Subject: Comments to the Draft Environmental Impact Report (DEIR) for the Gaviota Coast Plan Update

Dear Ladies and Gentlemen:

One of the primary roles of the Santa Barbara County Fish and Game Commission (Commission) is to advise the Board of Supervisors on all matters related to fish and game in our county. This includes the habitat and policies that affect those resources. Currently, County staff proposes in the DEIR, for review and implementation through the community planning process, policies and regulations of grave concern to our Commission. These policies and regulations are proposed for our rural county areas, and are related to brush management, fuel loading, and new trail siting and use. These new policies will affect both private and public National Forest lands.

These concerns were pointed out in the scoping process to County staff, yet our Commission cannot see where it was studied and/or analyzed in the DEIR as to the impacts the changes would have on our resources. If the County is going to use the community plan process to implement policies in rural areas which have wildfire problems caused by fuel loading and public access, the County needs to address this issue with the appropriate policies rather than make additional policies which will negatively affect our resources.

The County as the lead agency in preparing and certification of the EIR, under CEQA guidelines section 15064, is required to inform the public of the POTENTIAL environmental impacts of the proposed plan. Identify actions to mitigate or avoid potential plan impacts. Identify reasonable alternatives to the proposed plan that can reduce or avoid potentially significant environmental impacts, while achieving project objectives.
The use of prescribed burns and other methods to improve our habitat for our wildlife is an issue our Commission has worked on for years. I personally have dedicated countless hours on this subject since 1980 when I first joined the Commission. Our members have firsthand, boots on the ground knowledge of this issue, having worked side by side with numerous wildlife biologists over the years to conduct prescribed burns safely and for maximum fire protection and habitat benefit. In addition, our members collective personal experiences out in the field and backcountry have witnessed firsthand the numerous benefits prescribed fire has had and can have on our environment.

One of the biggest issues we have worked on over the years is the use of prescribed fire in our predominantly chaparral habitat. Learning to coexist with fire is one of the greatest challenges of living in the West, or any rural area. Fire is Mother Nature’s way of improving habitat. The question is not if it will burn, but when. Over time, dense dead material builds up causing the habitat to decline in productivity and gradually reach senescence, where wildlife numbers, biodiversity, and water production is adversely affected and greatly reduced.

Chaparral is a climax type of forest. We have found, and it is a generally accepted biologic principle worldwide, especially in our chaparral forests, that change in the environment is good for biodiversity. Fire in our local ecosystems is one of the best ways to achieve the goal of good biodiversity and maintain a healthy eco-system while reducing fuel loads that fuel catastrophic wildfires.

The local Native Americans burned wildland areas almost every year. Early Spanish explorer records confirm this historic practice. Lightning strikes naturally start fires in our area, but humans routinely put them out before the fires can clear the dead material and restore the vegetation. The result is an unnatural condition of heavy, dense, highly flammable fuel loading that ultimately causes catastrophic damage to the ecosystem by causing hot, raging wildfires. I can personally recall seeing U.S. Forest Service crews putting out over 100 lightening ignited fires in the chaparral over successive years.

Nancy Sandberg, the U.S. Forest Service biologist, accompanied the Commission up to Big Pine Mountain on a back country survey of habitat conditions. She related having taken core samples of the pine tree rings on the mountain and finding that they read like a book, depicting the natural history of fire in their rings. Every time a fire had burned around the trees, it would leave a charcoal layer. The rings showed that a fire burned through the area naturally every 13-14 years on average. This kept the forest healthy by preventing unnatural buildup of dead material and brush beneath the pine trees that otherwise would burn hot enough to burn the trees themselves. These trees are surrounded on all sides by chaparral as you drop down from the high elevation. It is only logical to assume that these normally and naturally occurring fires would burn for long periods of time through the chaparral until weather conditions changed and the fires went out from winter rains. Sadly, these trees are now burned because fire was eliminated from the eco-system, allowing dead fuel and brush to build up under these once beautiful trees. Because of the
Wilderness Area restrictions on mechanical equipment, prescribed burns weren’t feasible. The resulting fire burned so hot that these magnificent trees were consumed.

The scene of what was here before modern man came along was very different from what it is today. The local Native Americans having to live off the land and having one of the highest population densities in the world, recognized the importance of fire in our environment. They augmented naturally occurring fires, recognizing them as a valuable tool. Now we have unnatural conditions of dense fuel loads that cause catastrophic hot wildfires that cook the ground rather than a much cooler meandering natural fire with light fuel loads burning in cooler, mosaic patterns that also allow wildlife to evade the fire while increasing biodiversity. The flooding impacts after a catastrophic fire are devastating because the soil is completely stripped and the fire glaze on the surface repels rainwater. In contrast, a cooler, smaller fire leaves patches of unburned material and doesn’t damage the soil. This is a very important fact to consider since all the species and habitat required to be protected under CEQA evolved under the condition of more frequent, cooler burning fires. The importance of prescribed burns and fuel management in the wildlands and in the urban wildland interface must be analyzed in the DEIR or it will be fatally flawed because the habitat designations and the policies prohibiting and restricting vegetation removal or disturbance will have a profound impact upon the ability to manage fuel loads in the Plan Area.

Our concerns are that the Plan proposes policies and development standards that will result in significant unmitigable impacts to wildlife and habitat because these policies and development standards will prevent or discourage fuel management on public and private lands. The redesignation of Agricultural lands to a Mountainous Zoning and the declaration of brush, brush alliances, and communities as environmentally sensitive habitat will prevent or discourage prescribed burns. Imposing a permit process, separate and apart from the fire department regulations on prescribed burns, will delay and effectively prevent many prescribed burns because of the time and expense required for processing. The DEIR fails to acknowledge or analyze these impacts and to identify them as significant unmitigable environmental impacts of the Plan. The impacts will be significant and adverse to biological resources, soils, and agricultural land (because livestock grazing lands are particularly vulnerable to damage from fires that scorch the earth and destroy the seed bank in the soil. The designation of brush as ESH does not conform to the existing County Oak Tree Protection Ordinance because the fuel buildup under oak trees will, like the conifer forests, cause the trees to be seriously damaged and destroyed, in contrast to cooler fires not fed by a heavy fuel load, which do not damage oak trees.

The Commission also has serious concerns regarding potentially significant impacts of some Plan Policies on Agriculture. We do not believe that these impacts have been adequately identified and analyzed in the DEIR. We have seen that these types of private lands contain much of the habitat and wildlife in our county, and these private lands are usually well managed by the agricultural operator (who usually is the owner) resulting in great biodiversity and wildlife numbers. The private agricultural land generally either border or are inter-dispersed with National Forest Service lands, and the wildlife know no boundaries between the public and
private land holdings. There used to be a very active Santa Barbara County Range Improvement Association that burned thousands of acres of rangeland and habitat annually. These private land owners also used other methods of modifying fuel loads. Agriculture is a resource that CEQA requires be studied in an EIR to determine whether the project being analyzed will have potential adverse impacts upon it. The DEIR does not adequately analyze the impacts of the Plan, or of proposed Alternative 2, on productive agricultural lands. These concerns extend to the policies and zoning changes proposed in the Plan. If these agricultural operations cannot manage these lands in a manner that is beneficial to wildlife and the habitat, it is very concerning to the Commission, and must be adequately addressed in the DEIR; otherwise, the DEIR does not meet the requirements of CEQA. Simple stating that Agriculture is exempt from proposed new regulations is misleading and is no substitute for the extensive analysis required under CEQA. Agriculture may be exempt until it needs a permit, but then it is no longer exempt and is subject to all of these policies and restrictions in the Plan. A farmer or rancher will be deterred from applying for and processing a permit, including hiring expensive consultants, just to conduct activities that are a normal, and critical, part of maintaining agricultural viability. With this Plan, agriculturalists will be required to seek a permit for many routine activities and the Commission contends that vital ranching operations now will not be exempt. The impact of that change on agricultural productivity and viability is significant and must be described and analyzed in the DEIR.

We would also like to point out that because the location of proposed land use and zoning designation changes were not mapped out, the Commission could not adequately analyze the environmental impacts and understand and evaluate the accuracy of the DEIR analysis. Because we need this information to analyze the impacts of the proposed land use designations, the DEIR must be recirculated once this information has been added, so the public can comment on the information that is not currently in the DEIR. CEQA requires that an EIR be a full disclosure document and this DEIR not only fails to make full disclosure, it makes conclusory statements and demonstrates a strong bias in favor of certain types of regulations and policies and against others. It displays an embarrassing bias in favor of trails and grossly understates their impact upon habitats and agricultural operations.

The Commission has serious concerns about Action ECO-EGV-5A, which indicates that the County Land Use and Development Code (LUDC) and maps of Environmentally Sensitive Habitat (ESH) and Riparian Corridor (RC) Overlay areas will be studied and updated at some point in the future. Establishing policies and development standards applicable to ESH and RC, while postponing mapping of those areas to sometime in the future, is unlawful piece-mealing under CEQA and avoids a comprehensive analysis of the impacts of these provisions on the Plan Area, particularly upon biological resources, fire hazard, and agricultural resources.

The Commission also is concerned about Action ECO-EGV-5B which directs the county to consider requiring a land use permit for clearing and/or disturbance of ESH areas (which are proposed to include chaparral which covers nearly the entire rural Plan Area, see DEIR figure 4.6-1a). However, the DEIR fails to analyze the significant impact on agricultural resources and
on fire hazard associated with imposing such a requirement. The result will be the delay or abandonment of efforts to implement sound fuel management programs, wildlife habitat improvement, increased water flow and improvement to the aquatic habitat, increase in biodiversity, a decrease in the intensity of detrimental catastrophic wildfires, along with the negative impact to the health, welfare, and safety of the citizens of Santa Barbara County due to increases in catastrophic wildfires.

Again, the DEIR needs to study the above listed items and be recirculated for public comment regarding the analysis and findings.

The Commission recently held a public meeting on this issue, and listened to many speakers on the subject. Some of the concerns were that Chaparral needs protection as it is being cleared, and that we are losing chaparral at an alarmingly fast rate. If given ESH protection this would stop. We also heard that if chaparral is burned, the area would convert to weeds, silt in the creeks would increase, and the extreme heat from a large wildfire is needed to release seeds so we need to only have a large wildfire once every 30-50 years. There are also rare insects and other flora and fauna in the Chaparral, and that is why it needs ESH protection even though hundreds of thousands of acres are already protected in wilderness designations.

When we questioned the speakers, it seems that there has been only minor clearing of chaparral above Goleta of perhaps 50 acres, and that there is over 440,000 acres of chaparral in our county, hardly making the small amount cleared a concern. In fact, it creates better bio-diversity to have some areas cleared.

In all of the Commission’s experience, we have not found Chaparral areas in our county to convert to weeds after a wildfire or prescribed burn. Our commission encourages the use of seeding in areas that haven’t been burned for many years to help protect the ash and top soil from erosion. In areas burned more often which result in cooler mosaic pattern fires, reseeding generally is not necessary. Most Chaparral species have large root crowns that provide the nutrients and resources for the Chaparral to start sprouting within weeks of the fire event. The heat from these cooler fires is adequate to release any seeds from species that may require fire to sprout.

We have found that Smaller, more frequent fires in the event range of ten to fifteen years, creates a more natural condition while preventing fuel loading that causes large, expensive, catastrophic wildfires that create sediment and silt in streams, foul and pollute our air and water, jeopardize the health, welfare, and safety of our citizens, and kill wildlife and insects. These could all be avoided to the maximum extent possible by having more frequent, cooler fire events.

The University of California Division of Agriculture and Natural Resources in their California Agriculture volume 50, number 5 discuss how more than a century of fire suppression has led to the buildup of too much vegetation. This fire suppression has gradually changed the composition of California’s forests. Fire control doesn’t prevent fire in chaparral, it just
postpones it until later in the season when you get the worst kind of fire imaginable. It is hard to reintroduce fire into an ecosystem after many decades of fire exclusion due to the large fuel build up.

The Journal of Biogeography, 29, 303-320 Jon E. Keeley US Geological Survey, Western Ecological Research Center, Sequoia-Kings Canyon National Parks, University of California, Los Angeles, California report that California Indians were not motivated to develop crops because they were extraordinarily successful at managing the natural resources available through the widespread use of repeated burning. A critical adaption of the coastal Chumash was the use of fire to convert coastal sage scrub to grassland through the widespread use of repeated burning to effect type conversion of chaparral/coastal sage scrub to grassland and/or to maintain the grass/shrub mosaics. There is a 1792 report by Spanish explorer Jose Longinos Martinez who wrote “In all of New California from the Fronteras northward the gentiles have the custom of burning the brush...”. There are countless other accounts of Indian burning recorded by early Spanish and American explorers in the coastal ranges (Bolten, 1927; Moraga, 1930; Fages, 1937); particularly detailed is the widely cited proclamation by Spanish Governor Arrillaga delivered at Santa Barbara in 1793 (Clar 1959).

There were many reasons listed in the report as to why the Indians did this. Some widely desirable plants seeds were dependent on only smoke or charred wood to stimulate them for germination, as is true for the majority of chaparral annuals. Type conversion of chaparral to herbaceous associations has been shown to greatly increase annual flow of water from watersheds (Veihmeyer, 1953; Biswell & Schultz, 1958; Crouse, 1961; Hill & Rice, 1963; Rowe, 1963). All Indian settlements had to be located near a good permanent water source. In one Southern California study, repeated burning and type conversion of chaparral to grassland resulted in a 475% increase in summer flow (Hoyt & Troxell, 1934). The contemporary pattern throughout the central and southern coastal ranges of California is a mosaic of chaparral, sage, grassland and oak woodland. While the boundaries of this vegetation may seem timeless, there are ecological analyses that conclude disturbance has played a prominent role in their formation, patterns that may have been initiated by Native Americans and perpetuated by Spanish/Mexican and American settlers. In General, they are consistent with the hypothesis that Native Americans utilized high fire-frequency to drive type conversion from woody shrub lands to herbaceous associations.

The Board of Supervisors in 1967 after four wildfires had raged throughout Santa Barbara County, issued their own report called The Wildfire Threat! These fires burned 394,300 acres, or almost 18% of Santa Barbara County’s total area! Their findings were: It was recognized that there was need for some method of brush overgrowth control to reduce fire hazard, and at the same time to protect vital watersheds areas. The use of fire as a tool in land management is a recognized device by all testifying, including representatives of the US Forest Service. It is most vital that plans be made for future and continuing care of the altered areas. There needs to be cooperation and coordination between all agencies and levels of government.
Their findings among other things were: That controlled burning as a tool for land management be encouraged. Such controlled burning should be participated in actively by all units of government concerned. That other generally recognized methods of land management include, but not necessarily be limited to: Cover manipulation (alteration of vegetation). Use of chemicals to control growth of existing vegetation. Construction and maintenance of firebreaks. Development and care of fuel breaks.

On 10/15/1964 Dr. Cornelius Muller, Professor of Botany, University of California at Santa Barbara, testified at the Senate Natural Resources Committee, stating: “Protection of chaparral vegetation against fire is presumably practiced in the belief that such protection is somehow beneficial to the watershed cover and that fire, conversely, is destructive,” noted Dr. Muller. “I submit that precisely the opposite is the case and destruction has resulted from postponement of fire, with consequent accumulation of fuel and great increase in severity of the eventual, inevitable burn”.

In 1977 Professor of Forestry at the University of California, Berkeley, California, Harold H. Biswell presented at the symposium on Environmental Consequences of fire and fuel management in Mediterranean Ecosystems, Palo Alto, California on Aug 1-5, 1977 the following: “I like the idea of prescribed fire as a management tool. This involves setting fires in selected places under conditions of weather and fuel moisture that enable one to manage the spread of flames and intensity of heat desired to accomplish certain planned benefits. It is working in harmony with, and not against nature”.

“Prescribed fires should be widely used in California forest, chaparral and brushlands for a variety of benefits. The most important benefit would be a reduction of fuels, making wildfires less damaging to the environment and more easily controlled. Burning should be done by trained and experienced personnel only. Our most important need is to select and train people for this work. Prescribed fire is poorly understood, resulting in confusion and resistance to its use”.

“Prescribed fire as a management tool is working in harmony with, and not against nature. Fire is related to almost every aspect of the environment, the soils and water, the atmosphere, plants and animals, diseases and insects, people and politics. I am more worried about what happens with virtual fire exclusion, for this is something new and unnatural in forest and brushland environments”.

We have included an article in the Wildlife Professional from the spring edition of 2010, which encompasses all the principles that need to be studied in the EIR. It was written by five Ph.Ds. which are all specialists in their area of forest management. While this article is primarily written about a conifer forest, the same principles apply to a chaparral forest, which also has trees of mixed species and is even more dependent on fire to create a healthy forest.
We are also attaching a copy of a letter we wrote regarding our concern of the siting and management of proposed trails. Our Commission feels these issues were also not adequately addressed in the EIR and will have significant impacts on the wildlife unless properly mitigated.

CONCLUSION

The members of the Santa Barbara County Fish and Game Commission wish to thank you for allowing us to comment on the Draft Environmental Impact Report (DEIR) for the Gaviota Coast Plan update. Our goal in offering these comments is to help maintain and enhance our natural resources, habitat and bio-diversity here in Santa Barbara County.

Our Commission finds that the DEIR is inadequate under CEQA and request that it be revised and recirculated to include more thorough analysis of the issues presented in detail in this letter, and of the potential wildland fire hazard posed by the proposed biological resource policies in the Plan, and by the introduction of the general public, without policing or supervision, into the wildland and wildland interface portions of the Plan Area.

Sincerely,

Bill Giorgi, Chairman
Dear Brian:

Our commission is very concerned about the public trail systems in the Gaviota Coast area and further inland. We discussed this issue at several of our Santa Barbara County Fish and Game Commission public meetings, one of which you attended, and we have concerns about the effects an uncontrolled (i.e. unmonitored and unsupervised) public trail system would have on the wildlife and habitat in these areas.

Our Santa Barbara County Fish and Game Commission was formed to oversee projects funded by fine money collected for fish and game violations and to advise the Santa Barbara County Board of Supervisors on all matters related to fish and game in Santa Barbara County. Our specific concerns are again the effects new uncontrolled trail systems would have on the ecosystems in that area. Some of our commissioners have experienced first-hand the devastating effects these systems can have on the wildlife in an area with heavy unsupervised human use over the entire year. As an example, the effects of people hiking with their dogs during fawning season. The fawn separated from its mother is vulnerable to predators or dies a slow death from thirst or starvation. Dogs will chase, harass and perhaps kill the young fawns. The same is true of any young animal and fledging birds unable to leave the ground and return to their nest. Disruption of wildlife during breeding season will occur. Trails designated in sensitive areas previously undisturbed by humans and their dogs result in significant, unmitigable adverse impacts on biological resources. We see that the new proposed trails occasionally traverse riparian areas and we are concerned about the effects human, horse, and bicycle traffic will have on those areas. New trails are proposed in deep canyons which provide vital hiding places, habitat and sanctuary for a wide variety of wildlife. Nocturnal feeders rely on these secluded daytime hiding places for rest, care of young, and sleep. Females hid their dens in these same areas. What will be the effects of this and where will the wildlife move to? Some of the proposed trails go through private property, which as private land currently protects the land and wildlife from uncontrolled, unsupervised use. How will the adverse impacts to the resources of new
uncontrolled public access on these previously protected private lands be mitigated? All this needs to be documented and studied in the EIR as to the effects on the resources as demanded by CEQA, both in and out of the coastal zone.

It appears much of this remote area is already accessible from Gaviota Hot Springs to Gaviota Peak and across the top of the mountain heading west. Our concerns are as you add more connector trails and loops; more people will enter the ecosystem and disrupt the remote areas which currently have no trails or only trails on the fringes in one direction. These new connector trails and loops will cause more disruption to our fragile eco-system and the wildlife in this area. We also are concerned that hikers will leave the marked trails to create their own side trips, a common occurrence observable on virtually any public trail. Those informal trails cause erosion that fouls streams, further impacting fish and wildlife.

These trails also provide access for illegal marijuana cultivation. Growers pollute the streams and landscape with trash, pesticides, and rodenticides which continue to kill in the food chain. The sheriff department has statistics on the amount of cultivation and pollution in these remote canyon areas. Providing easier access to these areas and the immitigable negative impacts needs to be addressed in the EIR.

We would also like to request that you study the fact that there seems to be no fuel management plan in this large rural area with dense stands of brush. There seems to be a glaring lack of planning regarding the use of prescribed fire in your planning area and how it can be used to improve habitat and wildlife populations while reducing the devastating effects of high intensity wildfires. In fact, it seems that the proposed Gav Mt zoning would hinder, if not prevent, fuel management on forest service lands in the planning area, along with the adjoining private lands. We refer you to the effects the Rim Fire had, which a lot of the quick spread of the wildfire and the severe environmental damage was caused by the intensity of the fire because of huge fuel buildup that occurred over a one hundred year time span of fire suppression in this area. We feel statements about creating new fire stations, education about wildfires, defensible space, etc. are fine for urban populations, but do not address our concern of habitat improvement and reducing the intensity of wildfires by reducing fuel loads. This also improves the health and safety of all creatures and improves air quality.

A research group found that there were over 400 trees per acre just before the Rim Fire, compared to 60-90 trees in 1911 when fires were more prevalent and allowed to burn. The research group also found that fuel buildup on the forest floor was 60-90 tons per acre just before the fire, compared to 6-8 tons in 1911. This was all caused by over 100 years without a fire. Please know that a healthy forest only has a limited number of trees per acre. The same correlations can be applied to our chaparral forests which contain a large number of oak trees. Studies have also shown stream flows increase 300-500 percent for many years after a fire. Studies have also shown there is more carbon sequestration from forests with frequent fires and large trees, rather than forests that have had fire removed and there are many small trees with smaller root systems.
We believe placing a zoning designation like Gav Mt with the restrictions it has on it will prevent any type of fuel management practices to be applied. A lot of private land backs up to National Forest Lands, so if the private landowner is going to attempt to carry out a prescribed fire practice, it would have to do it cooperatively with the forest service, and vice versa. If the forest service does not control fuel loads on forest service land, wildfires that originate on forest service lands are more apt to sweep down on to the private agricultural lands causing wide spread damage to those resources as well. You will have to study the impacts to the environment that the Gav Mt Zoning will have in these instances on both public and private land in the planning area.

Finally, we are concerned that if you remove the agricultural zoning from forest service land, there may be a loss of grazing allotments. We have found that agriculturalists are good stewards of these lands and the wildlife benefits from the cattlemen’s stewardship, much as the private land does. In many instances there are water systems put in place for the cattle that the wildlife benefits from. There is a greater bio-diversity created and native plants thrive when a grazing animal is added back into the natural process, much like the introduction of prescribed fire. Please study all these important impacts on the environment.

We look forward to reading the EIR to review your findings.

Very Truly Yours,
William T. Giorgi, Chair
Santa Barbara County Fish and Wildlife Commission
Harnessing Fire for Wildlife

FUELS MANAGEMENT IN CALIFORNIA'S MIXED-CONIFER FORESTS

By Malcolm North, Ph.D., Pete Stine, Ph.D., William Zielinski, Ph.D., Kevin O'Hara, Ph.D., and Scott Stephens, Ph.D.

On a dry afternoon in September of 2007 the "Moonlight Fire" started in a northeastern California mixed-conifer forest that had been accumulating fuels for over a century. Twelve days later the fire was contained after burning 65,000 acres, destroying seven structures, injuring 34 firefighters, and costing $32 million. Much of the forest within the fire perimeter had not been treated to reduce fuels because the area contained 22 protected areas set aside as habitat for two threatened species, the spotted owl (Strix occidentalis) and northern goshawk (Accipiter gentilis). A year after the fire, one lone male spotted owl remained within those charred 65,000 acres.

Such are the unintended consequences of neglecting fuels management for the sake of threatened species. The question is, how can forest managers integrate the needs of both?

Fire's Role in Forests

In the early nineteenth century, an estimated 460,000 forested hectares burned each year in California alone. By the second half of the 20th century, fire suppression had reduced annual burn acreage by 95 percent (Stephens et al. 2007). As a result, forests have accumulated large loads of surface fuels (litter, branches, and logs) as well as ladder fuels, small trees that allow surface fire to burn up into the overstory canopy where it becomes lethal for trees.

This fuel accumulation has changed the nature of wildfire. Historically, slow burning, low-intensity wildfires recycled nutrients and cleared out dense thickets of small trees. Today wildfire often "crowns out," quickly burning through the canopy and killing many of the oldest and largest trees. Fire size has also dramatically increased. Within the last seven years, Arizona, Colorado, and Oregon have...
all been burned by the largest wildfires in each state's recorded history.

For the USDA Forest Service (USFS), firefighting efforts now consume one-third to one-half of its annual budget. This leaves few funds to pay for fuels treatments, which follow two general approaches. To contain the spread of wildfire, "linear defense zones" are created, where surface and ladder fuels and some overstory trees are removed from strips near homes or along roads or ridge tops. Within this perimeter, the second approach involves strategically placing low-fuel patches in the landscape to act as "speed bumps" that slow the spread and reduce the intensity of wildfire. Fire science models suggest that strategic treatment of 20 to 30 percent of the landscape can significantly reduce wildfire severity (Finney 2001).

Though often effective, these approaches were never designed to address how forests might be ecologically restored or wildlife habitat enhanced. Most of the landscape matrix—some 70 to 80 percent—is untreated and continues in an "unhealthy" condition from decades of fire suppression, leaving important habitat susceptible to high-intensity burns like the Moonlight Fire. In addition, because many fuels projects face legal challenges over potential impacts to threatened and endangered species habitat, agencies often avoid treating such areas.

The Dinkey Creek area in California's Sierra Nevada range offers a classic case in point. Its mixed-conifer forest provides rare habitat for the threatened Pacific fisher (Martes pennanti pacifica) and contains many summer homes, yet it also has high fuel accumulations. Managers proposed a fuels-treatment project back in the early 1990s, but in November of 2007, after 15 years of proposals and litigation, the project failed to be resolved even after months of mediated conflict resolution.

This case prompted USFS managers in California to ask several of us at the Pacific Southwest Research Station to develop a summary of current research that might inform best management practices in fire-prone forests (Nordi et al. 2009). Although the project's scientists had different expertise (fire science, forest ecology, silviculture, and wildlife biology), their recommendations coalesced around a common theme: the importance of creating variable forest structure and fuels conditions for ecological restoration, forest resilience, and wildlife habitat. Based on our research, we propose the following strategy using localized site conditions and landscape position as templates for varying forest treatments.

**Using Topography as a Tool**
Reconstructions of forest landscapes as they would have looked prior to fire suppression have found that forest structure and composition varied with topography at both stand and landscape scales. Within a stand, wetter areas such as seeps, concave pockets, and cold air drainages usually burned less frequently or at lower intensity. Across an entire forest watershed, forest and fuel conditions varied depending on slope position (location in a valley or riparian bottom, at mid-slope, or on an upper slope or ridge top) and aspect (cooler northeastern orientations versus hotter, drier southwestern aspects). Slope and aspect affect fire intensity and frequency.

In many Sierran mixed-conifer forests, higher slopes and more southwesterly aspects generated pine-dominated, open forests, while valley bottoms and northeastern aspects had fir-dominated forests with higher stem density and canopy cover. The latter, with riparian and cool microsite areas, likely provided movement and nesting/resting habitat for several species including some that are now threatened or endangered, such as the fisher.

We propose that fuels can be managed to create or sustain the types of conditions in which such species
evolved. In cooler, lowland areas, fuel treatments can focus on reducing the smaller surface and understory ladder fuels, while leaving high levels of overstory canopy cover as well as large logs for resting, prey habitat, and maintaining microclimate conditions. In contrast, on upslope and more southwestern aspects, forests can be treated to produce more open, fire-resistant conditions, with selective tree removal to create larger gaps between trees. A landscape treated in these ways would have a range of habitats for different species, mimicking the historic forest variability produced by low-intensity fire (see diagram below).

To test these ideas we analyzed the Dinkie Creek and Big Creek mixed-conifer watersheds in the Sierra Nevada, identified as preferred habitat for fishers and California spotted owls (*Strix occidentalis occidentalis*). We divided the landscape into nine topographic categories: three aspects (northeast, southwest, and neutral) crossed with three slope positions (riparian/lower slope, mid-slope, and ridge top), and calculated the percentage of the total watershed in each category. We then compared the proportion of owl nests and fisher resting sites in each area. Both species had significantly higher-than-expected use of the more mesic, high canopy cover areas (in riparian/lower slopes and northeast aspects) and lower-than-expected use of open ridge tops. Such information can guide fuels management in various topographic regions for the benefit of at-risk species.

**Strategic Treatments**

Reducing surface and ladder fuels achieves the greatest reduction in fire severity. In the western U.S., thinning can remove fire-sensitive tree species such as firs and cedar, and leave more fire-resistant pines. When thinning overstory trees, the goal is to leave openings and tree groups rather than a regular spacing of the remaining or “leave” trees. This pattern, which is found in most forests with active fire regimes, creates habitat heterogeneity and still provides breaks in the forest canopy to reduce crown fire spread.

Local stand conditions will often determine what size tree groups and gaps can be created. High canopy-cover areas are usually defined by groups of larger trees. Gaps can be located in areas with thinner soils or lower productivity since these areas historically supported lower tree densities and fuel loads. In the forest matrix between tree groups and gaps, frequent-fire forests generally consisted of widely spaced, large trees, most of which were pines. The relative proportion of these conditions—low density, dispersed large trees, and large and small gaps and tree groups—and their composition vary depending on forest conditions and topographic position.

Thinning larger, overstory trees can have ecological benefits under certain conditions. In drier, upslope areas, for example, thinning larger fire-sensitive trees can reduce moisture stress in the leave trees, reducing large-scale mortality risk from bark beetles and increasing forest resilience to fire. Given the deficit of large trees in many managed forests, however, their removal should be balanced against the need for large trees and snags.

**Preserving Key Habitat**

Forest managers must determine how to provide the right combination of variable forest conditions and high canopy cover, old-forest sites to maintain or increase threatened and endangered species populations across a forested landscape. A few key considerations:

**Know a species’ needs.** Conserving wildlife habitat requires providing specific stand structures associated with preferred use sites—for nests, dens, and resting—as well as managing the whole landscape to support foraging and movement. Some sensitive species like the spotted owl prefer old-forest conditions that, because of fire suppression, now have high surface and ladder fuel loads.
Managers can locate habitat for these species where, historically, fire would have burned less frequently or at lower severity owing to cooler microclimate and moister soil and fuel conditions.

**Allow for movement.** Landscapes need to provide foraging habitat and movement corridors, which often require a range of forest conditions associated with different prey, as well as dense canopy or shrub cover. Riparian forests provide valuable corridors in many dry areas, yet can have very high fuel loads and serve as landscape wicks in the advent of wildfire. Prescribed burning of riparian forest will help reduce fuels in these corridors, thus protecting important wildlife habitat.

**Leave 'defect' trees.** Perhaps the rarest structures in managed forests are large trees with habitat features such as broken tops, cavities, and platforms. The importance of these 'defect' trees for wildlife habitat is widely acknowledged, thus explicit guidance for retaining these trees is recommended.

**Focus on Resiliency.**

In the face of changing climate conditions, forest and habitat restoration can only be effective if it increases ecosystem resiliency. One measure of resiliency is that disturbance should produce mortality patterns consistent with the dynamics under which the forest evolved.

In fire-dependent forests, resilience might be best ensured two ways. The first is to reduce fuels such that if the forest burns, the fire will likely be a low-severity surface fire. This requires focusing more on influencing fire severity by manipulating fuels than on adhering to tree diameter and density goals.

The second measure for resilience is to produce a forest structure that keeps insects and pathogens at low, chronic levels. Drought-stressed trees are far more susceptible to insects and disease, now the dominant mortality agent in drier forests, which can result in large-scale, episodic tree die-off. Fire-dependent forests have persisted through more severe droughts than they are currently facing, but they have not adapted to the high densities and fuel loads found today in many stands. Much is unknown about the potential long-term effects of a warming and/or drying climate. In the more immediate future, however, reducing surface fuels and the densities of small diameter stems may be the best means of creating more resilient forests.

Some forest managers express concern that the types of strategies we describe will constrain their ability to design and implement forest management plans and practices based on local conditions. Our intent is not to dictate forest management for specific conditions at the local level. Instead we endeavor to provide a research-based conceptual approach for managing fire-dependent forests, against which proposed management plans and practices can be fairly evaluated.

**Epilogue.**

The Dinkey Creek case surfaced again in December 2009, when all interested parties finally reached a compromise and signed a memorandum of understanding for a fuels-treatment project. The resolution arose from the hard work of the participants, who built trust and found common ground in the understanding that wildlife, particularly sensitive species, historically thrived in frequent-fire conditions.

In fire-prone forests, management inaction is not an option. Wildfire is inevitable, as is the loss of habitat provided by high canopy cover forest. Yet it is possible to integrate the goals of fuel management, ecosystem restoration, and wildlife habitat. We've proposed using local topography to produce the variable, resilient forest structure in which forests' species evolved. As fuels treatments are finally implemented in Dinkey Creek, we'll be following fisher and spotted owl populations to see how they respond.