade dependant ground level plants are not considered and/or protected to the greatest extent possible when existing or reoccurring following fire. Failure and/or adaptation determinations should also be made when follow up treatments do not occur in a timely manner and/or increase potential fire behavior.

2. Old growth conifers and hardwoods are Management Indicator species for this CEMP. This Management Indicator can be either a primary or secondary Management Indicator based upon the availability of representative presence in treatment areas. Some treatment areas will not have any representative indicators of pre-suppression presence of

these species in this age class. In this type of treatment area this is a secondary Management Indicator. In most areas where this practice is employed there will be some evidence of pre-suppression old growth presence. In some cases it may be little more than conifer stumps and remnant large diameter hardwoods. Where such evidence exists, this is considered a primary Management Indicator.

In a secondary Management Indicator situation, the extent of restorative actions may be indeterminate as there is no baseline for representative presence. Therefore failure based on lack of an old growth component in this situation may not be warranted. For example, a 50 year old stand of mixed hardwoods/conifers may in fact call for eventual meadow restoration, in which case some degree of old growth restoration should be a component, but to lesser extent. This type of treatment area should have increased vegetative structure mimicking a more open environment following initial treatments. Success determinations may be more difficult to achieve in a short time frame due to the span of time it will take to complete the staged entries necessary for this restorative action. This situation will more likely trigger adaptation determinations over time involving further thinning, shorter fire return intervals, and to some extent hardwood extraction may be needed when re-sprout potential can be mitigated.

As a primary Management Indicator the need for success, failure and/or adaptation determinations should be more readily identifiable. Success determinations should be based on the probability of protecting and/or re-establishing the old growth population and species distribution over time to at or near the level identified by the evidence of pre-suppression old growth presence. In achieving a success determination, recruitment of a future old growth component should also be considered while allowing for sustainable harvest potential into the future. With a success determination based on this probability, site specific adaptation determinations should also be made to achieve further success over long periods of time. A failure determination should be made when the managerial, operational, or contractual safeguards are not institutionalized; the existing old growth component is not protected; the area is no longer capable of diversified restoration; old growth habitats are altered too quickly for adaptation by existing wildlife populations; or excessive reduction of aerial fuels trigger a significant increase in remnant ground, surface, or ladder fuel production.

Management Practice 11

Wildland Fire Management During Wildfire Events

This CEMP is intended to serve as supporting guidance for Agency/Tribal collaborative/cooperative decision makers for determining the managements response during wildland fire events within and adjacent to the Karuk Aboriginal Territory. It may also serve as guidance for identification of missing factors in current fire behavior modeling efforts (Fire Executive Council 2009-Guidence for Implementation of Federal Wildland Fire Management Policy).

Typically, wildland fire use, occurs in wilderness areas as conditions warrant and plans are in place. Through implementation of this CEMP, expansion of these principals to restoration landscapes that have been strategically pre-treated, in condition class I, and/or in condition class II and surrounded by interconnected reasonable control features, may also be appropriate. As contiguous acreage is treated through implementation of these CEMP's, managing fire for resource benefits should become a more viable option in a wider range of conditions.

GIS condition tracking of treatment and adjacent areas such as, date of initial treatment, date of last and scheduled fire occurrence (human and natural), planned and completed maintenance intervals by type, condition class, natural/cultural fire frequency, primary and secondary vegetative species, insolation influence factors, crown to base height, crown bulk density, percentage of evergreen vs. deciduous crown fuels and surface fuel type/loading should occur. The estimated fire intensity level for at least 3 reference conditions (i.e. NE winds 15-30 MPH, humidity less that 20%) with a diurnal fluctuation range of surface and live fuel moisture variability with and without inversion, etc., should be readily accessible when fire occurs. This will allow Agency Administrators, Incident Commanders, and Tribal Representatives, to influence more informed decisions as to the appropriate management response in emergency situations. This practice will likely be a key component in making the transition from the historical "suppress all fires" managerial approach to the future restoration of natural fire regimes.

Containment, confinement, control, contain/control, confine/control, wildland fire use strategies, or appropriate combination thereof, should be utilized where appropriate and will be in many cases dependant on agency management plan updates and potentially inconsistent definitions across multi-jurisdictional boundaries. Additional and or supplemental terminology will likely come about in the near future in regards to Appropriate Management Response guidelines and identified management actions in varying situations. Ideally strategies should have the capability to change upon significant variations in conditions, but remain consistent to the greatest extent possible through Incident Command Team transitions.

Resource Objectives

1. Air Quality – Promote increased range of opportunities for wildland fire management activities to restore natural background smoke emissions.

2. Cultural Resources – Promote natural regeneration and population viability of fire dependent cultural use species.

3. Energy

4. Enforcement / Regulation – Enhance the potential for utilization of new authorities, policies, and guidance, as well as develop and/or make readily available, new mechanisms for restoring fire adapted ecosystems.

5. Environmental Education – Promote educational opportunities relating to integration of treatments, methodology, end results, and informed emergency decision making, in the restoration of natural fire regimes.

6. Environmental Justice – Restore the natural balance of functional ecosystems, ecological processes and correlating traditional uses, practices, and benefits of low to moderate intensity natural fire.

7. Fire/Fuels Reduction – Promote natural maintenance of areas prepared for or otherwise in a condition conducive of the reintroduction of natural fire at intensities that provide for resource benefits.

8. Fisheries – Restore natural disturbance regimes and functional ecological processes with a reduced need for utilization of aerial retardants and other man made substances that can be potentially detrimental to imperiled fisheries populations and habitats.

9. Forestry – Promote fire adapted stand structure, species composition and resiliency to natural disturbance regimes.

10. NAGPRA– Promote low impact, beneficial wildland fire management practices for the increased protection potential of physical cultural artifacts from high intensity fire and uninformed reactionary suppression tactics.

11. Solid Waste - Promote utilization of biomass resources such as chips for suppression repair erosion control and incident action noxious weed control as appropriate.

12. Soils / Minerals – Promote reduced need for large scale soil disturbance from dozer line construction, non-effective direct attack firelines, and excessive contingency lines during wildland fire events.

13. Watershed Restoration – Promote reduced need for future fire suppression related ground disturbance and correlating sediment transport.

14. Water Quality – Promote the reduced need for construction of non essential firelines, and utilization of aerial retardants that can significantly impair water quality characteristics.

15. Wildlife – Restore natural levels of ecological response to wildland fire that has historically balanced, maintained, and/or formulated wildlife habitat variability while being mindful of reproductive success.

Management Indicators

1. Protection of life, property and natural/cultural is a primary Management Indicator for this CEMP. Although re-establishment of natural fire regimes is critical in

achieving restoration of fire adapted ecosystems, protection of life and property is of the utmost concern in implementing the appropriate management response.

A success determination should only be made when treatments are completed to a level in which fire can be allowed to burn up to or away from reasonable control features without damaging property, taking lives or causing irreparable damage to natural/cultural resources. Reasonable control features should be treated to a level conducive of safe and effective control of wildland fires in order to achieve this determination.

Failure or adaptation determinations should be made as unforeseen problems arise during the management of wildland fires in restoration landscapes. Adaptations will likely be needed over time as we experience extreme burn periods and fire weather events that call for expanded treatments or additional entries. The loss of life should not occur in any restoration landscape and should constitute a failure determination when occurring as a direct result of inadequate treatment or lack of maintenance.

2. The ability to manage wildland fires for resource benefits outside of wilderness is a primary Management Indicator for this CEMP. The ability to make well informed immediate decisions during wildland fire events is critical in re-establishing the natural range of variability and fire return intervals to restoration landscapes. As treatments occur that interconnect reasonable control features, the area within the external boundary of the completed treatments should be considered a restoration landscape and/or fire workload area. Sensitive habitats, gathering areas, and other highly valued resource protection areas in the restoration landscape, and/or fire workload area, should also receive treatment based on one or many of these CEMP's.

In order to achieve a success determination, pertinent information should be collected, tracked and made readily available, to enhance the ability to make the decision to manage wildland fires for resource benefits and restore natural fire regimes. Failure and adaptation determinations should be made if a wildland fire event occurs in a restoration landscape and fire managers elect to suppress the wildland fire. Upon the decision to suppress the fire in this situation an informal analysis of the decision should be made and adaptations should be determined. This should be completed by receiving the reason(s) for the decision to suppress from the Incident Commander and/or Agency Administrator. From these reasons it should be determined if treatments were not extensive enough; maintenance intervals were inadequate; interior fuels should receive additional treatment; more information should have been collected, conveyed and/or modeled; and if safety and/or fire weather was the determining factor. In any case, adaptations should be made to mitigate all concerns influencing the suppression decision and follow up treatment actions implemented to increase accountability in the restoration of fire adapted ecosystems.

In the event that the decision was based on extenuating circumstances beyond the control of managerial staff, such as political pressure, conflicting resource priorities, extreme fire weather, etc. the reasons and conditions at the time of the decision should be recorded as

one of the baseline reference conditions for future wildland fire events and adaptive prescription development for the restoration landscape or fire workload area.

3. A secondary Management Indicator for this CEMP is the protection of resources and/or habitats within the restoration landscape during the wildland fire event. Regardless of decision to manage a fire for resource benefits, to utilize a wildland fire use strategy, or to suppress the fire, cultural/natural resources, wildlife populations, and correlating habitats should be protected to the greatest extent possible while maintaining a safe and effective working environment.

As tribal members, resource managers, and the public, all live with the end results of a wildland fire event, the appropriate management response in a suppression situation may be to control fire intensity and contain the fire to within the most appropriate reasonable control features. Management ignited fire as a control action should be carefully planned when utilized to eliminate the trapping of wildlife between converging flame-fronts and to keep burn intensities to a minimum. In most cases, localized burn intensities are best managed with water. It is important to realize that in an extended attack suppression situation, appropriate timing of control actions is sometimes the most critical to the end result habitat quality, wildlife survival, and safe and effective management of the fire.

As this is an emergency situation, and conditions vary, success and failure determinations may be difficult to identify under this Management Indicator. However, in many cases adaptation determinations can be made. Resource Advisors assigned to the incident should track ignition patterns in relation to burn severity and location of flame-front at ignition. When there is an increase in burn intensity and severity in ignited areas it should be recorded as a suppression/control action and mitigated or rehabilitated when possible. This information should be utilized to improve institutionalized knowledge and establish adaptation recommendations for better protection of cultural/natural resources during additional management actions and future wildland fire events.

Management Practice 12

Reduce Fuel loading in and Adjacent to Degraded Spotted Owl Habitat

This CEMP is intended to supplement and enhance potential inadequacies of other fuels reduction practices in the interest of recovering local Northern Spotted Owl populations. When completed in conjunction, or in addition to, other CEMP's, this practice should help to protect, enhance, restore and/or maintain nesting, roosting, foraging, dispersal, and fledgling survival for the Northern Spotted Owl.

In areas selected for treatment of other CEMP's that overlap or are directly adjacent to Spotted Owl activity centers or vegetation characteristics indicate high potential for dispersal (contiguous fair to good habitat characteristics within 10 to 15.5 miles from occupied nesting sites), focused attention should be placed on initial treatments benefiting the Northern Spotted Owl (Hershey et al. 1998, LaHaye and Gutierrez 1999, Franklin et al 2000). In practicing other CEMP's, many benefits to this species should be indirectly

applicable. However, when re-establishing the potential for restoration of natural fire regimes in individual watersheds there may be a critical need to perform interior treatments in areas not indicated as a high priority by other practices (Bond et al. 2002).

In areas indicating potential nesting and roosting habitat, special attention should be placed on retaining 60 to 90 percent canopy closure while re-establishing or maintaining multi-layered/multi-species structural diversity, with large overstory trees (greater than 30" DBH or existing prior to effective fire suppression (1932) (Franklin et al. 2000). Some quantities of large woody debris at (varying states of decomposition when possible) should remain after treatment, but only in quantities/continuities ensuring low to moderate burn intensities in the event of wildland fire (Hershey et al. 1998, Bond et al. 2002). To the greatest extent possible ladder fuels should be removed in the presence of remaining ground fuels. Occasional pockets of small vegetation thickets as well as small openings (where indications show pre-existing openings) should be retained or re-established to promote prey escapement and/or availability (LaHaye and Gutierrez 1999).

Within ¼ mile radius of occupied nests sites, or 70 acre nest core, established limited operating periods (LOP) should be considered (February 1st to July 15th). However, with the quantity of work needed in order to restore natural fire regimes at the watershed scale and facilitate species recovery, restoration activities should not to exceed ½ of a LOP in every three years for any occupied nesting site. No more than two sites or 50% (which ever is lesser) should receive treatment in a watershed/fireshed per year. The remaining time can be spent enhancing and/or restoring foraging and dispersal habitats or implementing other CEMP's outside occupied nesting sites. Human ignited fires should only occur in the evening and allowed to burn into the night during LOP's to allow escapement of this species from pile burning smoke plumes

Resource Objectives

1. Air Quality – Protect species such as the Northern Spotted Owl from smoke related impacts during burning activities in LOP's.

2. Cultural Resources – Restore species composition in historically old growth stands to enhance potential for reestablishment of cultural use species in these stand types.

3. Energy

4. Enforcement / Regulation – Promote effective implementation of the endangered species act, through habitat restoration to enhance species survival and proliferation instead of protection of individuals and in essence condemn the species from recovery.

5. Environmental Education – Promote educational opportunities relating to the recovery of endangered species populations.

6. Environmental Justice – Promote meaningful jobs in local poverty stricken communities, while restoring species vital to balanced ecological systems.

7. Fire/Fuels Reduction – Restore fire adapted ecosystems and provide for a some degree of implementation in Spotted owl activity centers where there is currently no approved time period for completion when combined with other mandates and restraints.

8. Fisheries – Promote balanced ecological function and upslope management principals which ensure minimal impact activities that achieve greater watershed scale benefits.

9. Forestry – Promote economic recovery or cost offsets for additional treatment needs within and adjacent to Spotted Owl activity centers while restoring historical species composition and habitat variability.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and reduce potential for site disturbance.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Promote balanced nutrient cycling and decomposition of organic materials.

13. Watershed Restoration – Restore regular natural disturbance intervals in Spotted Owl activity centers instead of having these centers trigger perpetual suppression tactics in these areas.

14. Water Quality – Restore natural water infiltration and associated ground water recharge in the interest of maintaining balanced flow regimes.

15. Wildlife – Restore habitat infrastructure for the Northern Spotted Owl for increased reproduction success, fledgling survival, dispersal capability and occupation potential.

Management Indicators

1. Spotted Owl populations are the primary indicator for this CEMP. With the focused attention the Spotted Owl has received in recent decades, the Tribe has identified this species as being of special concern. Although this species was not traditionally managed for specifically, it is now an issue that needs resolution. Most management planning documents currently in effect limit integrated treatment capabilities. This CEMP is based on solving problems associated with habitat fragmentation and species survival as opposed to crippling expansive treatment capabilities in occupied nesting areas. Many of these occupied areas consist of correlating habitat qualities that severely limit the potential for successful forage, dispersal and fledgling survival which is critical to species proliferation.

A success determination can be achieved by different means. First, retained use in occupied stands can be considered effective when there is a mating pair in the stand within 2 years of treatment implementation. Second, successful mating and fledgling

survival is automatic grounds for success. Third, dispersal to unoccupied stands through treated areas is critical to species expansion, therefore this would also receive a success determination. This is especially true when male and female juveniles from different nesting pairs successfully disperse to occupy a treated stand.

When one the above successes do not occur, an adaptation determination will most likely be needed and treatments within the occupied area should cease until limited operating periods are over. This should be immediately followed by focusing more on interconnecting habitats to suitable areas a greater distance away. New information on species requirements should be researched and applied to treatment prescriptions.

Given the vast area that will be in need of treatment, and scale of time it will take to re-create and/or interconnect suitable habitats for this species, failure determinations are expected to only relate to direct harm. In the event that a nesting tree is damaged, removed, or mortality otherwise occurs as a direct effect of treatment activities, a failure determination is immediate and an alternate strategy for species restoration needs to be developed for occupied stands.

2. Habitat quality in unoccupied areas is a secondary management indicator for this CEMP. In some cases (plantations), this will take nearly a century to develop, and is therefore considered a secondary indicator. When suitable habitats cannot be directly interconnected without multiple entries over a long period of time, focused attention should also be applied to establish high quality habitat corridors around these areas.

When there is a multi-layered, multi-species canopy with a large mature tree component and an open understory at 60 to 90 percent closure immediately following treatment activities, a success determination should be made. In areas where multiple entries will be needed, success can be determined by potential for establishing species and age class diversity. In this type of area, occupied use such as foraging may be observed, in which case a success determination should also be triggered. Wood rat nests should be retained whenever possible to increase this potential (Carey et al. 1992).

When occupied behavior is observed in areas that differ from the current preferred habitats, the habitat should be assessed and documented by a qualified individual. As conditions have changed significantly in habitat infrastructure for this species since fire suppression and timber removal has begun, current science may be pointing at degraded habitats as being preferred as the ideal habitats may no longer exist. Occupation of a varying range of restored habitat infrastructure could therefore not only trigger a success determination, but also an adaptation to available science, correlating prescriptions, and treatment needs.

Management Practice 13

Decommission Problem Roads in the Interest of Water Quality

Road decommissioning under this CEMP is intended to reduce potential catastrophic water quality impairments in high priority watersheds (Luce et al. 2001). Road failures contribute high amounts of sediment into stream channels which can eventually have detrimental effects on anadromous and resident fish species (MacDonald et al. 1991. Furniss et al. 1991, Luce et al. 2001). These failures can cause many water quality impacts including but not limited to denuded riparian vegetation, filled in pools, increased water temperature, and excess suspended sediments during high water events (NRC 1996). Sediments can also cover spawning gravels, potentially causing juvenile mortality through reduced emergent survival (Ibid).

When possible, decommissioning efforts should focus on the restoration of hydrologic function. Inter-watershed/drainage transfers that can occur along road systems may further degrade water quality and ecological function. Concentrating water in inboard ditches, culverts and cross drains can reduce infiltration, groundwater recharge capability and may increase potential for catastrophic failures lower in drainages. In many cases water has been channeled through cross drains in areas where natural flow never existed (Furniss et al. 1991).

Port-Orford Cedar Root Rot is a significant water quality concern in territorial watersheds (Roth et al. 1957, Zobel et al. 1982). Reducing potential for spread of this noxious pathogen is of vital importance (Roth et al. 1957). Additional measures are incorporated into this practice when completing decommissioning activities in areas infected with Port-Orford Cedar Root Rot. These measures include limiting operating periods to dry weather only. Equipment and vehicles are to be washed when entering and exiting infected areas. Additional pressure washing will occur when an infected crossing is decommissioned and equipment is moving to an uninfected crossing (Roth et al. 1957). Through decommissioning of roads within infected areas, restricting access will help to reduce the potential for spread to adjacent uninfected areas.

Treatments should consist of removing culverts and cross drains and restoring the slope to near natural grade. Other CEMP's should be incorporated into adjacent slopes when possible. Noxious weed populations should be catalogued and treated in the appropriate manner to avoid spread and if possible eradicated. A foot traffic corridor should be left open for future site visits and monitoring. Follow up site visits should occur on an annual basis to up to the next 10 year storm event to identify adaptive management techniques and/or further eradicate noxious weeds.

Resource Objectives

1. Air Quality – Promote reduction in forest transportation infrastructure and associated dust related impacts from dirt roads.

2. Cultural Resources – Promote foot access along decommissioned road reaches to maintain access to cultural use species.

3. Energy

4. Enforcement / Regulation – Protect other drainages from the transport of port-orford rood rot disease, large scale water quality impairments, and reduce wildlife habitat fragmentation.

5. Environmental Education – Promote educational opportunities relating to restoring hydrologic function and reduced potential for large scale water quality impacts.

6. Environmental Justice – Promote meaningful jobs in local poverty stricken communities, while reducing potential for large scale negative effects to species vital to Karuk culture.

7. Fire/Fuels Reduction – Promote fuels reduction efforts adjacent to decommissioned road reaches to enhance potential for slowing, stopping, accessing, or otherwise increasing firefighter safety during wildland fire events.

8. Fisheries – Restore hydrologic connectivity along road systems contributing to impaired fisheries habitats and critical remnant populations.

9. Forestry – Promote natural regeneration and species diversity along decommissioned road reaches.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and restore sites previously disturbed during past management practices.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Restore soil stability along road reaches planned for decommissioning.

13. Watershed Restoration – Restore hydrologic connectivity and reduce potential for large scale road failures that can contribute excessive amounts of sediment into stream channels.

14. Water Quality – Restore hydrologic connectivity and riparian vegetation along high priority roads to promote balanced disturbance regimes and protect water quality characteristics.

15. Wildlife – Enhance wildlife migration potential, reduce habitat fragmentation and promote habitat connectivity.

Management Indicators

1. Post project erosion rates are the primary management indicator for this CEMP. All though chronic erosion occurs on unpaved roadways, inboard ditches, and culvert/cross drain outlets, these erosion factors are not typically measured by road reach.

Following implementation of this practice, short term adjustments may occur. In the long term a net decrease in sediment delivery will be achieved within decommissioned road complexes. In the interest of maintaining low monitoring costs, this indicator will be calculated by potential for reduction of the catastrophic road failures that will eventually occur without road maintenance or upgrades (GAO 2001).

For the purposes of making a success, failure, or adaptation determination in regards to this practice, fill removed vs. post project erosion will be analyzed (MacDonald et al. 1991). This will occur by calculating the volume of fill material in the crossings that are removed. This data will then be compared to short term adjustments that typically occur following decommissioning activities and weather events. A success determination through this indicator would be triggered when these erosion rates remain within 1 to 5 percent of fill volume removed. This should in many cases, be roughly equivalent to the short term impacts of the above mentioned chronic sediment delivery that will be resolved through the decommissioning of the road complex.

A failure and/or adaptation determination should be triggered by the exceedence of the 1 to 5 percent allowable adjustment factor. When this threshold is surpassed, prescriptions should be reviewed for potential adaptations to future projects in similar soil types, and drainage sizes. Concurrent emergency handwork, such as planting, structure placement, etc., should be employed in an attempt to mitigate impacts and/or reduce additional erosion. When this cannot be done a failure determination should be made.

2. Hydrologic connectivity is another primary Management Indicator for this CEMP. Most road systems are moderately to highly removed from the natural hydrologic flow regime within territorial watersheds. Though mostly surface flows, infiltration, and dispersal, are directly impacted by road construction, there are many cases when subterraneous flows have been severely altered (Furniss et al. 1991).

Subsurface flows are the most difficult to monitor and are therefore difficult to define in regards to success, failure and adaptation. It is however important to ensure that these subsurface flows are properly located and managed. This would most likely be implemented by creating a swale with hopes that infiltration will occur thereby restoring the subsurface flow. In most cases however, restoration of hydrologic connectivity in this circumstance would be have little reflection on a success determination other that when these flows do not surface in any place other than directly downhill from the source. A failure and/or adaptation determination should be made in the event excess saturation and subsequent failure of restored ground flows intercepted by road construction occurs.

In most other cases, restored hydrologic connectivity can more easily measure success, failure and adaptation. Post project inter-drainage water transfers and excess water channeling should trigger a failure and adaptation determination. Additional work should be implemented to remedy these problems. It should be noted prior to planning and implementation that there could be contributing factors such as adjacent ghost roads and interconnecting skid roads that could cause a failure determination. Such circumstances

should be planned accordingly so as to ensure a success determination triggered by all water flow appropriately remaining in the drainage of origin.

3. Reducing potential for spread of Port-Orford CedarRoot Rot is a secondary indicator for this CEMP. Through restricting access through infected drainages on dirt roads, potential for spread to uninfected drainages should be reduced. It is believed that the primary method of transport of this pathogen is by water or mud (Roth et al. 1987). With this being the case, the decommissioning of these problem roads would eliminate vehicle traffic and therefore reduce the potential for transmission to adjacent drainages. There is the possibility that spread can occur by wildlife such as elk/deer migration, bear wallows, etc... This would make success determinations difficult for the long term.

For decommissioned roads within infected areas, success failure and/or adaptation determinations would be have slight modifications relating to monitoring strategies. In the interest of reducing foot and vehicle traffic and potential post project spread, monitoring would consist of checking to see if access restriction measures have been compromised. Though it is hard to control foot traffic by the public, adaptations such as posting informational signs may help to avert such use when it is noticed. Other adaptations should occur if a vehicle such as motorcycle, ATV, or bicycle traffic has found a way around access control measures. Monitoring for spread within the decommissioned road complex should be comparatively assessed by aerial photograph.

Management Practice 14

Upgrade Manageable Road Systems

Road upgrades under this CEMP are needed in many areas throughout the entire transportation infrastructure. Upgrades are needed not only on Forest Roads, but also County Roads and State Highways. There continues to be a large number of road failures during large storms and rain on snow events (Furniss et al. 1991). Upgrades to the transportation system should not only reduce the water quality impacts caused by these events, but also help to ensure emergency access/egress is maintainable during emergency situations. Though there may not be much that can be done to prevent wind/snow down events during these storms, the roads can be opened relatively easily in this situation when there is a road remaining to open.

Culvert failures, water channeling in inboard ditches, improper drainage, driving safety, and fish barriers are the primary reasons for road upgrades (Funniss et al 1991). There are many things that can be done to prevent catastrophic road failures, many of which are site specific. Emergency repair work generally consists of rebuilding the road to the exact specification in which the failure takes place. This may be ok, when the failure was caused by an old rusted out culvert. The Karuk Tribe Department of Natural Resource believes however that all areas where a failure has taken place should be assessed and upgraded, if not decommissioned.

Activities that occurring in the road upgrade process should consider the limitation of inboard ditches; utilization of out sloping practices; mitigations for potential flows (including debris following fires) in culvert sizing; the mimicking of natural drainage patterns; re-establishment of fish passage; as well as establishment of safe visual distances, adequate traction, and reduced erosion potential.

Funding received for road upgrades should whenever possible, have a provision for transfer to more cost effective upgrades in emergency situations. It is cheaper and easier in many cases to simply upgrade a culvert when one is being replaced in an emergency situation anyway. The purchase and installation of a larger culvert and/or additional stability structures across many failures when they occur can help to reduce the chance of additional failure well into the future.

Resource Objectives

1. Air Quality – Promote improved access and effectiveness of roads as reasonable control features during wildland fire events, in the interest of restoring natural background smoke emissions.

2. Cultural Resources – Promote safe access to hunting and gathering areas along high use road systems.

3. Energy

4. Enforcement / Regulation – Enhance critical transportation infrastructure for enforcement and/or regulation of tribal hunting, gathering, fishing and/or other tribal ordinance.

5. Environmental Education – Promote educational opportunities relating to hydrologically stable road construction.

6. Environmental Justice – Enhance access/egress of rural residents during emergency situations, while promoting mitigation actions for resource impacts caused by inadequate road construction standards.

7. Fire/Fuels Reduction – Enhance public and firefighter safety during wildland fire events and the implementation of other CEMP's along upgraded road systems.

8. Fisheries – Enhance hydrologic distribution along road systems contributing to impaired fisheries habitats and critical remnant populations.

9. Forestry – Promote safe and effective low impact roadside timber removal practices to provide revenues for implementation of other treatment needs.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and relocate sites previously disturbed during past road building practices.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Enhance soil stability and maintain energy dissipaters to provide a reduction in road related sediment transport.

13. Watershed Restoration – Promote reduced sediment transport, inter drainage water transfers, soil stability and adequate culvert sizing.

14. Water Quality – Promote stream shading, energy dissipation, and adequate culvert sizing for balanced hydrologic function along upgradeable road systems.

15. Wildlife – Promote wildlife habitat improvement projects to enhance wildlife escapement potential along road systems.

Management Indicators

1. Hydrologic function is a primary Management Indicator for this CEMP. Most road systems are moderately to highly removed from the natural hydrologic flow regime within territorial watersheds. Though surface flow, infiltration, and dispersal, is directly impacted by the transportation system, strategic road upgrades can help to mitigate some of these issues (Funiss et al 1991). In most cases, simple road upgrades will not completely restore hydrologic function. However, impacts from inter-drainage water transfers, excess water concentration in inboard ditches, subsequent erosion rates, and potential for catastrophic failures can be reduced (Harris 2005).

Success determinations should be based on adequate culvert size, increased dispersal through out sloping, as well as the placement and functionality of rolling dips or low water crossings. A failure and/or adaptation determination should be made when water continues to flow around ridges, beyond the first natural drainage feature, there is inadequate dispersal, or a failure occurs after project completion.

2. Safe driving conditions are a secondary indicator for this CEMP. This is considered a secondary indicator as maximum success determinations can only be made in the event other CEMP's such as *Reduction of Fuel Loading Along Forest Roads*, are implemented in conjunction with this task. This however needs to be a Management Indicator because of the fact that some level of out sloping to reduce the quantity of inboard ditches may be involved.

Improving natural hydrologic function can potentially impact driving safety. Project design and outcome must include provisions to ensure safe driving road conditions. These provisions must significantly exceed the standard speed limitations for the road system involved. In many cases along windy roads, sight distances are a factor that cannot be adequately addressed unless fuels reduction measures are implemented.

With the importance of public safety, this indicator is intended primarily as a means to adapt past road designs to remedy this potential issue prior to implementation. Roads cannot be fully hydrologically restored without total decommissioning. Since this CEMP does not involve this practice, the level of hydrologic restoration will be limited to what can be done in a manner that is consistent with safe driving conditions.

3. Fish passage is a secondary Management Indicator for this CEMP. Road upgrades that improve and/or restore accessibility for native fish species is needed along many road systems. Although the removal of fish passage barriers is a CEMP of its own, it is necessary to assess as an indicator for road upgrade projects. Given the fact that not all road upgrade projects will include a fish passage component, it is considered a secondary indicator when relating to this CEMP. Passage should include anadromous and resident fish species of concern which include but are not limited to: Salmon, trout, lamprey eel, sculpins, and suckers.

Fish passage upgrades include but are not limited to culvert removal, culvert replacement, bridge construction, fish ladder placement, culvert baffling, road realignment, structure placement, and fill slope stabilization. These activities should be completed in the dry season when spawning or pre-emergent populations of anadromous fish species are not present. All activities relating to fish passage road upgrades should consider the potential for extreme high water from floods and excessive amounts of debris following high intensity fires if they were to occur.

As a secondary indicator, the assessment for success, failure and/or adaptation is relatively simple. Success determinations should be made by the physical habitat conditions following treatment as related to the ability for present fish species to utilize such habitat for spawning, rearing, and/or migration. In the event that the habitat remains in an unusable state a failure determination should be made. Adaptation determinations should be made if post project storm events cause adjustments that inhibit fish passage abilities. These adaptations should include simple fixes such as, strategic structure placement for completed projects and improved design features for future projects (Harris 2005).

Management Practice 15

Maintain Selected Transportation System Roads

Continued maintenance of transportation system roads will be needed for long periods of time. Current road maintenance budgets are insufficient to meet the projected need (GAO 2001). Tribal participation in road maintenance under this practice will likely be limited to access project areas and local residences; as well as to supply potential emergency escape routes and/or public services during severe winter weather situations. Many roads need annual work such as snow plowing, downed tree removal, slide removal, and culvert/ditch cleaning; where others may simply need grading, rocking, watering, noxious weed removal, brushing and/or wet weather closures.

Roads that have had successful fuels reduction treatments (Agee and Skinner 2005) should be maintained under the same practice originally employed, as flail mowers can add fine dead fuels and proliferate roadside brush accumulations in areas previously treated. Noxious weed populations should be eradicated along roadways as any practice is being employed. Grading, rocking and/or watering of roads may occur in times of projected high traffic or wet weather and is needed to improve driving safety.

The clearing of medium sized woody debris is appropriate when excess amounts are observed from the culvert inlet. Debris accumulations beyond this line of sight should be dealt with under another CEMP when appropriate, and should not be required of a road maintenance project.

Emergency maintenance will be needed from time to time. When this occurs, residents should be notified of the actions taking place. Other services such as charging freezers, transporting emergency provisions, assisting with heating needs and/or assisted evacuations, (especially the elderly) should occur concurrently. Prior to and during these emergency events culverts should be checked and cleaned if can be done so safely, snow should be plowed to allow egress, and obstacles in the roadways should be cleared. There may be additional unforeseen emergency situations that could occur and these issues should be dealt with in an adequate timeframe to insure public health and safety.

Resource Objectives

1. Air Quality – Promote well maintained road systems, reduce dust and enhance potential for restoring natural background smoke emissions.

2. Cultural Resources – Enhance access and management potential for the utilization of easily accessible cultural use resources.

3. Energy

4. Enforcement / Regulation – Enhance year round access/egress for rural residents to improve public health and safety.

5. Environmental Education – Enhance access and safe driving conditions for educational field trips.

6. Environmental Justice – Promote safe access for the implementation of effective management practices that protect promote enhance or restore the natural/cultural resources and environmental processes upon which the Karuk people depend.

7. Fire/Fuels Reduction – Enhance public and firefighter safety during wildland fire events, while improving access to implement other CEMP's.

8. Fisheries – Promote the regular maintenance and identification of potential road related impacts to fisheries resources and avert potential disasters prior to occurrence.

9. Forestry – Enhance potential for multiple entry management to slowly restore ecosystem diversity and associated variations in stand structure and composition.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and restore sites previously disturbed during previous road building actions.

11. Solid Waste – Promote the safe and cost effective transportation/utilization of biomass resources.

12. Soils / Minerals – Promote soil stability and reduce potential for large scale road failures.

13. Watershed Restoration – Promote safe access to other project locations, and enhance roadbed, cut/fill slope, and culvert stability.

14. Water Quality – Promote reduced water quality impacts through regular culvert cleaning and maintenance of appropriate drainage along road systems.

15. Wildlife – Promote the safe and effective implementation of other CEMP's that benefit wildlife species.

Management Indicators

1. Access and egress to/from private residences is a primary indicator for this CEMP. There are many private parcels along State, County and Forest roads. Most of the maintenance needs for this indicator can be assessed simply on safe access to these areas. Personal driveways are not included unless there is an emergency situation and land owners are in critical need of assistance.

Success can be determined when access/egress routes are safe for travel in a timely manner following natural events that cause road problems. Extreme weather events and wildland fires can create frequent road blockages and catastrophic road failures. These areas should be checked frequently and opened quickly when these events occur. Access/egress routes identified for the purposes of wildland fire management in the Wildland urban interface, should be should be the priority for maintenance and these roads should be traversable with firefighting vehicles prior to July of each year.

Failure and adaptation determinations should be minimal if not non-existent for this CEMP. These determinations would primarily be made due to lack of adequate budgets or inability to be actively involved in roads management.

2. Another primary indicator for this CEMP is free flowing water in road related drainage features. This is a critical component of road maintenance because blocked ditches and plugged culverts are in many cases the primary cause of large scale road failures (Funiss et al 1991).

Success would be determined when water flows through these drainage features unimpeded during storm events. Failure determinations should be made when large scale road failures occur because these problems were not resolved. Adaptations should be made to priorities and work locations during large storm events to ensure culverts are not plugging during such storms. Areas where recent fires have occurred should receive special attention due the fact that there is increased potential for large debris flows in these areas. Culverts should only be unplugged during these storms when it is safe to do so. Unsafe working conditions should not warrant a failure determination.

Management Practice 16

Remove Unnatural Fish Passage Barriers

Removal of unnatural fish passage barriers is needed in many territorial watersheds. Many of these barriers are along state highways and county roads. The removal of dams are not a part of this CEMP as they will be covered under the practice entitled *Restore the Historical Range of Occupation and Reproduction Potential for Anadromous Fish Species.* There are many unnatural fish passage issues that relate to road construction, culvert placement, channel failures, and large scale log jams associated with catastrophic fire events, wind throw and snow down events (Funiss et al 1991).

Many issues that anadromous fish species face today may appear to be associated with natural processes. However, Traditional Ecological Knowledge shows that the compounded effects of changes in managerial actions over the last century have significantly altered ecological function and are therefore considered unnatural by the Tribe (Hicks et al 1991). Removal of these barriers will in many cases require some level of stream channel restoration (Reeves et al 1991). Therefore, this practice should when needed, be done in conjunction with other related practices to achieve maximum efficiencies in overall restoration costs (Huppert and Fight 1991).

The removal of these barriers can be very expensive and time consuming (GAO 2001). Many of the fish passage barriers relating to the refugial capacity for juvenile Coho in the Middle Klamath and Salmon River Sub-Basins have already been catalogued and prioritized based on the quantity of high quality refugial habitat that can be potentially restored. Many of these areas also have the potential for restored access to spawning populations of other anadromous fish species.

Resource Objectives

1. Air Quality – Enhance the potential for utilization of stream channels as reasonable control features, furthering the effort to restore natural background smoke emissions.

2. Cultural Resources – Enhance potential spawning base populations for increased harvest and use potential of anadromous fish species.

3. Energy

4. Enforcement / Regulation – Promote increased harvest allocations for anadromous fisheries stocks

5. Environmental Education – Promote educational opportunities relating to increasing spawning habitat for anadromous fish species.

6. Environmental Justice – Enhance utilization potential and reverse the undue impacts of past management practices relating to fish populations and tribal uses.

7. Fire/Fuels Reduction – Promote fire safe native riparian vegetation composition in areas where fish passage is restored.

8. Fisheries – Restore habitat connectivity historic range of occupation and reproductive success in mainstem Klamath River tributaries.

9. Forestry – Promote sustained access and utilization of forest resources in a sustainable manner to offset managerial needs.

10. NAGPRA – Promote access to historic tribal fishing locations that may have been disrupted by past management practices to restore the integrity of such prehistoric sites.

11. Solid Waste - Promote utilization of biomass resources and roadside cleanup during project implementation.

12. Soils / Minerals – enhance soil stability and natural stream channel hydrologic function.

13. Watershed Restoration – Restore hydrologic connectivity and promote natural variations in stream channel morphology.

14. Water Quality – Protect water quality and reduce potential for large scale sediment inputs into critical stream channels.

15. Wildlife – Enhance access to prey base for terrestrial and aviator species that are dependant on fisheries resources.

Management Indicators

1. Restored access to suitable habitat for anadromous fish species is the primary Management Indicator for this CEMP. Many miles of high quality habitat within the historic range of anadromous fishes are currently blocked. Restoring these problems can expand access to, and subsequently increase the holding capacity of individual watersheds.

Some barriers allow passage of species such as Steelhead, but past management practices have eliminated access for Coho to their historic range of occupation (Bjornn and Reiser 1991). Therefore success, failure, and adaptation determinations should not only be based on the ability for anadromous species access, but in some cases species specific issues must be addressed. These determinations on historically low gradient streams should be Coho specific when these unnatural barriers can be restored to natural conditions.

In many cases, success, failure and/or adaptation determinations will be straight forward. The visual occupation of anadromous fish species below a barrier can further be noted above following restorative actions. This would trigger a success determination. Failure and/or adaptation determinations should be made when post treatment passage is not observed.

Species specific determinations can be more difficult to make. In some cases, the altered hydrology of the Mainstem Klamath may be creating an unnatural barrier at the mouth of creeks. In these areas determinations should be made based on the species currently accessing the watershed to the point of the barrier until correlating CEMP's can be successfully implemented and additional species access these areas for the long term.

2. Long term adjustment factors are a secondary Management Indicator for this CEMP. Anytime mechanical manipulation occurs there is high potential for short term adjustment in the manipulated channel. This is a secondary indicator as some passage barrier projects such as creek mouth enhancements will be temporary as they may be in an uncontrolled environment. Both long and short term adjustments should still allow for passage following most other treatment activities.

Success determinations should, when applicable, include prolonged access and use following stream channel adjustments. Structure placement may be appropriate when it is foreseen that adjustments will likely occur that could be a detriment to a success determination under this indicator. In the event that adjustments do not allow future passage, adaptations should be quickly developed and implemented to ensure long term hydrologic balance in the restored stream channel.

Management Practice 17

Restore Wetlands and Associated Wet/Dry Meadow Habitats

Restoration of wetlands and associated wet/dry meadow habitats is needed in many territorial watersheds. As a starting point many areas in need of restoration can be identified by utilizing the 1944 aerial photographs. Conifer encroachment on these meadows (Skinner 1995) has created a landscape condition that is no longer conducive of a natural fire regime, and has significantly reduced habitat availability for calving elk and other wildlife (Sachro et al 2005). In some cases these meadows have associated wetlands that have either been disturbed by road construction, landing placement, and/or plantation management, that should be enhanced and whenever possible restored to pre-

contact conditions (Odion et al 2005, Parks et al 2005). Burning of high elevation meadows resulted in variable effects on vegetation diversity and water table capacity (Mullen et al 2006).

In many cases the vegetation around springs, and ponds have been significantly altered. Restoration of a larger, wider spaced vegetation component in these areas will help to maintain shade while potentially balancing ground water to surface flow transfers. Restoration of the meadow components associated with many of these wetlands should further contribute to balanced flows and seasonal evapo-transpiration rates (Mount and Hammersmark 2007).

Actions under this CEMP include core sample mapping and excavation of fill material in wetlands and associated drainage structures; vegetation enhancement in the form of large tree restoration combined with grass/forb habitat expansion and maintenance burning.

Other wetlands have been filled in for infrastructure development purposes. Many of these areas may not be readily identifiable, but should be located, recorded and restored when possible. For example, there are two sacred ponds that were filled in for the construction of the Forest Service Work Center in Somes Bar. Though these wetlands may be difficult to restore even with fixing the drainage problems associated with highway 96 and the correlating instability of this landscape, some level of restoration should occur if it can be safely and effectively be achieved.

Resource Objectives

1. Air Quality – Restore wetland and meadow habitats for increased success in wildland fire management and natural background smoke emissions.

2. Cultural Resources – Promote increased quality and quantity of cultural use species requiring open spaces and wetland habitats.

3. Energy

4. Enforcement / Regulation – Enhance potential for increased terrestrial wildlife habitat variation and populations and promote a future hunting rights ordinance based on managerial principles.

5. Environmental Education – Promote educational opportunities relating to restoring terrestrial habitat variability and integration of fire dependant ecosystems structure.

6. Environmental Justice – Restore historic fire dependant habitat infrastructure and species variability that was unjustly altered by fire suppression and other policies or managerial actions.

7. Fire/Fuels Reduction – Restore open spaces and fire dependant vegetation composition prior to high in intensity fire occurrence in wet/dry meadows in the interest of utilization of native seedbed for vegetative restoration.

8. Fisheries – Restore the natural hydrologic function, sediment filtration, and balanced evapo-transpiration rates of wet/dry meadows for increased hydrologic stability in fishery dependant streams.

9. Forestry – Enhance economic recovery of additional treatment costs through increased per acre harvest rates in meadow restoration project areas.

10. NAGPRA – Enhance the ability to locate, record, and protect physical cultural artifacts and potentially restore the integrity of specific resource processing sites.

11. Solid Waste - Promote utilization of biomass resources.

12. Soils / Minerals – Promote balanced nutrient cycling, sediment filtration and stability of springs, seeps, and streams beginning within or transecting meadow habitats.

13. Watershed Restoration – Enhance stream channel morphology and sediment filtration.

14. Water Quality – Promote delayed peak runoff and increased summer base flows and correlating sediment transport, water temperatures, and channel failures in streams originating in wet dry meadow habitats.

15. Wildlife – Enhance wildlife species that are dependant on open space, meadow and correlating transitional habitats.

Management Indicators

1. Elk calving and winter habitat is a primary Management Indicator for this CEMP. With continual meadow encroachment primarily by conifer species, elk calving and winter habitat has been decline. The expansion of this habitat type will be critical to the viability of elk populations (Becker and Raedeke 1996).

Success determinations should be made when the use of these areas are observed during the calving season. Areas currently being utilized should be expanded to avoid over grazing and allow for herd development. In these areas success should be determined by continued use the following season. In many cases elk utilize wetlands to escape wildland fires. Observed use or restored wetlands for bathing, drinking and/or escapement from fires should also contribute to a success determination.

In the event elk herds abandon these specific habitats because of implementation efforts a failure and/or adaptation determination, such as limited operating periods should be made. If completely restored habitats are not utilized, adaptation determinations such as

the reducing habitat fragmentation adjacent to treatment areas should be made through implementation of other CEMP's. This however should be planned up front so CEMP's in a given watershed complement each other to the greatest extent possible.

2. Water Temperature is a primary indicator for this CEMP. Water temperatures on average, should not show a significant rise downstream of restored wetlands. This practice is intended as a means of achieving balanced water input into territorial streams. Though a slight rise in temperature may be observed at the restoration site until riparian re-vegetation can be reestablished, this should be offset downstream by increased surface runoff and reduced ground water consumption rates in surrounding meadows (Mullens et al. 2006).

Success determinations should be made when water temperatures at the nearest point of use by anadromous fish species, are maintained or reduced on average. Failure and/or adaptation determinations should be triggered in the event average temperatures increase at the same location, or long term studies show the additional treatments or adaptations are needed.

3. Balanced flows are a secondary Management Indicator for this CEMP. Given the lack of studies and relating to this potentially beneficial byproduct of proper ecosystem management, balanced flow regimes is considered a secondary indicator. This indicator is intended to instill a placeholder for a long term study of the potential for balancing flow regimes through the restoration of wetlands and associated wet/dry meadow habitats. Though the implementation of this CEMP alone may not entirely show a balance in flow regimes, it is believed that sediment filtration from restored meadows and steady surface flows from restored wetlands should contribute significantly.

Success/failure determinations for this indicator would likely not occur in the short term. However additional treatment needs and/or adaptations may be identified and incorporated into this plan during the course of, or upon completion of such study. The long term study should show increased summer mean base flows and decreased winter peak flows as well as a reduction in potential large scale debris flows, when implemented with other CEMP's.

Management Practice 18

Enhance Degraded Stream Channel/Groundwater Fed Pond Interconnectivity

In many areas throughout the Klamath River Basin enhancement of degraded stream channels and/or groundwater fed ponds will be needed. Juvenile Coho are dependent on groundwater fed ponds within the high water mark (Giannico and Hinch 2003). Adult Coho and other anadromous fish species are dependant on stream channels that have been degraded (Lichatowich 1998). Mining, flooding, farming, road construction, and other past management practices have, in some cases altered entire river and stream reaches (NRC 2004).

In some instances this has caused these rivers and streams to flow subsurface in the summer months having potentially detrimental effects to anadromous fish species and water quality. Degraded stream channel enhancements would likely consist mostly of creek mouth enhancements to allow for access to suitable habitat (Guillen and Magneson n.d). There would be a need for a few larger scale projects to restore the meander to the original stream course in larger streams where excessive channeling has occurred. Restoration of meandering stream channels can slow water flow and maintain variation in stream channel morphology and temperature (Welsh et al 2001, Moughamian 2003). This can maintain surface flows and reestablish habitat diversity in areas that currently dry up in the summer months.

There are numerous areas local rivers and creeks where pond habitats have been disconnected due to altered hydrologic function (Swales and Levings 1989). In some areas entire creeks have shifted out of these critical habitat areas, hindering access by sensitive species. In other areas excessive stranding occurs and summer conditions do not allow survival. These areas can be enhanced to bring in additional subsurface flows, establish or maintain shade and cover, and allow access/egress to these areas for better survival rates of sensitive and endangered species that utilize these habitat types (Swales and Levings 1989, Welsh et al 2001). In some cases the eradication of non-native predator species may be needed.

These treatments could be critical to the survival of anadromous fish species in the Klamath River Basin (NRC 2004). Fish stranding areas should be monitored catalogued and prioritized for enhancement in the interest of maximizing survival rates of stranded species. Many ponds outside of the high water mark that have been previously been disconnected are currently catalogued and prioritized but are need of funding, permits, and agreements to be negotiated.

Resource Objectives

1. Air Quality – Promote balanced evapo-transpiration rates.

2. Cultural Resources – Enhance traditionally utilized fish species populations.

3. Energy

4. Enforcement / Regulation – Promote increased potential for future delisting of endangered Coho Salmon.

5. Environmental Education – Promote educational opportunities relating to juvenile Coho refugial habitat restoration.

6. Environmental Justice – Promote future Coho returns to harvestable levels and restore traditional late fall salmon harvest practices.

7. Fire/Fuels Reduction – Promote balance riparian vegetation and large woody debris in areas treated under this practice.

8. Fisheries – Enhance potential for restoration of Coho Salmon populations in the Klamath River Basin.

9. Forestry – Promote large woody debris recruitment adjacent to these habitats.

10. NAGPRA – Promote continued utilization of traditional fishery harvest methods.

11. Solid Waste – Promote river clean up activities for additional enhancement of water quality and fish habitat infrastructure.

12. Soils / Minerals – Promote balanced stream morphology, sediment distribution and riparian soil production.

13. Watershed Restoration – Restore natural variations in, access to, and long term functionality of degraded Coho and other aquatic species habitats.

14. Water Quality – Promote spring fed cold water inputs to refugial fishery habitats.

15. Wildlife – Enhance riparian habitats that are critical to migratory birds and terrestrial wildlife species.

Management Indicators

1. Refugial cover is a primary Management Indicator for this CEMP. Refugial cover refers to places for juvenile fish species to hide from predators within the area of potential occupation for anadromous species. With the historic decline of suitable habitat for Coho at all life stages, this species is on the path to extinction (Frissell 1993). The Karuk Tribe believes that restoration of the habitat types mentioned in this CEMP is critical to reversing this trend. In the restoration of these habitats, it is important to consider hiding places for these sensitive species as they are susceptible to predation in these environments which are in many cases clear and shallow water.

Success determinations should be made in part by the availability of cover for juvenile Coho. For this CEMP all Management Indicators should be met before making a success determination. In the event that all of the indicators are not met, an adaptation determination should be made. Failure is not an option in the recovery of Coho populations. With this in mind, if treatments are not working then prescriptions should be changed or additional practices should be developed and incorporated into this plan.

Cover from natural predators should be available following treatments, however in some cases adaptations such as eradication of non-native predator species should be implemented during restoration activities (Harvey and Kareiva 2005).

2. Refugial temperatures are another primary Management Indicator for this CEMP. Given the fact that juvenile Coho habitats in many cases, involve stranding for the summer months, temperatures will be critical to the successful implementation of these projects (Welsh et al 2001). The temperature range will fluctuate throughout the day but there should always be large enough refugial area within these habitats to accommodate more of this species than currently occupy each area (Harmon et al 2001).

Water temperatures generally peak at 6:00pm with minimum occurring at 6:00am so permanent temperature gauges should be placed in the appropriate locations within each restored habitat (Flint and Flint 2008 for USGS gauge data summary reports). When an area is selected for potential treatment, temperature data should be collected will before the project is implemented in the interest of gathering baseline temperature data (see Bartholow 2005 for historical analysis of Klamath River and Flint and Flint for models of estimating un-gauged tributaries). Routine scheduled aerial surveys using Thermal Infared and Color Videography may another monitoring application (Watershed Sciences, LLC 2004).
Success determinations should be made when excess temperatures do not cause mortality of juvenile Coho occupying these habitats (Sutton et al. 2007). Mortality generally begins in this species when water temperature reaches 74 degrees Fahrenheit (Frissell 1992, Welsh et al 2001, Sutton et al. 2007). In the heat of the summer, much of the water volume in this habitat type exceeds this temperature (Flint and Flint 2008, Karuk Tribal Fisheries Personnel observations. unpublished data on-file). However, this should only cause the suitable habitat area to be reduced in size, and not disappear entirely (Sutton et al. 2007).

In the event that all of the indicators are not met for this CEMP, an adaptation determination should be made. Failure is not an option in the recovery of Coho populations. With this in mind, if treatments are not working then prescriptions should be changed or additional practices should be developed and incorporated into this plan. Klamath River data can be entered into the USGS program SIAM. SIAM is a suite of models for the Klamath River in northern California. SIAM integrates a water quantity model (MODSIM), a water quality model (HEC-5Q), and a fish production model (SALMOD), to aid the evaluation of water management alternatives (see http://www.mesc.usgs.gov/products/software/SIAM/).

3. Access to these suitable refugial habitats is the third Management Indicator for this CEMP. In many cases, access/egress, or the connectivity from these habitats occurs during high winter and spring river flows and juvenile fish may be stranded in side channel pools (NRC 2008). This is the natural access/egress pattern for that habitat type and when occurring, should be considered suitable for the purposes of making success or adaptation determinations. This indicator is in place more for the refugial habitats that are improved for the purposes of ensuring juvenile anadromous fish species can escape the warm water temperatures that occur in the mainstem Klamath River.

Success determinations should be made in the event that anadromous juveniles can enter these refugial holding areas during low flows. In some cases access improvements may

be needed on an annual basis. In most cases, the juveniles should be accessing these areas by August so any annual improvements should be completed by then. Whenever possible, access improvement projects should be designed to be hydrologically stable. This may require large boulders or some sort of structure placement to ensure that restored stream channels are self maintained during changes in water level and flow (Rosgen 1996, Cal. Fish and Game Habitat Restoration Manual).

Failure and adaptation determinations under this indicator should be made when access is not available following treatment. This determination would be more likely made following treatments involving boulder and/or structure placement. Given the flow and velocity variations at river and creek junctions, the design of this type of project will be critical in achieving a success determination. In some cases, adaptations such as additional boulder/structure placement following post project hydrologic adjustment may be needed to ensure long term, naturally maintainable habitat infrastructure.

Management Practice 19

Restore the Historical Range of Occupation and Reproduction Potential for Anadromous Fish Species.

This CEMP is primarily intended for the restoration of access to the historic spawning habitats and survival potential above the Klamath River dams (Hamilton et al 2005). Given the current political realities of dam removal, this CEMP has been separated out from the removal of unnatural fish passage barriers practice (Harden 2007, see Cubed 2006 and Blevins 2007 California Energy Commission reports at http://www.energy.ca.gov/klamath).

Dam removal is in itself a phenomenal task. The Karuk Tribe believes that removal of the lower four Klamath dams will be critical to successful access/egress for anadromous species. The upper dams are in the historic location of natural reefs that have always been there but allowed for passage of anadromous species (Hamilton et al 2005). We do however believe that some sort of screening should be placed above and below the upper dams to ensure species such as Pacific lamprey will utilize the fish ladders already in place.

Lampreys utilize the flow margins to travel stream and let the downstream flows guide juvenile egress (See Hamilton et al 2005 for discussion of historical lamprey species distributions). With this in mind, lamprey may not have the ability to locate fish ladders and attempt to pass through turbines or climb spillways instead, causing problems to dam operation and be a detriment to species survival rates (Dauble et al. 2006, Schilt 2007).

As for the reintroduction of other anadromous species following dam removal, this should be done primarily by allowing natural passage to occur (See Hamilton et al 2005 for potential species reviewed). In the event that hatcheries or hatch boxes are utilized for initial reintroduction, it is believed by the Tribe that egg fertilization should occur at or near the point of release (Cloud and Thorgaard 1993, see also examples and references

in Hassemer et al 1997). We believe that any unnatural reintroduction implemented should be done in this way, because it is likely that homing or "imprinting" could occur during the water hardening stage of reproduction.

Traditional Fishery harvest timing is also a critical to increased reproduction potential. The first spring salmon runs should be allowed to pass traditional fishing grounds unimpeded (Sweezey and Heizer 1993). These fish are migrating upriver at a time when river temperatures are lower and allowing these fish to travel farther upstream before moving into mainstem tributaries to spawn (Sullivan et al 2000, NRC 2008). This harvest timing has been previously described in the *Traditional Laws Governing Land Management Practices* section of this document for areas within the Karuk Aboriginal Territory. All traditional Karuk salmon and steelhead harvesting should be in accordance with this timing (Kroeber and Barrett 1960). Departmental staff should make every attempt to restore this timing in areas outside the Karuk Aboriginal Territory and correlate harvest management regulations to meet the intent of non harvest of the fish that migrate through Karuk territory during these times.

Resource Objectives

1. Air Quality – Promote lower water temperatures in the mainstem Klamath River and decreased nutrient loading to potentially improve the scent of the air along river corridor.

2. Cultural Resources – Restore traditionally utilized fish species populations.

3. Energy

4. Enforcement / Regulation – Restore access to a majority of spawning habitats in the Klamath River Basin.

5. Environmental Education – Promote educational opportunities relating to a restored anadromous fishery.

6. Environmental Justice – Restore historic levels of anadromous fish returns reversing the effects of dam construction in the Klamath River Basin.

7. Fire/Fuels Reduction – Promote natural stream channels and associated riparian vegetation in areas affected by dam construction.

8. Fisheries – Restore access to a majority of spawning habitats in the Klamath River Basin.

9. Forestry – Promote large woody debris recruitment adjacent to these habitats.

10. NAGPRA – Promote the potential utilization of additional traditional fishery locations.

11. Solid Waste – Promote river clean up activities for enhancement of water quality and fish habitat infrastructure.

12. Soils / Minerals – Promote natural stream morphology, sediment distribution and increased fish based terrestrial nutrient cycling.

13. Watershed Restoration – Restore natural variations in river sediment transport and substraight composition.

14. Water Quality – Restore natural flow regimes while reducing water heating, algae blooms and associated microcystin production in the shallow unnatural Klamath River reservoirs.

15. Wildlife – Restore food base for fishery dependent terrestrial and avian wildlife species.

Management Indicators

1. Unimpeded access and egress for anadromous fish species to the headwaters of the Klamath River Basin is a primary Management Indicator for this CEMP. Following dam removal, anadromous fish should be able to freely migrate beyond all current dam locations on the mainstem Klamath River (Hamilton et al 2005). Approximately 2/3rd's of the historic spawning habitats are located above Irongate Dam (Ibid). Free migration beyond this point is believed by the Tribe to be the only reasonable way to restore the anadromous fisheries in the Klamath Basin.

Success determinations should be made in the event that anadromous species can freely pass by these locations into waters conducive of species survival. Visual observations of these species utilizing habitats beyond the current dam locations should be a first step towards a success determination. In some cases a success determination may be contingent upon certain adaptations.

Adaptations such as dredging sediments captured above dams may be needed prior to dam removal (Doyle et al 2003, Graf 2003). However, if it is determined that allowing these sediments to flush through the river system is the most biologically and economically sound treatment there may be some additional treatment still needed (Doyle et al 2003, Curtis et al 2005). Immediately following such sediment flush, substraight types suitable for spawning should be identified. In the event cobbles maintain excessive fine sediments that could potentially suffocate emergent juveniles, adaptations such as dredging out the sediments may be needed (Perrow and Davy 2002, Curtis et al. 2005).

Additional adaptations determinations should be made in the event that fish can pass these locations, but spawning, incubation, emergence, and rearing are not highly successful, or out migration cannot occur.

2. Increased water quality below the current location of Irongate dam is also a primary Management Indicator for this CEMP. Following dam removal, the reduction in potential algae blooms currently occurring in the reservoirs (Kann and Corum 2006), should alone significantly improve water quality characteristics downstream.
Success determinations should be triggered in the event that reduction in average temperature is noted downstream of the current dam locations (with consideration for climate trend warming see Bartholow 2005). The removal of shallow reservoirs should slow water heating, and speed water cooling, thereby balancing diurnal temperature fluctuations. Spring water influences should also help to maintain water suitable water quality characteristics.

Adaptation determinations may be needed in the event significant toxic algae blooms remain following dam removal or water quality in general does not improve. At a minimum, water quality characteristics conducive of anadromous species survival should be met to the extent that adequate refugial capacities for all life stages of anadromous species is well distributed throughout restored reaches.

3. Restored Spring Salmon runs are a secondary Management Indicator for this CEMP (Snyder 1931). Given the extended time period it would take for these runs to naturally return this is considered a secondary indicator. Though restoration of these particular runs are an overall goal for this practice, this indicator is intended more for determining the level of success as well as guide adaptation determinations and/or harvest timing regulations.

Spring and Summer Chinook runs are virtually non existent (Moyle 2002). Historically, these runs fed native peoples for many months (Synder 1931, Kroeber and Barrett 1960). Harvesting of these species was managed extensively (Sweezey and Heizer 1993). These runs used to migrate in large numbers from April through August (Synder 1931). Currently, the only harvestable runs of salmon, primarly Fall-run Chinook, migrate from the end of August through October. This issue accounts for 4 to 5 months of salmon harvesting that no longer exists on a sustainable level. Restoration of these runs is critical to perpetuation of Salmon in the Klamath River Basin (see Kroeber and Gifford and or First Salmon ceremony, started spring fishery)).

Restoration of these runs should be automatic grounds for success for this CEMP. Integration of traditional harvest management will be a critical component in the natural reintroduction of these runs. Spring run salmon typically migrate farther upstream to spawn (DesLaurier and Barnhart 1990). They also move out of the river system during more suitable water conditions, therefore should have a higher survival rate than other runs.

Adaptations such as temporary non harvest of spring salmon would be a good start for an established time period. As populations increase restoration of traditional harvest timing based on fishing location will be entirely necessary to maximize populations and subsequently increase harvestable allocations.

Management Practice 20

Extirpated Species Reintroduction

There are many species that have been extirpated locally (Barrett 1997, Carroll et al 2001). The primary focus of this CEMP is the reintroduction of beaver and porcupine. Though there have been some beaver sightings in recent years the population of this species is not remotely near historic levels. There has only been one reported sighting of a porcupine since the government bounties and no other visual evidence of there local existence has been observed (Barrett 1997). Porcupines are reported to have been absent or scarce in westerncoastal areas west Aboriginalprior to logging. Porcupines dependence on early seral, hardwood/forb dominated, and post-fire habitats would have been maintained by Karuk fire management practices (Yocom 1971, Lewis 1993). Other locally extirpated species such as the pacific fisher could be reintroduced (USFS-PSW 2008) once porcupine populations become an more abundant prey/food source, although a recent study demonstrates that porcupines presently compose a lesser portion of fishers' diet (Golightly et al 2006). Although, this study doesn't account for the fact that porcupines were historically more abundant in the Karuk Aboriginal TAboriginal erritory, and were likely a more substantial part of the fisher diet (See SW Oregon studies for fisher reintroduction to deter porcupine damage to plantations, Yocom 1971 for invasion/colonization of porcupines in Humboldt and Del Norte counties as the result of intensive logging.)

Beaver are critical to supplying increased juvenile Coho habitat quality and quantity (Collen and Gibson 2001 and references there in). Beaver dams provide velocity brakes, refugial cover, increased pool depth, and can significantly influence the formulation and maintenance of additional habitat infrastructure (Ibid). The reintroduction of a minimum of three mating pairs of beaver could be needed in each stream currently occupied by juvenile Coho. The number of mating pairs would be dependant upon the size of stream utilized, but it is believed by the Tribe that three pairs would be the minimum to provide some level of genetic variation for species expansion and population viability.

Porcupines are critical to the maintenance of oak woodlands and the reduction of conifer encroachment on restored habitats. They provide a significant cultural resource for tribal basket weavers whom no longer have a source for collecting the quills (O'Neal 1995). As with the beaver, it is believed that a minimum of three mating pairs should be reintroduced per watershed. Reintroduction should initially occur in areas treated with fuels reduction CEMP's to provide some level of natural maintenance interval by this wood eating species. Appropriate analysis of their life cycles and habitat needs and acres or restored areas should guide the amount reintroduced in a given area.

Other species such as the fisher may also need reintroduction (USFS-PSW 2008). With the fisher being the primary species that prey upon porcupines, we believe that either additional pairs of porcupine should be reintroduced, or the reintroduction of fisher should not occur until porcupine populations become reproductively stable. It may be that fisher populations recover naturally upon an increase in their extirpated food source.

With any species identified for reintroduction, it is believed by the Tribe that these same principles for the re-establishment of natural ecological processes be closely examined and tiered to habitat needs and the ecological purpose of the species in question.

Resource Objectives

1. Air Quality – Promote natural fuels maintenance for balanced smoke emissions from wildland fires.

2. Cultural Resources – Restore traditionally utilized species populations.

3. Energy

4. Enforcement / Regulation – Promote tribal collection ordinance development for individual sacred and utilitarian terrestrial resources.

5. Environmental Education – Promote educational opportunities relating to the interrelated purpose of codependent species.

6. Environmental Justice – Restore populations of locally extirpated species to mitigate the loss of ability to utilize such resources by government initiated/supported bounties and/or exterminations.

7. Fire/Fuels Reduction – Promote natural maintenance factors in treated areas.

8. Fisheries – Enhance juvenile Coho habitat infrastructure.

9. Forestry – Promote naturally maintained forested ecosystems.

10. NAGPRA – Enhance our ability to make and utilize traditional basketry and ceremonial regalia.

11. Solid Waste – Promote reduced biomass removal intervals.

12. Soils / Minerals – Enhance forest decomposition, nutrient cycling and fertilization in forested ecosystems.

13. Watershed Restoration – Restore symbiotic components of natural ecological processes.

14. Water Quality – Promote reduced water temperatures, balanced flows and enhanced evapo-transpiration rates.

15. Wildlife – Restore locally extirpated species populations and associated habitat infrastructure.

Management Indicators

1. Reintroduced species population expansion is a primary Management Indicator for this CEMP. As extirpated species are reintroduced, dispersal should be immediate to the nearest suitable habitat and capacity for habitat sharing based on species requirements. Reintroduced species should be monitored every year for five years to determine population viability (see Hoopa Tribal Forestry Pacific Fisher Ecology and Conservation Program). Follow up monitoring should occur every five years over a twenty year period to determine the need for reintroduction of additional species that relate specifically to the species reintroduced.

Success determinations should be based on reproduction, dispersal, and population expansion rates over the first five years. Failure and adaptation determinations should be triggered when this does not occur, or existing levels of predation are beyond a level to allow for species expansion. Adaptations such as reintroduction of additional mating pairs, and/or implementation of additional CEMP's for habitat expansion/improvements should be made a high priority when populations remain at the reintroduced level, or are in decline.

2. Increased holding capacity for juvenile Coho is a secondary Management Indicator for this CEMP. This is a secondary indicator as it relates specifically to the reintroduction of beaver. With the well documented relationship between beaver dams and Coho habitat, success, failure and/or adaptations should be easily determined (Collen and Gibson 2001 and references therein). Beaver dams reduce stream velocity and increase marginal habitats and in some cases increase pool depth which provides for increased habitat availability for juvenile Coho.

Juvenile Coho continue to be extensively monitored in Klamath River tributaries (Karuk Tribe,Yurok Tribe, Salmon River Restoration Council, Mid-Klamath Watershed Counical, USFS and USFWS sampling). This effort has supplied a stable baseline for existing population and holding capacity of individual streams and/or habitats. In addition to indicator one for this practice, habitat selection will be a contributing factor to a success determination. Since Coho population recovery may take many years, and require a wide range of CEMP implementation over time, the selection of beaver dam locations and associated habitat improvements will drive the level of success for this indicator.

Success should be determined by an increase in marginal habitat consisting of suitable velocity, cover, and depth. Failure and/or adaptations should be made in the event that cover is substantially reduced, velocity is increased, and depth is inadequate for a majority of beaver dam locations following an appropriate period of hydrologic and riparian vegetation adjustment. Other adaptations such as the implementation of the *Abandoned Mine Tailing Reclamation and Associated Riparian Infrastructure*

Restoration practice may be based on findings that limited beaver habitat infrastructure exists, triggering reduced population expansion capabilities.

Management Practice 21

Abandoned Mine Tailing Reclamation and Associated Riparian Infrastructure Restoration

Mine tailing piles have potentially altered the function of flood plane habitats and riparian microclimates (Hanson et al. 2001). In some cases entire river reaches have been channeled potentially altering flow regimes. This CEMP is intended for the purpose of recording the location and extent of areas impacted by hydraulic mining activities that may have significantly altered ecological functions. It is also included to guide the restoration of these altered landscapes for the enhancement of functioning natural ecosystems while supplying restoration byproducts for other CEMP's (Ibid).

When appropriate, byproducts such as rock sources could be utilized for the implementation of other CEMP's. Projects such as road decommissioning can require the use of large rock to stabilize restored stream channels. In other instances such as road upgrades and flood repair, smaller rock is also needed for construction of retaining walls and drainage features. The use of rock that can be extracted from physically altered ecosystems can not only be a more ecologically sound source of these materials, but serve as a cost reduction mechanism for other important projects.

These large exposed rock piles can in their current state absorb significant amounts of heat throughout the day and release it over night potentially altering the diurnal temperature fluctuations of the pre-existing microclimates (Spense et al. 1996, Hanson et al. 2001). Depending on the extent of this change locally, sensitive conditions in certain times of year may have been altered to beyond threshold for certain species.

Rocks that were deposited out of river flood planes thousands of years ago have in many cases been placed in areas that can allow for them to be washed into rivers and streams during high water events. This coupled with the phenomenal amounts of material that have been introduced into the river by road building, hydraulic mining, and management related debris torrents, exacerbates a reduction in pool and riffle depth and can alter the physical characteristics and correlating holding capacity of entire river systems (Spence et al. 1996, Hanson et al 2001). Although a study in the Sierra Nevada Mountains, with similar geology, found little residual impacts to resident fish and marcroinvertabrates from sediment loads (Gard 2002).

Utilization permits and/or agreements with Tribal, State and County roads programs should be formulated to incorporate these areas to serve as disposal sites for excess slide materials when can be located outside of areas influenced by floods. Precious metals, when located during restoration activities, should be utilized to offset implementation costs of this and other CEMP's.

Resource Objectives

1. Air Quality – Promote a reduction of potential heat pockets in or adjacent to habitats potentially influencing riparian microclimates.

2. Cultural Resources – Enhance traditional cultural use vegetation characteristics in restored mining activity centers.

3. Energy

4. Enforcement / Regulation – Promote rock source use agreements and/or utilization ordinance as an effective cost benefit to implementation of other CEMP's.

5. Environmental Education – Enhance educational opportunities relating to the integration of multiple CEMP's to achieve a greater benefit from the restoration of natural systems.

6. Environmental Justice – Restore traditional use areas and prehistoric village sites that have been detrimentally altered from historic mining activities.

7. Fire/Fuels Reduction – Promote restoration activities that are conducive of utilization of these areas as reasonable control features where applicable.

8. Fisheries – Restore fisheries habitat infrastructure associated with altered by historic mining activities.

9. Forestry –.Enhance the ability to utilize accessible mining areas for long term production and utilization of cultural and forestry resources associated with surrounding stand characteristics.

10. NAGPRA – Restore mine tailing areas in accordance with adjacent natural features and traditional utilization characteristics associated with physical cultural artifacts identified and protected during planning and implementation and relocate such items in restored upslope tailing areas.

11. Solid Waste – Promote the location and cleanup of garbage, scrap metal and other waste products in and adjacent to historic mine tailing areas.

12. Soils / Minerals – Promote the productive utilization of waste soil and mineral resources.

13. Watershed Restoration – Restore natural drainage features, hydrologic function, and riparian infrastructure associated with altered stream channels caused by historic mining activities.

14. Water Quality – Promote the identification and restoration/mitigation of severe water quality impacts such as acid drainage caused by improper placement and or exposure of mine tailings and mine waste byproducts.

15. Wildlife – Protect salamanders and other wildlife populations from harm during restoration activities.

Management Indicators

1.

2.

3.

Management practice 22:
Energy conservation and sustainable resource use.

Management practice 23:
Soil waste management and recycling.

Research needs to support implementation and monitoring of Cultural Environmental Management Practices: What additional research is needed to know more-current data gaps in science?

CEMP-1:
CEMP-2:
CEMP-3:
CEMP-4:
CEMP-5:
CEMP-6:
CEMP-7:
CEMP-8:
CEMP-9:
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CEMP-18:
CEMP-19:
CEMP-20:
CEMP-21:
CEMP-22:
CEMP-23:

Definitions

Appropriate Management Response

The management strategy implemented upon occurrence of a wildland fire or incident of an emergency nature requiring expedited decisions as to the appropriate managerial actions.

Co-Administration
To bring into use, operation, or implementation, within a co-managerial context.

Co-Management
To jointly bring about or succeed in accomplishing, sometimes despite difficulty or hardship.

Condition Class
The landscape condition classification that reflects the range of alteration in the fire return interval of the local pre-contact fire regime.

Confinement Strategy
A wildland fire management strategy that primarily focuses on confining a fire to within an identified perimeter or reasonable control feature(s).

Containment Strategy
A wildland fire management strategy that primarily focuses on containing a fire to within an established fireline or reasonable control feature(s).

Control Strategy
A wildland fire management strategy that primarily focuses on the control of fire spread, intensity, duration, and/or consumption within an established perimeter.

Cultural Environmental Management Practices
Practices employed by indigenous peoples often mimicking natural disturbance processes in the management and utilization of natural resources and balanced ecological systems.

Fire Return Interval
The scale in time which fire occurs with or without human influence in a specific landscape condition, vegetation type, elevation range, slope, or aspect.

Fireshed
An area in which fire has historically occurred that can be surrounded by reasonable control features (ridges, creeks, rivers, roads, etc.), these features should be capable of receiving contiguous treatments to maximize safety and effectiveness of fire management personnel.

Indian Country (EPA's definition)

Karuk Aboriginal Territory
All Federal, State, County and Private lands within the external boundary of the Karuk Aboriginal Territory (see attachment A).

Natural Fire Regime
Definitive range of fire return interval, burn duration, and intensity reflective of both lightning and cultural ignitions upon a given landscape, vegetation type, elevation, slope and aspect within individual firesheds.

Post Contact
The span of time following European contact, and/or influence upon the lands and people within the Karuk Aboriginal Territory.

Pre-Contact
The span of time prior to European contact and/or influence upon the lands and people within the Karuk Aboriginal Territory. Pre-1850 AD settlement by Euro-Americans

Previously Managed Stand
Areas that have been influenced by post contact management practices excluding fire suppression. Includes but is not limited to silvicultural practices as: clear-cutting, shelterwood, high-grading, "hack and squirt"-herbicide use on hardwoods, sanitation harvest, selective thinning, hazard tree removal, and post-fire salvage logging.

Restoration Landscape
A readily identifiable area in which pre-treatment has been initiated for the reintroduction of natural fire, or has otherwise been designated for the restoration of natural disturbance regimes.

Reasonable Control Feature

Any natural or physically altered natural feature of the landscape that can be determined safe and effective in achieving a containment, confinement, or control strategy as the appropriate management response or as can otherwise utilized for wildland fire use, prescribed, cultural, or wildland fire.

Traditional Ecological Knowledge
A cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with the environment…it is both cumulative and dynamic, building on experience and adapting to changes.

Tribal Trust Resources
All cultural/natural, resources traditionally utilized and/or managed which have been influenced by European or societal induced change from the traditional dynamic, triggering a governmental fiduciary trust responsibility to maintain and/or restore cultural integrity.

Uncharacteristically Intense Wildfire
The intensity of fire exceeding levels naturally occurring in landscapes characteristic of a pre-contact condition class and fire regime within individual firesheds and/or restoration landscapes.


KARUK ANCESTRAL TERRITORY
Ancestral Territory
National Forests
Klamath National Forest
Six Rivers National Forest
Del Norte
Siskiyou
Shasta
Trinity
Humboldt


Indian
Thompson
Grider
Clear
King
Elk
Dillon
Wooley
BLUFF CREEK
CAMP CREEK
RED CAP CREEK

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Appendix:

Appendix __: Criteria and Indicators

Center for International Forestry Research-**North America Indicator Set**

P.1 POLICY, PLANNING AND INSTITUTIONAL FRAMEWORK ARE CONDUCIVE TO SUSTAINABLE FOREST MANAGEMENT

C.1.1 Policy, planning and institutional frameworks are conducive to sustainable forest management

I.1.1.1 Effective instruments for inter-institutional co-ordination on land-use and forest management exists

I.1.1.2 There is sustained and adequate funding and staff for the management of forests

I.1.1.3 Institutions responsible for forest research are adequately funded and staffed

P.2 MAINTENANCE OF ECOSYSTEM INTEGRITY

C.2.1 Ecosystem function is maintained

I.2.1.1 Ecologically sensitive areas, especially buffer zones along water courses, are protected

I.2.1.2 Coarse woody debris and snags retained at functional levels

I.2.1.3 Area and severity of area burned

I.2.1.4 Area and severity of insect attack and disease infestation

I.2.1.5 Population sizes and demographic structures of selected species do not show significant change, and demographically and ecologically critical life-cycle stages continue to be presented

I.2.1.6 The status of decomposition and nutrient cycling shows no significant change

I.2.1.7 There is no significant change in the quality and quantity of water from the catchment

C.2.2 Landscape patterns support native populations

I.2.2.1 Level of fragmentation and connectedness of forest ecosystem components

I.2.2.2 Road network density, type, use and location

C.2.3 Native species diversity is maintained

I.2.3.1 Protected areas are maintained to protect rare, unique and representative species and features

I.2.3.2 Populations of indigenous species are likely to persist

I.2.3.3 Number of known forest-dependent species classified as extinct, extirpated, endangered, threatened or vulnerable relative to the total number of known forest dependent species

I.2.3.4 Assessment of changes in the distribution of native aquatic fauna

C.2.4 Ecosystem diversity is maintained

I.2.4.1 Percentage and extent, in area, of vegetation types and structural classes relative to the historical condition and total forest area

I.2.4.2 Rate and total area of forest land converted to non-forest land cover, classed by major forest type

I.2.4.3 Representation of selected key and sensitive guilds occur in the community guild structure

C.2.5 Incidence of disturbance and stress

I.2.5.1 Pollutant levels in the ecosystem

I.2.5.2 Area and severity of occurrence of exotic species detrimental to forest condition

C.2.6 Genetic diversity is maintained

I.2.6.1 Population sizes and reproductive success are adequate to maintain levels of genetic diversity

I.2.6.2 Use of scientifically-based seed transfer rules and seed orchard zones in planting native species

I.2.6.3 Management does not significantly change gene frequencies

C.2.7 Physical environmental factors

I.2.7.1 Percentage of harvested area having greater than 25% of the area with degraded soil quality, including soil compaction, displacement, erosion, puddling, and loss of organic material

I.2.7.2 Trends and timing of events in stream flows from forest catchments

P.3 FOREST MANAGEMENT MAINTAINS OR ENHANCES FAIR INTERGENERATIONAL ACCESS TO RESOURCES AND ECONOMIC BENEFITS

C.3.1 Forest management provides ongoing access to the resource

I.3.1.1 Access to forest resources is perceived to be fair and secure

I.3.1.2 Ownership and use rights and responsibilities to resources (inter and intra-generational) are clear and respect pre-existing claims

C.3.2 Concerned stakeholders have a right to participate in open and meaningful public participation processes in order to influence management

I.3.2.1 The process should be inclusive with all interests represented

I.3.2.2 Stakeholders should have detailed and meaningful reciprocal background information necessary to provide quality input into the public participation process

I.3.2.3 Management staff and stakeholders should recognize and respect the interests and rights of each other

I.3.2.4 The decision-making processes must be transparent such that participants are confident that their opinions and values will be considered during the process and be reflected in the final product

C.3.3 Forest-based human health issues are recognized

I.3.3.1 Forest managers cooperate with public health authorities regarding illnesses related to forest management and potable water related concerns

I.3.3.2 Forestry employers follow ILO working and safety conditions and take responsibility for the forest-related health risks of workers

C.3.4 Recognition and respect for Aboriginal roles in sustainable forest management (Aboriginal rights, Treaty rights and aboriginal values)

I.3.4.1 Extent to which forest planning and management processes consider and meet legal obligations with respect to duly established Aboriginal and treaty rights

I.3.4.2 Extent of Aboriginal participation in forest-based opportunities

I.3.4.3 Extent to which forest management planning takes into account the protection of unique or significant Aboriginal social, cultural or spiritual sites

I.3.4.4 Area of forest land available for subsistence purposes

C.3.5 There is equitable access to and distribution of economic rents

I.3.5.1 Mechanisms exist for sharing the economic benefits derived from forest management

I.3.5.2 Wages and other benefits conform to national and/or ILO standards

I.3.5.3 Employment of local population in forest management

I.3.5.4 Estimated distribution of rent capture

I.3.5.5 Number of communities with a significant forestry component in the economic base

P.6 YIELD AND QUALITY OF FOREST GOODS AND SERVICES ARE SUSTAINABLE

C.6.1 Forest management provides for sustainability of goods and services

I.6.1.1 Policy and planning are based on recent and accurate information

I.6.1.2 Objectives are clearly stated in terms of the major functional areas of the forest, with respect to their spatial distribution

I.6.1.3 Silvicultural systems are prescribed as appropriate to forest type, production of desired products and condtion, and assure forest establishment, composition and growth

I.6.1.4 Harvesting systems and equipment are prescribed to match forest conditions in order to reduce impact on wildlife, soil productivity, residual stand conditions and water quality and quantity

I.6.1.5 Annual and periodic removals calculated by area and/or volume prescribed

I.6.1.6 Mean annual increment for forest type and age class

I.6.1.7 Distribution of, and changes in, the land base available for timber production are identified

C.6.2 Forest management is socially efficient

I.6.2.1 Availability and use of recreational opportunities are maintained

I.6.2.2 Total expenditures by individuals on activities related to non-timber use

I.6.2.3 Existence of economic rents: Total harvesting revenues exceed harvesting costs

C.6.3 The management plan is implemented and effective in moving toward stated goals

I.6.3.1 Actual vs. planned performance is measured and recorded

I.6.3.2 An effective monitoring and control system audits management's conformity with planning

I.6.3.3 Continuous inventories established and measured regularly

I.6.3.4 Documentation and records of all forest management activities are kept in a form that makes monitoring possible