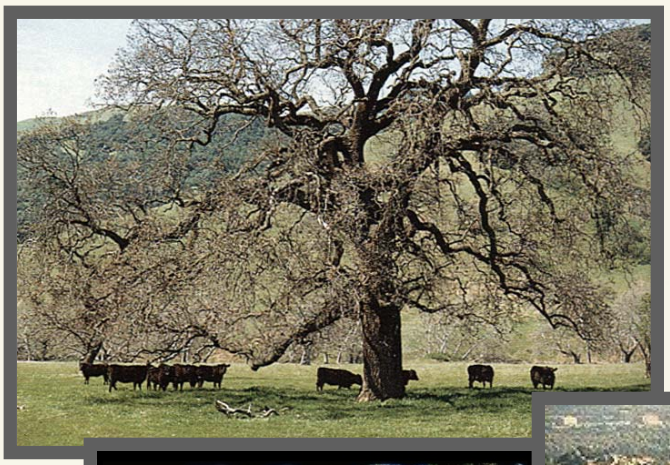
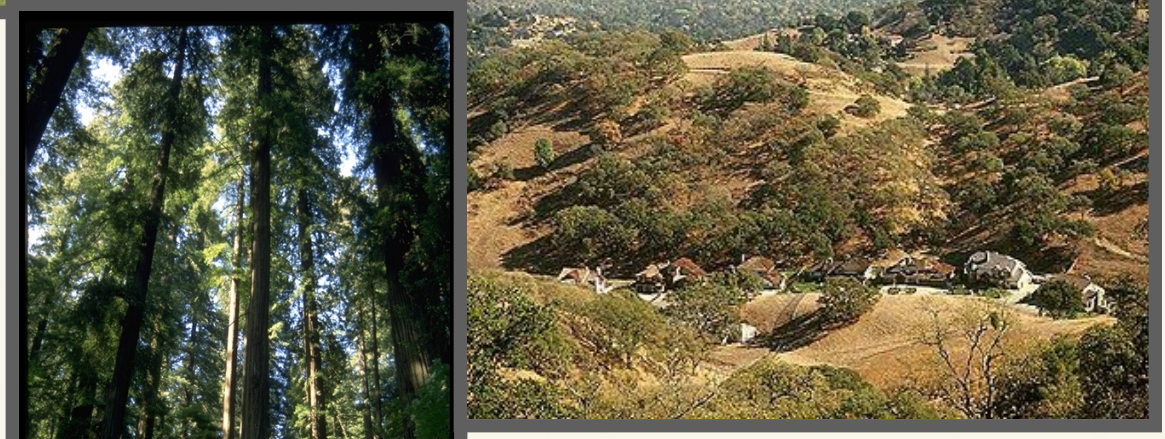
CALIFORNIA'S FORESTS AND RANGELANDS: 2010 STRATEGY REPORT





California's Forests and Rangelands:
2010 STRATEGY REPORT

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CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

FIRE AND RESOURCE ASSESSMENT PROGRAM

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http://frap.fire.ca.gov/assessment2010.html

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EXECUTIVE SUMMARY

Forests and rangelands in California are an abundant and important resource that support and enhance the quality of life enjoyed by all Californians. California forests cover a diversity of habitats that are comprised of a mixture of conifer and hardwood forests. California has retained extensive forest and rangeland across the state, covering nearly 80 percent of the land base. There is a growing demand for the renewable products and environmental services provided by California's forests and rangelands. These services include: timber, grazing, bioenergy, recreation, clean air, clean water, carbon sequestration, habitat, and many other services. Conservation and management of these natural resources is challenged by increasing demand, changing climate and ongoing natural threats, legacy of historic management practices, limited infrastructure, varying community capacity, and few incentives for landowners to maintain and enhance the broader range of environmental services that benefit all Californians.

At issue is how to manage these natural resources with such a diverse set of management objectives. Given the variety of threats, the key overarching issues to be addressed on forests and rangelands relate to how to preserve their health and enhance their resilience. These will require dealing with complex ecological factors and related human impacts. Forest and range policies must strike a balance between promoting the goods and services that are produced by these lands while protecting and enhancing the underlying ecosystems. Sustainable use of these lands will require a broad set of strategies that places investments in priority areas to maintain, restore, and enhance productive forest and rangelands.

The strategies in this report are based upon the findings from the supporting 2010 Forests and Rangelands Assessment Report. Several cross-cutting issues that emerged from the assessment are:

- Forests and rangelands, and urban forests, remain valued assets, critical to the economic, social, and environmental well-being of California.
- California's forests and rangelands face a variety of threats, and trends indicate that these are increasing in number, extent, and severity.
- Demands on forest and rangeland resources are increasing, especially for ecosystem services. Emerging markets are placing new demands on these lands. These broader management objectives have created a more complex framework for decision making, with increased demands for science based approaches.

- A significant portion of forests and rangelands, urban forests, and the infrastructure required to meet demands from these lands, is in a degraded or undesirable condition.

- Opportunities exist to improve the quality of and quantity of benefits from these lands. There are management options leading to desired future conditions to sequester more carbon, improve water quality, foster more vibrant rural economies, and make natural landscapes more resistant to threats. Reaching desired future conditions will require surmounting numerous political, social, and economic challenges.

- One of California's great strengths is its human capital. The potential to reach desired future conditions across forests and rangelands will depend in large part on taking advantage of and augmenting existing collaborative efforts and groups, initiatives, strategies, and success stories.

The USDA Forest Service State and Private Forestry Redesign and the 2008 Farm Bill requires states to develop a Statewide Forest Resource Strategy based on their completed state assessments of forest resources (SAFR). California's 2010 Forests and Rangelands Strategy Report seeks to provide a long-term, comprehensive, and coordinated frame work for investing state, federal and stakeholder resources to address the management and landscape priorities identified in the assessment.

California has a long and extensive commitment to protecting, managing and investing in natural resources. This has resulted in number of existing plans and strategies that influence and guide management on forest and range lands. Many federal, state, and local agencies, as well as landowners and other stakeholders already are involved.

Under state law, the State Board of Forestry and Fire Protection (BOF) is charged with maintaining an adequate forest policy for the state.

In addition, under PRC 4789, the Board of Forestry and Fire Protection (BOF), is required to develop forest and rangeland policies on private lands. The most recent Policy Statement of the BOF was adopted in 2007. It has provided a foundation for the 2010 Forests and Rangelands Strategy Report. In addition, the Strategy Report incorporates key elements from existing statewide management plans, including, but not limited to, the following plans:

Board of Forestry Policy Statement
2010 Strategic Fire Plan for California
California State Water Plan
California Wildlife Action Plan
AB32 Scoping Plan
California Adaptation Strategy
California Biomass Collaborative – Roadmap
California Outdoor Recreation Plan (2008)

The Strategy Report outlines strategies that address each of the priority issues and landscapes that were identified in the 2010 Forests and Rangelands Assessment Report. The assessment is organized around three broad national themes that were identified in the redesign of State and Private Forestry programs: 1) conserve working forest and range landscapes; 2) protect forest and rangelands from harm; and 3) enhance public benefits from trees, forests and rangelands. Following the assessment framework the strategies report was then organized around 11 priority sub-themes that are presented as separate chapters in the assessment report.

A summary of individual issues, goals and strategies are depicted below in the following format:

National Theme

- **Assessment Chapters (Sub-Theme)**
    - Strategy Goal Statement
        - *Strategy*

The issues, goals and strategies are as follows:

Conserve Working Forest Landscapes

- **Population Growth and Development Impacts**
    - Conserve and protect ecosystems most threatened by development.
        - *Reduce urban sprawl: Promote redevelopment and infilling of available land within the urban matrix.*
        - *Support comprehensive planning at the statewide and regional scales that is coordinated with wildlife habitat conservation efforts.*

- **Sustainable Working Forests and Rangelands**
    - Promote long-term economic and ecological sustainability of forest and rangelands.
        - *Maintain and improve the capacity of the wood products and range industries statewide.*
        - *Increase the capacity to provide incentives to forest and range landowners*.
        - *Sawmill and associated infrastructure should be monitored and policies enacted to maintain and improve the existing infrastructure consistent with sustainable forest management.*

Protect Forests from Harm

- **Wildfire Threat to Ecosystem Health and Community Safety**
  Fire Prevention, Protection and Restoration
  - Prevent damaging wildfires, protect life and property and restore wildfire impacted areas to maintain ecosystem health, ecosystem services and public safety.
    - *Reduce the occurrence of damaging wildfires and reduce life, property and natural resource losses through the implementation of effective and efficient fire prevention programs and activities.*
    - *Protect life and property from wildfire through efficient and effective fire protection planning and suppression, financial management, and firefighter/public safety strategies.*
    - *Reduce the impacts of wildfire on ecosystem health, public safety and private property through appropriate scientific. research, education and training.*

- **Forest Pests and Other Threats to Ecosystem Health and Community Safety**
  - Reduce the introduction and spread of exotic pests and invasive plant species in California forests and rangelands.
    - *Prevent the introduction and spread of new exotic pests and invasive plant species.*
    - *Rapidly respond to outbreaks of exotic forest pests and invasive species.*
    - *Monitor forestland to quickly identify new and evaluate current outbreaks of exotic forest pests and invasive species, to protect the most vulnerable and valued forest and rangeland assets.*
    - *Restore forest lands impacted by current and historical forest pest outbreaks, air pollution and invasive species.*
    - *Prevent forest pest outbreaks and control their spread to maintain ecosystem health, preserve ecosystem services and avoid public safety hazards associated with large scale tree mortality events.*

Enhance Public Benefits from Trees, Forests and Rangelands

- **Water Quality and Quantity Protection and Enhancement**
  - Maintain and enhance water supply and water quality in forested watersheds to support a broad range of downstream uses.
    - *Promote watershed protection and restoration in priority watersheds.*

- *Improve water quality through implementation of Best Management Practices and monitoring in high priority watersheds.*

❖ **Urban Forestry for Energy Conservation and Air Quality**

- Improve air quality and reduce energy consumption through expansion of management and restoration of urban forests.
  - *Promote urban tree planting to improve air quality and energy conservation.*
  - *Maintain urban tree canopy to conserve energy and improve air quality.*

❖ **Planning for and Reducing Wildfire Risks to Communities**

- Increase the number of communities directly involved in coordinated wildfire planning and the number of community wildfire protection plans to reduce wildfire risks.
  - *Promote formation of Local Fire Safe Councils for priority communities.*
  - *Promote participation in the National Firewise/USA program.*
  - *Establish a statewide comparative database of community wildfire planning.*

❖ **Emerging Markets for Forest and Rangeland Products and Services**

- Facilitate the sustainable development of a biomass industry and to develop carbon and other ecosystem service markets as a way to achieve hazard reduction, improved ecosystem health and services, and lowered green house gas emissions in California.
  - *Facilitate development of sustainable biomass harvest practices to grow, collect and utilize forest and range biomass resources as feedstock to biomass markets.*
  - *Facilitate the expansion of biomass markets through improved infrastructure (e.g. transmission lines), monetization of external benefits (e.g. hazard reduction), feedstock collection, and generation capacity.*
  - *Support and conduct biomass research and development including life cycle analysis, best management practices, monitoring and sustainability.*
  - *Support education and training and the development of curricula to inform citizens, consumers, and decision makers and develop well trained biomass industry professionals in California.*

- *Address existing constraints and develop new policies, laws and regulations that promote and facilitate the expanded use of biomass while protecting the state's environment.*
- *Support the development of voluntary and compliance carbon markets.*
- *Support the development of other emerging voluntary markets including water, habitat and green tourism*.

❖ **Plant, Wildlife and Fish Habitat Protection, Conservation and Enhancement**

o Protect and conserve wildlife and fish habitat in order to enhance high species richness, endemism and core habitat.

- *Reduce the loss and modification of habitat that supports wildlife, and maintains California's unique biodiversity.*
- *Develop policies and incentives to facilitate better integration of wildlife conservation considerations into local and regional planning and land-use decision making.*
- *Sustain healthy forest ecosystems to maintain California's unique biodiversity.*

❖ **Green Infrastructure for Connecting People to the Natural Environment**

o Improve the opportunities for people to connect with natural environment through conserving and enhancing green infrastructure.

- *Support efforts to develop and maintain regional strategies to conserve, manage, and connect people to green infrastructure.*
- *Support implementation of regional green infrastructure strategies.*
- *Support successful programs to conserve, manage, and connect people to green infrastructure.*

❖ **Climate Change-Threats and Opportunities**

o Promote actions to preserve and enhance carbon sequestration (i.e. mitigation) and actions to promote ecosystem health and resilience under changing climate conditions.

- *Protect and enhance the capacity of California's forests to sequester carbon through reducing risk of loss from disturbance, protecting existing forest land, and expanding forest area through tree planting.*
- *Support adaptation needs for forests by assessing climate vulnerabilities, improving institutional capacity, and promoting a priority research agenda.*
- *Support actions that maintain, enhance, and protect ecosystem functions to promote biodiversity and increase resilience to climate change*.

Collaboration

The strategies and actions that appear in this report were developed by CALFIRE staff with the input from numerous stakeholders who participated in meetings, workshops, and reviewed draft versions of the assessment and strategies reports. For many topics the proposed strategies have been built on existing state and federal plans. The guidance provided in these existing plans was further refined by the priority issues and landscapes that were identified in the 2010 Forests and Rangelands Assessment.

Synthesis

California is a large state with complex ecology, a history of forest and range land use, a world-class economy, and with a current population of over 38 million people. In this setting, several over-arching themes and goals are found in the 2010 Forests and Rangelands Strategy Report. Collectively the strategies contribute to the national State and Private Forestry goals for: conserving working forests, protecting forests from harm, and enhancing public benefits from trees and forests. The following section briefly discusses the cross-cutting nature of the proposed strategies.

Strategies for promoting sustainable working forests and those for reducing development impacts are both focused on meeting the larger national theme/goal of conserving working forests and rangelands. Achieving “sustainable” working landscapes has ecological, economic and social dimensions. California already has a wide variety of approaches to deal with various elements of sustainability. To a significant degree, existing state policies already focus on preserving working forest and rangelands. These emphasize a mix of approaches that will encourage maintenance of lands in production and minimize conversion and loss of key habitat or other critical ecological elements.

Dealing with development impacts and promoting working landscapes are very interrelated. California has a complex mix of laws, agencies, and policies that focus on disclosing, evaluating, and mitigating the impacts of development. A number of these explicitly deal with development impacts on forests and rangelands.

There are also a number of strategies that address improved range and forest ecosystem health and resilience in California which contribute to national goals of protecting forests from harm. Underlying most strategies is the need for accurate problem analysis, effective program design and delivery, feedback on results and making appropriate alterations. Implicit in these things is the understanding that much of California contains altered ecosystems from elements such as fire suppression, land management, and spread of invasive species. Changing climatic patterns and other factors may increase vulnerability of some ecosystems and add to the uncertainty in making management decisions. In such cases, accurate assessment, monitoring, information, planning and research become even more important.

One of the overarching themes in this assessment is the impact of wildfire and other natural disturbances on forested and range landscapes. Fire and other disturbances are an inherent and sometimes necessary part of the ecosystem dynamics, including

impacts to wildlife and fish. A number of ecosystems or ecosystem components are dependent on wildfire or other disturbance. In these cases, it may be necessary to reintroduce wildfire, or if this is not possible, to find ways to mimic its effects through management. At the same time, fire and other natural factors can be significant threats to life, public health, natural resources, and other property. Thus, in the case of wildfire, a variety of approaches have evolved that cover such things as; management programs that address reduction of wildfire risk and attendant smoke and particulate matter, as well as use of wildfire as a tool to enhance ecosystems.

Similarly, insects, disease and other pests are endemic to forests and rangelands. They can play a key role in ecosystem function. Conversely, pests from outside of California are having a significant impact in many areas. In the case of forest pests and invasive species, strategies and approaches focus on education, prevention, control of existing outbreaks or spread, and restoration of previously impacted areas. Issues with both endemic and invasive pests and species, remain a very significant challenge to maintaining and improving forest and rangeland resilience.

In addition, because many people live in or near forests and rangelands, there are a number of strategies focused on community protection from wildfire, and other risks. Collectively these strategies emphasize expanded pre-fire planning and prevention efforts that include: increasing awareness for maintaining defensible space around buildings, adopting and implementing fire safe building standards, strategic placement of vegetation treatments to remove hazardous fuels, greater collaboration in the development of community based wildfire protection plans.

The benefits of California’s forests are found in both natural wildlands and urban settings. Urban forests provide shade, improve air quality, contribute to carbon sequestration, filter stormwater runoff, and add aesthetic value. Strategies were developed to expand urban tree planting and maintain the many benefits derived from urban forests.

People living in or near forest and rangelands also place numerous demands on these lands. Strategies to conserve, manage, and connect people to green infrastructure can enhance quality of life by providing open space, scenic vistas, outdoor recreation and education opportunities, watershed value, and wildlife habitat close to population centers most in need of these services. Strategies can also engage local populations in being advocates for and stewards of green infrastructure and its associated values.

An additional set of strategies is organized around maintaining and enhancing the public benefits and broad range of environmental services that are provided from California’s forests and rangelands. These strategies include watershed protection and restoration actions in priority watershed areas. These actions address water supply and water quality issues in upper watersheds that support a range of downstream beneficial uses. Strategies and actions were also developed to protect wildlife, fish, and related habitat needs.

While still important in many local areas, the relative economic importance of the forest products and range-livestock industries has declined. Because of this, emerging markets that can support investment in forest and range resources, as well as the related economic and social infrastructure, are critical. Ecosystem services, such as wildlife habitat and clean water, have grown in importance, but the markets to capture the value of these services have been limited. For other ecosystem services markets are beginning to develop. In recent years there has been increased interest in the capacity of forests to generate biomass as fuel and energy source and in the role of forests to maintain and enhance carbon sequestration. These two areas represent emerging markets that offer a larger public benefit and potential financial incentives to landowners. There is additional interest in solar, wind, and other sources of renewable energy. Strategies are proposed for supporting the development of carbon markets, forest biomass, and other types of renewable energy. In addition, strategies are needed to evaluate potential environmental impacts from these emerging markets and ensure that they are developed in a sustainable manner.

Strategies are proposed to support the further development of voluntary and potential compliance-based carbon markets. Additional strategies call for facilitating the sustainable development of biomass industry, as well as future markets that may be developed for water, or for wildlife habitat.

Climate change is another over-arching issue that will have an increasing affect on the policy choices and management of forests and rangelands. Strategies for climate change include actions to protect and enhance the capacity of forests to sequester carbon both through reforestation (expanding forested areas) and through actions that are intended to reduce the risk of loss through human caused and natural disturbances. Recognizing that some degree of climate change is likely to occur additional strategies have been proposed to support adaptation needs in forest and rangelands.

Recommendations

Many state, federal and local laws already define a complex framework of goals, programs, and funding sources that apply to forests and rangelands in the state. Strategies already exist at many different levels, from governmental agencies to communities and community groups, non-profits, private landowners, and other stakeholders. The challenge is to take advantage of and incorporate this rich fabric of interest and involvement.

Historically, California has shown a strong commitment to investment in natural resources, through a variety of funding mechanisms. Ballot initiatives especially have had a substantial influence on priorities for protection and enhancement of natural resources on forests and rangelands. California voters in the past two decades have been supportive of programs and ballot initiatives that support conservation, restoration, open space and improved environmental quality.

In many instances, strong programs of cooperation and coordination have developed between agencies and stakeholders with an interest in forest and rangeland resources.

With increased uncertainty, rapid change, and limited resources, it is imperative that such cooperation continue and grow. The use of place-based and other community-related approaches, such as watershed organizations and Firesafe Councils, is well-developed in California and will continue to play a critical role in developing and implementing strategies.

Key recommendations for implementing strategies on forest and rangelands include:

1. Focus on Maintaining and Enhancing the Resilience and Health of Forest and Rangeland Ecosystems – At the heart of any set of strategies for forest and rangeland must be: understanding, maintaining and enhancing the resilience and health of forest and rangeland ecosystems in California. Resilience refers to the ability of an ecosystem to respond positively to or recover quickly from the effects of disturbance. If forests and rangelands are not in good health and able to respond to disturbance, they will be less able to produce the wide range of goods and services that are desired.

2. Investing in Forests and Rangelands – There is growing public demand for managing forests and rangelands to support a broad range of environmental services. There is also pressure to convert forests and rangelands to other uses. The loss of forests and rangelands diminish their value as open space, wildlife habitat, and the many other resources that they provide. Investments in infrastructure and support to landowners (private and public) are needed to manage lands to maximize the benefits from these environmental services. Sustaining long-term investments in forest and range resources would benefit from diversifying funding sources and reducing reliance on bond funded programs. Promoting emerging markets for forest biomass, carbon sequestration, and other ecosystem services will provide additional incentives for landowners to provide these public benefits.

3. Promote a Collaborative Science-based Approach – Protecting, enhancing, and restoring forest and rangeland ecosystems requires a commitment to a science-based understanding of the threats and risks to forests. This can be done most effectively through a collaborative approach that recognizes the wide range of forest uses and differing management objectives. While management objectives differ across ownership and administrative boundaries a more cohesive approach is needed across all forests and rangelands. A collaborative approach is essential to further refine the preliminary priority landscapes that were identified in the 2010 Forests and Rangelands Assessment.

4. Prioritize Strategies Based on Co-benefits – With limited resources the implementation of strategies for addressing priority management issues brought forth in 2010 Forests and Rangelands Assessment need to consider the co-benefits associated with any one strategy. For example, the strategic placement of fuel reduction projects will likely have additional co-benefits for watershed protection.

5. Policies, Planning, and Organization – Promoting more cohesive polices on forests and rangelands will require a more integrated management of private and public lands. Ecosystem health, wildfire management, water resource management, and many other important public benefits derived from forest and rangelands can only be achieved through a program that integrates policies and actions across larger ecosystem units.

6. Research, Information Needs, and Decision Support – Understanding the threats to forests and rangelands, and the effectiveness of management actions requires a commitment to research, data collection and monitoring. The 2010 Forests and Rangelands Assessment made use of the best available data, but there are many data gaps and analysis limitations (see data limitation section for additional information). In addition, there are many knowledge gaps that would benefit from a sustained research agenda to better understand forest ecosystem processes, response to natural and human caused disturbances, and effectiveness of management actions. The limitations in data collection, monitoring, and research, reduce the capacity to support and inform important policy choices.

7. Public and Landowner Outreach – Public understanding and support are essential for implementing strategies related to management of natural resources on forests and rangelands. In addition, expanded outreach to landowners is needed to encourage participation in vegetation management, reduction of fuel hazards, and related programs that benefit overall forest health. There is also a need to expand the capacity of existing State and Private Forestry programs, related governmental agencies, councils, resource conservation districts and other regional entities that provide education and outreach to both landowners and the public.

INTRODUCTION

The U.S. Forest Service State and Private Forestry Redesign and the 2008 Farm Bill requires states to develop a Statewide Forest Resource Strategy based on their completed state assessments of forest resources (SAFR). California's 2010 Forests and Rangelands Strategy Report provides a long-term, comprehensive, coordinated plan for investing state, federal and partner resources to address the management and landscape priorities identified in the assessment. The strategy report incorporates existing statewide forest and resource management plans; and provides the basis for future program, agency, and partner coordination. This plan outlines strategies that address each of the priority issues and landscapes that were identified in the 2010 Forests and Rangelands Assessment. While not required by the federal mandates, range resources were addressed in the 2010 assessment to fulfill State assessment requirements.

In 2008, the U.S. Forest Service implemented a "Redesigned" State and Private Forestry (S&PF) program. The S&PF Redesign effort was conceived in response to the combined impacts of increasing pressures on our nation's forests and decreasing S&PF resources and funds. Significant threats to forests, such as insect and disease infestations, catastrophic fire, and the loss of critical forested landscapes to development; coupled with the pressure placed on local economies by the increasingly global nature of the forest products industry, pointed to the need for more progressive strategies to conserve our nation's forest resources.

The California Forests and Rangelands Strategy Report addresses the following:

- Provides long-term strategies that address issues and priority landscapes identified in the 2010 Forests and Rangelands Assessment;
- Identifies how federal, state, private and other resources could be invested and aligned to address issues in priority landscapes that cross ownerships;
- Identifies how State and Private Forestry program areas, along with stakeholders and key partners can contribute to long-term goals and strategies;
- Provides performance measures that can be used to evaluate the effectiveness of strategies over time and;
- Describes how the strategy goals tier to the national goals of the State & Private Forestry Redesign, Montreal Process and California Board of Forestry and Fire Protection policy objectives.

Relationship to Board of Forestry (Policy Statement)
The Board of Forestry and Fire Protection (BOF) has responsibility for developing and implementing forest and rangeland policies in California. By statute (PRC 4789) the Board is required to develop a policy statement following the periodic assessment of forest and rangeland resources conducted by the California Department of Forestry and Fire Protection's (CAL FIRE) Fire and Resource Assessment Program (FRAP). The previous assessment was completed at the end of 2003. The 2003 assessment was organized by the seven criteria from the Montreal Process that are used to evaluate forest sustainability. Thus, the current goals and objectives of the Board's Policy Statement (2007) also closely follow the Montreal Process.

To provide a transition between existing forest and range polices and proposed strategies, the 2010 Forests and Rangelands Strategies Report provides a crosswalk between newly proposed strategy goals developed under Redesign and existing policy goals that followed the Montreal Process.

Other State Plans
In addition to the Board of Forestry and Fire Protection's Policy Statement, there are many existing statewide planning efforts that have established strategies for managing forests and rangelands. Existing state plans provided the foundation for developing strategies. In most cases strategies from existing state plans were incorporated directly or refined based on findings from the 2010 Forests and Rangelands Assessment. The following provides a list of plans consulted.

- The 2010 Strategic Fire Plan for California
- National Fire Plan
- Board of Forestry Policy Statement
- California Water Plan – Update 2009
- Water Board Strategic Plan Update 2008-2012
- Regional Water Quality Control Board (Basin Plans)
- Delta Vision Strategic Plan
- Roadmap for Biomass Development – CEC report
- California Wildlife Action Plan
- California Outdoor Recreation Plan 2008
- AB 32 Climate Change Scoping Report
- 2009 California Adaptation Strategies
- Indicators of Climate Change in California (OEHHA, 2009)
- Northwest Forest Plan
- National Fish Habitat Action Plan
- USFS Strategic Framework for Responding to Climate Change
- USFS—Region V Best Management Practices Evaluation Program

Context

California is a large and diverse state covering roughly 100 million acres. Although it is the most populous state in the nation, the population is concentrated in urban areas and roughly 80 percent of land base still consists of forests and rangelands (Figure 1). Covering over 80 million acres, California's forests and rangelands provide a wide range of environmental services including: recreation opportunities, scenic vistas, wildlife and fish habitat, clean air, watershed functions (water supply and water quality), forest and agricultural products and other uses. With a population exceeding 36 million (and growing) there are many demands placed on our forests and rangelands. Population growth has increased concerns over water resources, water quality, preservation of open space and habitat, species extinction and increased risk from wildfire.

California forests are comprised of both conifer forest types (~ 19 million acres) and hardwood forest types (~ 13 million) of variable age classes. Overall, forest stands are mostly dominated by medium age trees (FRAP, 2003; Christensen et al., 2008). However, forests on public lands tend to consist of older forest stands than those found on private lands (Christensen et al., 2008). There are general concerns that current forest stands are much denser than they were historically; and that there are increased risks to forest health associated with this. In addition to affecting forest condition, population pressures and resulting land conversions can also reduce the total extent of forest land across the state.

Figure 1 – Forests and rangelands occupy roughly 80 percent of the land base in California. Source (FRAP, 2003).

Policy Challenges

Forest and range policies must strike a balance between promoting the goods and services that are produced by these lands while protecting and enhancing the underlying ecosystems. The complexity and diversity of California's forests and rangelands creates a set of difficult policy choices. The most prominent policy issues were first discussed in the 2003 assessment and have been further refined in the 2010 assessment (Table 1).

Table 1 – Policy Challenges in California's Forests and Rangelands (modified from FRAP, 2003)

THEMES	**POLICY ISSUES**
Biological Diversity	Gaps in wildlife habitat structure. Decline in some native species. Using all landscapes to meet biological diversity goals.
Productive Capacity	Declining land base and administrative withdrawals of land available for timber and range production. Risks and Impacts from increased forest stocking levels. Decline in rangeland area and availability.
Forest Health	Managing forest structure for productivity, habitat and forest health goals. Management of metropolitan and interface forests and rangelands. Public understanding of management practices. Forest and rangeland conversions. Fuels buildup risks to ecosystems and human assets. Elevated pest damage related to forest stocking levels. Emerging pest and disease threats to unique habitats and live-stock health. Impacts of exotic and invasive species to biological diversity and rangeland productivity. Increasing air pollution in several regions.
Soil Conservation and Water Quality	Measuring cumulative watershed impacts. Improving watershed condition and restoring fish habitat; protecting water supply watersheds.
Forests and Climate	Understanding and responding to climate change. Promoting carbon sequestration in forest biomass while protecting against losses from forest pests, disease, and wildfire. Identifying tree species and ecosystems most vulnerable to climate change.
Socio–Economic Well Being	Increasing consumption and statewide limitation on California commodity output. Meeting changing demands for recreation and open space. Meeting costs of resource protection. Incentives for private production of ecosystem services. Maintaining large landholdings in resource industries. Weak economies in rural communities. Promoting forest biomass and other emerging markets, while ensuring environmental protection and sustainability.
Governance	Complexity of regulatory oversight. Limited policy integration. Conflicts over forest and rangeland management practices. Coordination in research and information sharing. Standardized, comprehensive information systems.

A central goal of this report is to integrate proposed strategies with existing plans and strategies that are already being implemented across California's forests and rangelands. Many state, federal and local laws already define a complex framework of goals, programs, and funding sources that apply to forests and rangelands in the state. Strategies already exist at many different levels, from governmental agencies to communities and community groups, non-profits, private landowners, and other stakeholders. The development of strategies is also greatly influenced by public ballot initiatives. California voters in the past two decades have been supportive of programs and ballot initiatives that support conservation, restoration, open space and improved environmental quality. Compared to other states, California's investment in natural resources is relatively high (see investing resources section).

Still, current levels of investment are typically insufficient to address the potential needs for vegetation treatments. As a result, emphasis has been placed on identifying strategic locations where vegetation treatments are most needed. In addition, support for bond funding tends to be cyclical and may be difficult to sustain with increasing budgetary pressure. Long-term solutions should include a mix of revenue sources that in addition to bond funding include fees, where appropriate, for risk reduction, and market based incentives to promote sustainable forest management that reduces environmental risks and enhances environmental services.

Building on the Assessment

The California 2010 Forests and Rangelands Assessment Report identified landscape areas where national, regional and state resource issues and priorities converged. The assessment incorporated the best data available and input from stakeholders; and considered other relevant state assessments, plans and priorities. The assessment was built around the three national themes identified by the U.S. Forest Service:

- Conserve Working Forest Lands: conserving and managing working forest landscapes for multiple values and uses.

- Protect Forests From Harm: protect forests from threats, including fire, catastrophic storms, flooding, insect or disease outbreaks, and invasive species.

- Enhance Public Benefits from Trees and Forests: including air and water quality, soil conservation, biological diversity, carbon storage, and forest products, forestry-related jobs, production of renewable energy, and wildlife.

Each chapter in the assessment was centered on a priority issue (i.e., fire threat, forest health, etc.). Using a common GIS-based analytical framework the assessment spatially defined natural resource assets and data layers representing threats to those assets. Priority landscapes were derived by intersecting asset and threat layers. The combination of high value assets coinciding with high threats produced high priority areas. Proposed strategies were then developed to address both priority issues and priority landscapes that were identified in the assessment report.

The strategy report follows the assessment framework and develops strategies for each priority issue, following the order of chapter topics. Each priority issue is supported by one or more priority landscapes. In some cases, the proposed strategy may come from an existing statewide planning document. However, the priority landscapes will further refine and focus the strategies by identifying where resources are most needed.

Cross-Cutting Issues

The 2010 Forests and Rangelands Assessment Report is divided among three broad themes and 12 different specific resource topics. The key findings for each of the resource topics are discussed in the second chapter of the strategies report, but there are also many cross-cutting issues that emerge. Examples include:

Socio-Economic: Forests and rangelands, and urban forests, are critical to the economic, social and environmental well-being of California.

Emerging Markets: Uses of forest resources are increasing and changing. Emerging markets are placing new demands on these lands, such as for renewable energy and ecosystem services. At the same time, the forest products industry and range-livestock industries face difficult challenges.

Forest Health: California's forests and rangelands, and their many uses, are under a variety of threats (forest pests, development, wildfire, climate change), and trends often indicate an increasing number, extent, and severity of threats.

Infrastructure: A significant portion of forests and rangelands, urban forests, and the infrastructure required to meet demands from these lands, needs improvement.

Uncertainty: Among other factors, changes in the climate and shifting economic factors add considerably to the uncertainty surrounding forest and rangeland issues (see Lawler et al., 2010).

Management Solutions: There are potential management solutions leading to desired future conditions that produce more carbon, improved water quality, more vibrant rural economies, and landscapes more resistant to threats. However, reaching these desired future conditions will require meeting numerous political, social and economic challenges.

The cross-cutting nature of these issues demonstrates that most approaches or solutions can not be dealt with in isolation, but instead they will require coordination for implementing many of the proposed strategies. In addition, many of the priority landscapes that were identified in the 2010 Forests and Rangelands Assessment have a high degree of spatial overlap. Figure 2 was developed by overlaying priority landscapes for multiple topics together into a single meta-priority landscape. In this example all priority landscapes relating to forest and range ecosystems were combined (i.e., wildfire threat, forest pests, water resources, climate change). The resulting meta-priority landscape identifies areas that were identified as a high priority for multiple assessment topics.

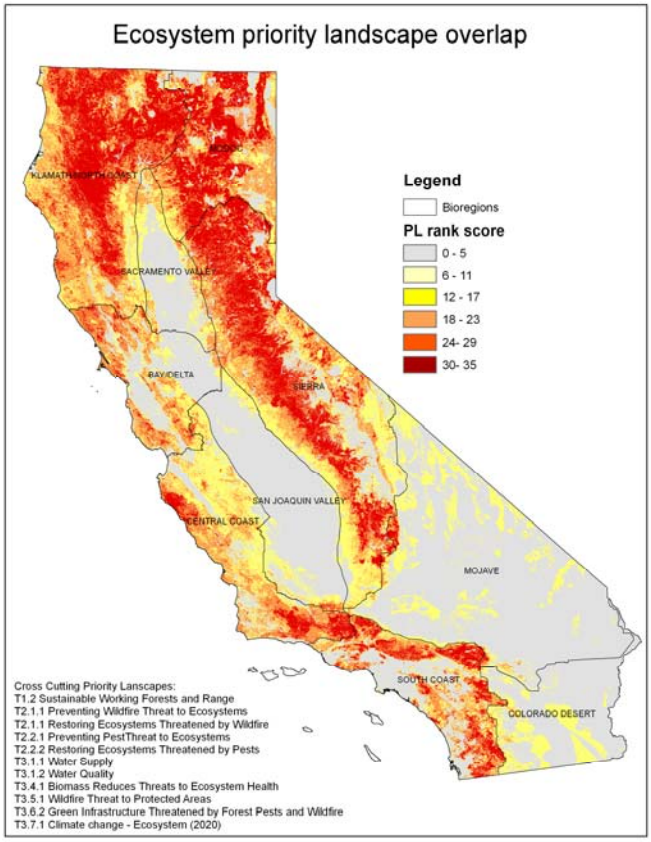


Figure 2 – Meta-priorities were identified by overlaying priorities for multiple resource topics. High scores are associated with areas where multiple high priorities coincide.

Community Capacity

Collectively, the proposed strategies in this report are intended to complement existing management approaches that promote healthy forest and range ecosystems that are more resilient to disturbance from both natural and man-made sources. The ability to reach a desired future condition of healthy and resilient ecosystems is also greatly influenced by local community capacity.

In California, the capacity of local groups to implement strategies and positively influence resource conditions is well developed for a number of resource topics. For example, the broad network of Fire Safe Councils throughout California provides support for local community based fire planning efforts. Watershed groups are also very well established and provide a critical resource for implementing conservation, restoration and stewardship strategies. In addition, community groups are active across the state to promote tree planting and address other urban forestry issues.

For areas where development of community capacity are still in the initial stages of development, it is important to include tools for creating capacity. For example, forest biomass projects as a tool for reducing fire risk to local communities is only viable where

there is a nearby biomass processing facility. For communities with large populations facing high fire risk, and with no biomass facility nearby, there is no mechanism to utilize biomass harvesting to mitigate fire danger.

Outreach Process

CAL FIRE conducted an extensive outreach campaign for the assessment and strategies reports. Outreach was targeted at government agency partners, non-governmental organizations (NGOs), and other public groups. Outreach consisted of meetings, workshops, webinars and use of an assessment website for posting information and soliciting public input.

Federal and State Agencies

Following the Redesign guidance, outreach was conducted with the following groups: State Forest Stewardship Coordinating Committee, State Technical Committee, the state wildlife agency, applicable federal land management agencies such as the Forest Service and Bureau of Land Management, the State Urban Forestry Council and the Forest Legacy Program.

The U.S. Forest Service was considered a primary stakeholder from which to solicit input for the 2010 assessment and strategies reports. They were heavily involved in the assessment process because they are administering the Redesign program and also because they are the largest public landowner of forested lands in California. In 2009, CAL FIRE held four webinars for U.S. Forest Service leadership. Topics covered included methods, analytical framework, themes and subthemes, preliminary results, and proposed strategies. In addition, CAL FIRE made a presentation to the U.S. Forest Service Regional Leadership Team and consulted directly with many different individuals for input. In general, the U.S. Forest Service provided CAL FIRE with positive feedback on methods and results and encouraged us to focus a significant amount of time and energy on public outreach.

The Natural Resources Conservation Service (NRCS) is another key agency and meetings were held to brief staff on findings from the assessment and on the development of strategies to address both priority issues and priority landscapes. Other important federal agencies consulted, briefed, or notified included the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service, the Fish and Wildlife Service and the National Park Service.

CAL FIRE provided briefings and solicited input on strategies from a number of state agencies including: Department of Water Resources, Department of Conservation, State Water Resources Control Board, Department of Fish and Game, Department of Parks and Recreation, California Energy Commission and California Air Resources Board. Each of these agencies has responsibilities and expertise that involve many of the resource issues in the assessment and would be important partners for implementing strategies.

Public Outreach

Public input was solicited primarily through the use of meetings and webinars. Webinars were particularly useful, as they enabled the Department to “meet” with people across our large state where we wouldn’t have been able to otherwise. The use of the CAL FIRE website, including an online survey tool and e-mail lists, were also helpful and effective.

CAL FIRE held three large webinars/workshops for a broad general audience. Topics covered included methods, analytical framework, themes and subthemes, preliminary results, and proposed strategies. Attendance at the webinars/workshops was good and a variety of input was received, primarily in regards to data inputs, issues being addressed and suggested strategies. Announcements were made to a mailing list of approximately 150 stakeholders representing state, federal, private, non-profit, academic and tribal interests. The announcements were then circulated beyond this to additional mailing lists belonging to other agencies. These mailing lists were also used to broadcast the information posted on the CAL FIRE website about the assessment.

Throughout the assessment process, the CAL FIRE FRAP website contained extensive background and details on the methods for the analysis. The website also used online surveys to allow users to provide feedback on the methods and data used in the analysis. The website was visited by approximately 2,000 unique users over the course of nine months.

To solicit direct input from public and private stakeholders in the resource management field, CAL FIRE made direct contact with phone calls and interviews. Many were interested in the assessment, some attended subsequent webinars/workshops, and many provided referrals to staff to provide feedback. Individual interviews were conducted with the assistance of the Center for Collaborative Policy (California State University Sacramento) to key stakeholders in forest management in the non-profit, private and academic communities. Through these interviews CAL FIRE received input on the issues stakeholders considered to be most important, strategies for conducting an objective and scientifically sound assessment, and recommendations for further outreach.

Conferences and Newsletters

In an effort to distribute information about the assessment to broader audiences, CAL FIRE made announcements and held exhibits at a variety of well-attended conferences including the California Biodiversity Council’s Anadromous Fish Recovery Conference in October, 2009. The California Biodiversity Council is composed of 43 resource management and environmental protection organizations at federal, state, and local levels. In addition, information about the assessment and strategies reports was highlighted in many newsletters during 2009 and 2010.

Organization of the Document

The strategy report has four main sections. In the first section, the introduction provides the background and setting. Section two provides a summary of key findings for each of the 2010 assessment chapters. Section three provides a description of the strategies for each assessment topic. The strategy topics correspond directly with the assessment topics. For each of the following assessment topics one or more strategies have been proposed.

Conserve Working Forest and Range Landscapes

- 1.1 Population Growth and Development Impacts
- 1.2 Sustainable Working Forests and Rangelands

Protect Forests and Rangelands from Harm

- 2.1 Wildfire Threat to Ecosystem Health and Community Safety
- 2.2 Forest Pests and Other Threats to Ecosystem Health and Community Safety

Enhance Public Benefits from Trees, Forests and Rangelands

- 3.1 Water Quality and Quantity Protection and Enhancement
- 3.2 Urban Forestry for Energy Conservation and Air Quality
- 3.3 Planning for and Reducing Wildfire Risks to Communities
- 3.4 Emerging Markets for Forest and Rangeland Products and Services
- 3.5 Plant, Wildlife and Fish Habitat Protection, Conservation and Enhancement
- 3.6 Green Infrastructure for Connecting People to the Natural Environment
- 3.7 Climate Change: Threats and Opportunities

Section four discusses strategies for addressing limitations in data and analysis.

Section five provides a discussion of how investments in natural resources are made in California; focusing on the success of large bond initiatives and their influence in setting priorities for conservation, restoration, and land stewardship. Further, this section discusses the adequacy of existing programs and constraints that prevent those programs from being effective.

ASSESSMENT CHAPTER SUMMARIES

The following section contains key findings and an overview from each topic covered in the *California's Forests and Rangelands: 2010 Assessment*. These highlights are intended to provide a brief overview of the issues and analysis that were conducted for each chapter. Please refer to the assessment report for a more comprehensive discussion on each topic.

1.1: Population Growth and Development Impacts

CHAPTER OVERVIEW

Many of the same ecosystems that have been hard hit by historical development are projected to be further impacted by development in the near future, particularly in and around the largest urban areas. The state's already large population is still growing, particularly in Southern California, and an estimated 3.9 million residents will be added over the next decade. This ongoing trend will maintain or increase pressure for land development that can increasingly compromise ecosystems across the state.

Tools to address development threat to ecosystems are now being employed by public and private organizations in California. These include land acquisition, easements, zoning policies, and policies to promote in-filling of existing developed areas.

This chapter has a single spatial analysis which examines the threat of near-term development to ecosystems.

ANALYSIS: POPULATION GROWTH AND DEVELOPMENT IMPACTS

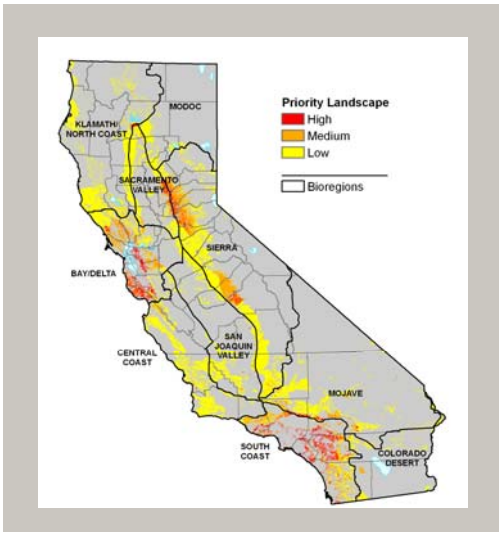
Key Findings

- The habitat types in California with the most at-risk acres from development statewide are Annual Grassland, followed by Coastal Scrub, Montane Hardwood and Blue Oak Woodland.

- The bioregions with the highest proportion of at risk acres are the South Coast, Bay/Delta, and the central and northern foothill areas of the Sierra. Types found to be most at risk in these regions:
  - South Coast: Coastal Scrub, Annual Grassland and Mixed Chaparral.
  - Bay/Delta: Annual Grassland, Coastal Oak Woodland, Montane Hardwood and Redwood.
  - Sierra: Montane Hardwood, Blue Oak Woodland, Annual Grassland and Montane Hardwood-Conifer.

- Other habitat types of much smaller extent show up as threatened in local areas of other bioregions. One example is the Blue Oak - Foothill Pine in the northern Sacramento Valley bioregion.

Priority Landscapes



This analysis identifies California landscapes of high ecosystem values that are currently facing significant threats from development. High ecosystem value landscapes are defined as areas where specific wildlife habitat types are at significant risk from regional development over the next ten to thirty years.

1.2: Sustainable Working Forests and Rangelands

CHAPTER OVERVIEW

The concept of "working landscapes" was developed to encompass the idea that lands used for commodity production also provide crucial ecosystem services and that future demands make it essential that these systems are managed for joint production of ecosystem services as well as food, fiber, energy, and other economic values.

Current condition and trends of working landscapes and the industries that depend on them, as well as threats to their sustainability from various land use practices are discussed in chapter sections related to: Land Use and Land Cover Impacts, Forests and Woodlands, Forest Products Sector, and Rangelands and Range Industry.

The final chapter section addresses opportunities for landowner assistance to enhance productivity and health of working landscapes. This includes three unique spatial analyses, each identifying priority landscapes where additional investments have both the potential to enhance commodity production and the capacity to provide ecosystem services.

1) Risk Reduction on Forestlands: identifies areas with timber and biomass energy assets that are threatened by wildfire and forest pests.
2) Risk Reduction on Rangelands: identifies areas where range productivity is threatened by wildfire
3) Restoring Impacted Timberlands: identifies areas with timber and biomass energy assets that have been impacted by past wildfires or forest pest outbreaks.

A fourth non-spatial statistical analysis is included to quantify opportunities for improving stocking levels on timberlands. The landowner assistance section concludes with a discussion of the various state and federal programs that exist to provide technical, financial and other assistance to forest and range landowners.

LAND USE AND LAND COVER IMPACTS KEY FINDINGS:

- Permanent land cover change occurs most often (47,000 acres a year) in grassland/shrubland types, most dramatically in grazing lands along the edges of the Central Valley.
- Forest disturbance from harvest peaked between 1986 and 1992 with fire-caused disturbance most common in forests from 1992-2000.
- Monitoring of Best Management Practices on private and public forestlands shows generally high compliance with implementation and effectiveness when implemented properly.
- Unmanaged outdoor recreation may adversely impact natural resources by causing erosion, spread of invasive weeds, compaction, plant damage, wildlife disturbance, damage to cultural resources and others.

FORESTS AND WOODLANDS KEY FINDINGS:

- Both private and public forestlands appear to continue to build inventory volume.
- A U.S. Forest Service analysis indicates that while carbon sequestration is occurring, long-term carbon storage will be a function of management inputs over the next 100 years.
- A carbon sequestration and storage analysis of California's private timberlands suggests that less total storage and sequestration is occurring relative to public lands, but given management inputs may be more sustainable in the long-run. The annual net sequestration is estimated to be about 5 million metric tons per year on private forestlands and about 25 million metric tons per year on public forestlands.
- The propensity for the conversion of working forests and woodlands is increasing due to pressures from high costs, low income, infrastructure loss and generational turnover.

1.2: Sustainable Working Forests and Rangelands

FOREST PRODUCTS SECTOR KEY FINDINGS:

- The forest products infrastructure of California is declining in terms of jobs, capacity and overall economic activity. Softwood sawmill capacity shrank by 25 percent in the last few years. Climate change adaption, biomass energy production, and risk reduction and restoration activities depend on that infrastructure, as do many of the rural economies of California.
- Industrial ownership patterns have shifted from publicly held corporations to privately held firms.
- Individual Timber Harvesting Plans (THPs) have been increasing in size. Their total acreage was fairly steady before 2009. Acres under Non-Industrial Timber Management Plans (NTMPs) continue to rise but with smaller landowners increasing in participation. As of January 1, 2010, there are 711 NTMPs covering 301,598 acres.
- The acres of alternative prescriptions have declined and clearcutting acreage has been generally constant over the last several years.
- Cost reduction and regulatory streamlining is necessary for the forest products sector in California to compete and be sustainable in the long-term.

RANGELANDS AND RANGE INDUSTRY KEY FINDINGS:

- Rangeland productivity is highly variable across space and time. Climate change impacts this further. Buffering public lands with grazing helps protect ecosystem health from development and protect development from wildfires originating on public wildlands.
- Like the timber industry, the ranching industry has been in steady long-term contraction. The maintenance of large ranches across California landscapes cannot rely on amenity values; these must be economically viable operations to avoid conversion, abandonment or fragmentation.
- The propensity for the conversion of working rangelands is increasing due to pressures from high costs, low income, infrastructure loss and generational turnover.

LANDOWNER ASSISTANCE

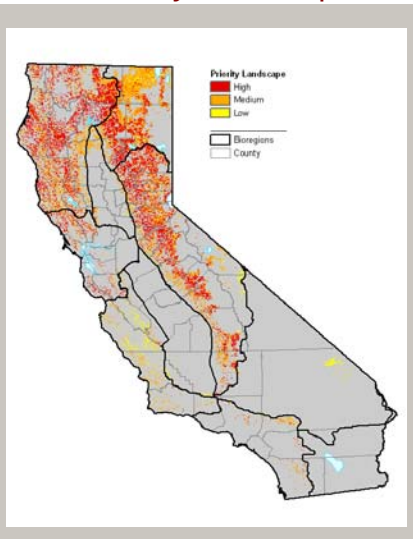
ANALYSIS: RISK REDUCTION ON FORESTLANDS

Key Findings

- High priority landscapes were found primarily in the Klamath/North Coast, Modoc and Sierra bioregions.

For this analysis, economic assets include timber and forest biomass, which are threatened by wildfire and forest pests. High priority landscapes represent areas with important economic assets that face significant threat from wildfire and forest pests.

Priority Landscapes



High Priority Landscape Acres by Ownership

USFS	3,940,000
BLM	140,000
DOD	< 10,000
Tribal	50,000
NPS	< 10,000
Other Fed	10,000
Other Gov	90,000
PRVT	3,570,000
NGO	10,000

LANDOWNER ASSISTANCE

ANALYSIS: RISK REDUCTION ON RANGELANDS

Key Findings

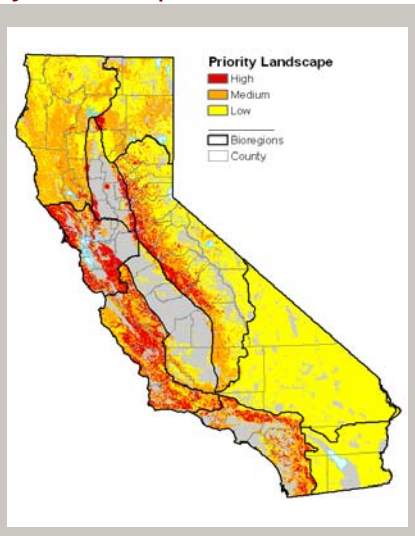
- High priority landscapes were found primarily in the Bay/Delta, Central Coast, Sierra, and South Coast bioregions. Bioregions with smaller acreages of high priority landscapes or extensive areas of medium priority included the Klamath/North Coast, Modoc and Sacramento Valley bioregions.

This analysis identifies areas where range productivity is threatened by wildfire.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	1,520,000
BLM	270,000
DOD	160,000
Tribal	70,000
NPS	130,000
Other Fed	40,000
Other Gov	620,000
PRVT	6,420,000
NGO	60,000



ANALYSIS: RESTORING IMPACTED TIMBERLANDS

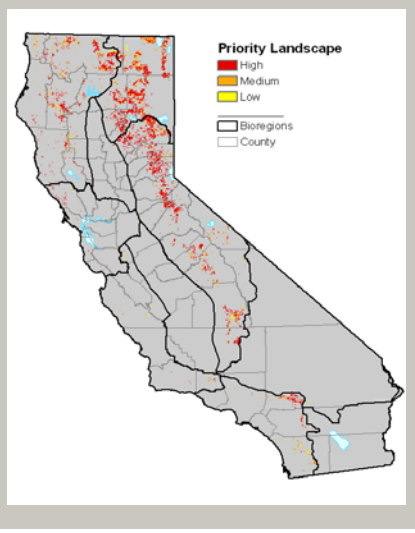
Key Findings

- Extensive areas of high and medium priority landscapes were found in the Klamath/North Coast, Modoc and Sierra bioregions. Bioregions with smaller acreages of these priority areas include the South Coast and Bay/Delta.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	2,050,000
BLM	20,000
DOD	< 10,000
Tribal	< 10,000
NPS	< 10,000
Other Fed	< 10,000
Other Gov	10,000
PRVT	570,000
NGO	< 10,000



For this analysis, economic assets include timber and forest biomass. Threats were derived from areas impacted by past wildfires and forest pest outbreaks. High priority landscapes represent areas with important economic assets that have already been significantly damaged by past wildfires or forest pest outbreaks.

ANALYSIS: STAND IMPROVEMENT

- A clear opportunity exists to implement strategies for improving forest stands across California. The costs and benefits are variable, but competing for resources to implement stand improvement projects often benefits from both matching resources and economies of scale. Opportunities to tie projects to landscape plans are currently limited, especially across public/private boundaries. Examples of successful landowner aggregation are with existing watershed and Firesafe groups and CFIP projects that aggregate landowners with less than 20 acres.

2.1: Wildfire Threats to Ecosystem Health and Community Safety

CHAPTER OVERVIEW

California is a complex wildfire-prone and fire-adapted landscape. Natural wildfire has supported and is critical to maintaining the structure and function of California's ecosystems. As such, the ability to use wildfire, or to mimic its impact by other management techniques, is a critical management tool and policy issue. Simultaneously, wildfire poses a significant threat to life, public health, infrastructure and other property, and natural resources.

Data suggests a trend of increasing acres burned statewide, with particular increases in conifer vegetation types. This is supported in part by the fact that the three largest fire years since 1950 have all occurred this decade. Wildfire related impacts are likely to increase in the future based on trends in increased investment in fire protection, increased fire severity, fire costs and losses, and research indicating the influence of climate change on wildfire activity.

Developing coherent strategies involves collaborative planning, given the unique and disparate audience for dealing with the threat (i.e., numerous individual landowners). In terms of protecting communities, this is discussed in detail in chapter 3.3: Planning for and Reducing Wildfire Risks to Communities.

This chapter contains three unique spatial analyses that generate priority landscapes:

1) Preventing Wildfire Threats to Maintain Ecosystem Health
2) Restoring Wildfire-Impacted Areas to Maintain Ecosystem Health
3) Preventing Wildfire Threats for Community Safety

ANALYSIS: PREVENTING WILDFIRE THREATS TO MAINTAIN ECOSYSTEM HEALTH

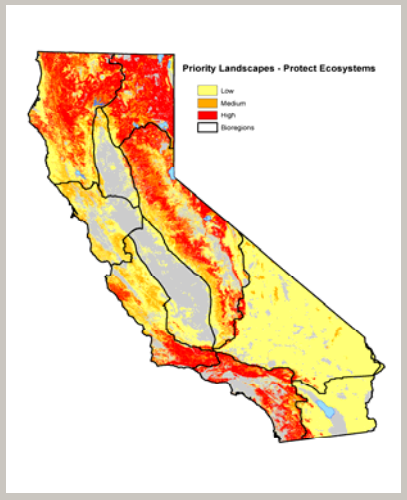
Key Findings

- Over 21 million acres statewide are viewed as high priority ecosystems for protection from threats from wildfires, with large concentrations in the South Coast, Sierra, and Modoc bioregions, and the northern interior portions of the Klamath/North Coast.
- Key ecosystems at risk include conifer types such as Klamath and Sierran Mixed Conifer and Douglas-fir; shrub systems at risk include Sagebrush, Mixed Chaparral, and Coastal Scrub.
- Managing these risks requires understanding the specific mechanisms of disruption of the natural fire regimes that once formed the ecological stability of the ecosystem, and determining actions that best mimic and or restore these natural processes in manners that are appropriate for different types of land ownership and management. As such, tools must be tailored to the specific ecosystem.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	10,980,000
BLM	1,980,000
DOD	130,000
Tribal	230,000
NPS	370,000
Other Fed	60,000
Other Gov	640,000
PRVT	6,890,000
NGO	50,000



This analysis identifies priority landscapes where unique ecosystems have high levels of threat of damage from future fires, and should be viewed as a basic assessment of need for strategies and adoption of tools to protect these key areas in the future.

ANALYSIS: RESTORING WILDFIRE-IMPACTED AREAS TO MAINTAN ECOSYSTEM HEALTH

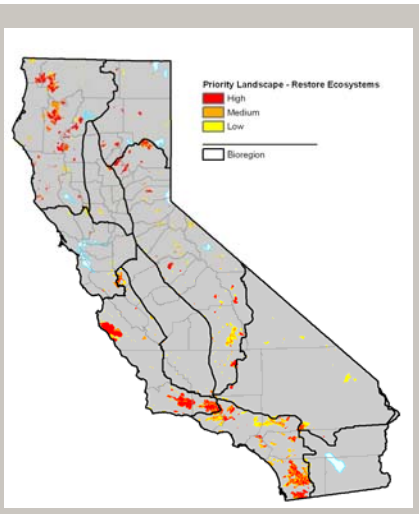
Key Findings

- A total of 2.35 million acres statewide considered high priority for restoration.
- In the northern portion of the state, high priority landscapes include the Klamath, Trinity, and Feather River water basins, and highlight the fire-restoration issue in conifer ecosystems adapted to a frequent, low-severity fire regime, but burning under a less-frequent, more severe modern era regime.
- A total of 445,000 acres in Douglas-fir, Klamath Mixed Conifer, and Sierran Mixed Conifer are high priority for restoration.
- In the southern portion of the state, a large area of Mixed Chaparral is in high priority status (over 700,000 acres) highlighting direct impacts on soils and watersheds due to fire's typical high intensity/high severity nature in this habitat type, as well as some areas suffering repeated burning and associated type-conversion.
- Similarly, the 200,000 acres of Coastal Scrub in high priority landscapes deserve special attention due to the loss of key ecosystem components, the apparent trend in increased fire frequency, increased non-native invasive dominance, and loss of ecosystems due to land use practices.
- Priority for restoration efforts reflect areas recently burned in wildfire, and will require more resources than have historically been available due to the large area burned in recent fires.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	1,440,000
BLM	120,000
DOD	20,000
Tribal	40,000
NPS	30,000
Other Fed	20,000
Other Gov	150,000
PRVT	530,000
NGO	10,000



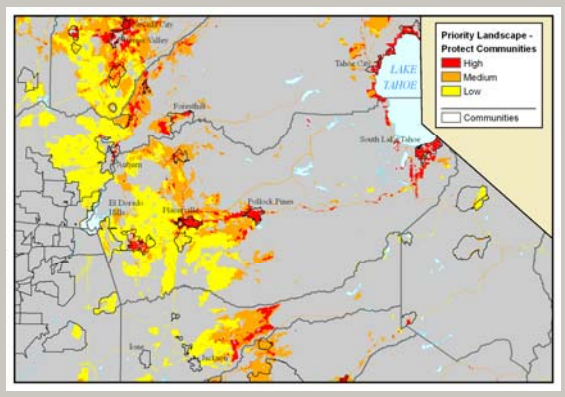
This analysis focuses on restoring fire damaged lands by prioritizing areas that have recently burned in wildfires, especially where a majority of entire ecosystems are impacted. The objective is to define areas in need of activities designed to facilitate recovery of key ecosystem components.

ANALYSIS: PREVENTING WILDFIRE THREATS FOR COMMUNITY SAFETY

Key Findings

- Community areas of high and medium priority are scattered throughout the state, occurring in at least modest (500 acres) abundance in 46 of 58 counties statewide.
- Areas of high priority landscape concentration occur in the South Coast and Sierra bioregions, and other isolated urban areas near significant wildfire high threat areas, such as the East Bay and Redding.
- The cities of San Diego and Los Angeles are by far the largest communities in terms of high priority landscapes. Urban populations of San Bernardino, Riverside, Orange and Ventura counties also have extensive high priority areas. Many of these densely populated areas require coordinated fuel management across significant amounts of adjacent areas to be effective.
- Many rural counties have significant numbers of communities and acreage in medium priority landscapes – a result of extensive low density housing areas in high threat landscapes. These are areas where individual homeowner vegetation management can make a large difference.
- A total of 404 communities meet a basic asset-area threshold for significance, and many more lands not captured within the community layer represent significant areas of risk from wildfires.

Priority Landscapes



Top Counties, Populations and High Priority Landscapes
(population in thousands)

Los Angeles	813	San Bernardino	120	Conta Costa	42
San Diego	432	Riverside	93	Nevada	39
Orange	235	El Dorado	67	Butte	38
Ventura	174	Alameda	65	Shasta	37

This analysis derives priority landscapes as the convergence of areas with high wildfire threat and human infrastructure assets. This is summarized using indicators for prioritizing communities in terms of investments to prevent likely wildfire events that would create the most severe public safety hazards.

Map depicts an example priority landscape for the western Sierra Nevada/Lake Tahoe region, where high wildfire threat converges with high infrastructure assets. Priority landscapes were derived for the entire state.

2.2: Forest Pests and other Threats to Ecosystem Health and Community Safety

CHAPTER OVERVIEW

The term forest pest, as used in the assessment, refers to both forest insects and diseases. In California, they cause widespread damage to forest economic values and ecosystem services. Bark beetles and wood boring insects have undergone periodic outbreaks nearly every decade, often related to several years of drought. For example, in 2003 Congress provided over $225 million over three years to address hazards from bark beetle killed trees in Southern California, allowing agencies to remove over 1.5 million dead trees to address a potential public safety hazard. Other examples of past widespread damage are numerous, including sudden oak death in the San Francisco Bay Area and the north coast, and bark beetles and wood borers in the south coast and Sierra. Areas of attack tend to be in stands under extreme stress due to root disease, other insect and disease impacts, drought, or overstocking.

While native forest pests are expected to continue to cause extensive problems, the ratio of exotic (non-native) pests to native pests has been increasing over time. Currently, up to one-third of the total number of significant pests are now non-native to California. These risks are increasing rapidly and additional resources that can work across all lands are needed. The potential for spread and impact of gypsy moths, light brown apple moths, the goldspotted oak borers and exotic bark beetles is a major concern for forest management agencies. Pitch canker disease, sudden oak death, white pine blister rust and Port-Orford-Cedar root disease are examples of exotic diseases of major concern.

In California, responsibility for the control of forest pest outbreaks often falls to the California Department of Forestry and Fire Protection (CAL FIRE) on state and privately owned lands and the U.S. Forest Service on federal lands. CAL FIRE, with the approval of the California Board of Forestry and Fire Protection (BOF) can declare a Zone of Infestation for native and exotic insect and disease pests. Within a Zone of Infestation CAL FIRE employees may go on private lands to attempt eradication or control in a manner approved by the BOF.

Forest management tools include the removal of dead, dying and diseased trees, thinning of small and medium live trees, replanting multiple species, and other techniques used to remove hazards and improve ecosystem health. Lack of mills in some areas and historically low wood prices have left many spot infestations untreated and growing rapidly.

This chapter includes four unique spatial analyses that identify priority areas where forest management practices are most likely to prevent and mitigate impacts;

1) Restoring Forest Pest Impacted Areas to Maintain Ecosystem Health
2) Restoring Forest Pest Impacted Communities for Public Safety
3) Preventing Forest Pest Outbreaks to Maintain Ecosystem Health
4) Preventing Forest Pest Outbreaks for Community Safety

Finally, other threats from invasive non-native plants and air pollution could not be analyzed spatially due to data limitations, and are discussed by narrative. Invasive non-native plants damage ecosystems in California by displacing native species, out-competing native plants, changing plant communities and structure, altering natural processes related to water and fire, and reducing wildlife habitat value. This chapter also addresses regional air pollution impacts that can adversely affect natural ecosystems and working landscapes in California.

ANALYSIS: RESTORING FOREST PEST IMPACTED AREAS TO MAINTAIN ECOSYSTEM HEALTH

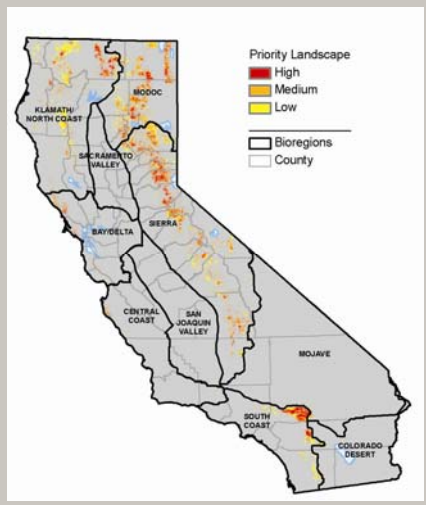
Key Findings

- There are over six million acres of priority landscapes that are impacted by forest pests in California, with 31 percent of these ranked high. Seventy-five percent of priority landscapes are on lands managed by the U.S. Forest Service (USFS), only 18 percent are on privately owned lands.
- Sierra Mixed Conifer (SMC), Eastside Pine (EPN), Red Fir (RFR) and White Fir (WFR) are the habitat types with the most priority acres.
- White Fir had the largest proportion of its habitat identified as a priority landscape (43 percent), and almost 240,000 acres (26 percent) designated as high priority. Twenty-eight percent of Red Fir was designated as high.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	1,430,000
BLM	10,000
DOD	0
Tribal	< 10,000
NPS	60,000
Other Fed	< 10,000
Other Gov	30,000
PRVT	340,000
NGO	10,000



This analysis identifies priority landscapes that represent forest pest impacted ecosystems where restoration activities are most needed.

ANALYSIS: RESTORING FOREST PEST IMPACTED COMMUNITIES FOR PUBLIC SAFETY

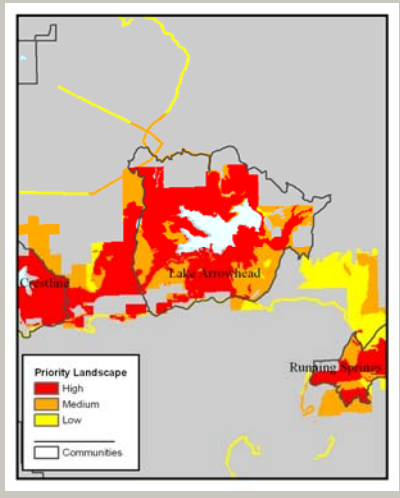
Key Findings

- Restoration priorities were identified in 13 communities with at least 20 percent of their area in priority landscapes. Eight of these are in the South Coast bioregion and are covered by state and county level declared emergencies. Four of the remaining five priority communities are in the Bay/Delta bioregion and are covered under a Zone of Infestation order, which has been declared by CAL FIRE to address sudden oak death.
- The South Coast, Bay/Delta and Sierra bioregions comprise 98 percent of high priority areas and 83 percent of priority landscapes. Bark beetles in the South Coast and Sierra bioregions and sudden oak death in the Bay Area are major issues; Zones of Infestation have been declared to address many of these concerns.
- San Bernardino, Sonoma, San Diego, Riverside and Placer Counties have over half of the priority landscapes. San Bernardino County alone has almost 60 percent of the highest priority acres.

Priority Landscapes

High Priority Landscape Acres by County

San Bernardino	17,709
Riverside	4,371
Sonoma	1,801
Marin	913
Nevada	720
Placer	624
San Mateo	546
San Diego	536
Tulare	472
Kern	328



This analysis identifies priority landscapes that represent areas of tree mortality coincident with human infrastructure such as houses, roads, and transmission lines where falling trees are a public safety issue, and restoration activities are most needed.

ANALYSIS: PREVENTING FOREST PEST OUTBREAKS TO MAINTAIN ECOSYSTEM HEALTH

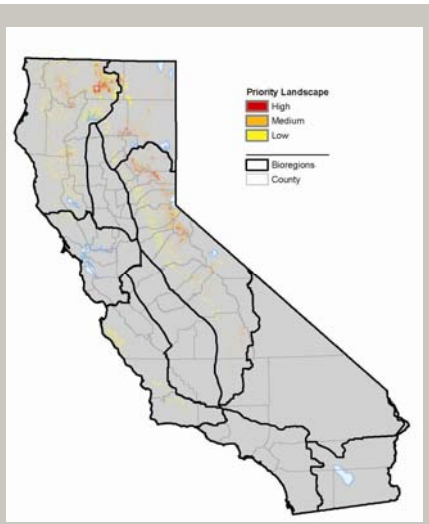
Key Findings

- The Klamath/North Coast (48 percent), Sierra (33 percent), and Modoc (13 percent) bioregions comprise almost 95 percent of priority landscape acres.
- Two-thirds of areas at risk are U.S. Forest Service lands, one-third are private.
- White Fir (30 percent), Red Fir (29 percent), and Lodgepole Pine (16 percent) are the habitat types most at risk (high plus moderate priorities) from future tree mortality. These results are partially supported by findings from the previous analysis, which identifies these types as having significant pest activity over the last 15 years.
- Montane Hardwood is the habitat with the most total priority landscape acres in the Klamath/North Coast Bioregion. Red Fir, Ponderosa Pine, and White Fir are the most at risk habitat types in the Sierra bioregion.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	310,000
BLM	< 10,000
DOD	0
Tribal	0
NPS	20,000
Other Fed	< 10,000
Other Gov	< 10,000
PRVT	70,000
NGO	< 10,000



This analysis identifies priority landscapes that represent ecosystems most at risk from damage from future outbreaks.

ANALYSIS: PREVENTING FOREST PEST OUTBREAKS FOR COMMUNITY SAFETY

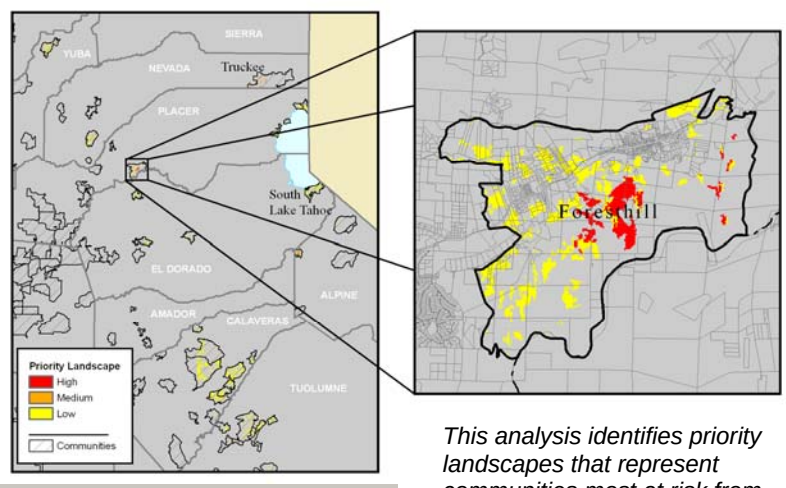
Key Findings

- Over 82,000 acres of community infrastructure are found to be at risk from future forest pest outbreaks.
- Magalia, South Lake Tahoe, Paradise and Truckee are the largest communities identified as priorities for forest pest prevention activities.

Priority Landscapes

High Priority Landscape Acres by County

Placer	300
Mono	200
Alpine	100
Plumas	100
Nevada	100
Humboldt	100
Tehema	100
El Dorado	< 100
Shasta	< 100
Siskiyou	< 100



This analysis identifies priority landscapes that represent communities most at risk from damage from future outbreaks.

3.1: Water Quality and Quantity Protection and Enhancement

CHAPTER OVERVIEW

Forested watersheds in California provide an abundant supply of clean water that supports a broad range of downstream uses. The major watersheds across California differ distinctly in climate, geology, ecosystems, and land use; each of which has an affect on the availability of water resources. This has resulted in different water resource conflicts and constraints that vary regionally across the state. To account for this tremendous variation, flexible water management tools and policies are needed. In addition, public education is needed to increase awareness of the role forests play in protecting critical water resource assets and the threats that exist to water resources in headwater regions.

Protecting and managing forests in source watersheds is an essential part of future strategies for providing a sustainable supply of clean water for a broad range of beneficial uses. Tools to address threats to water supply include: water conservation, restoration of riparian forests, restoration of mountain meadows, and protection of groundwater. Tools to address water quality concerns include: reduction of soil erosion through Best Management Practices for forest roads and timber harvesting, additional protection for riparian areas in salmonid watersheds, road maintenance and fuel reduction treatments designed to reduce high severity wildfires. Urban forests have also been shown to improve water quality by filtering stormwater runoff.

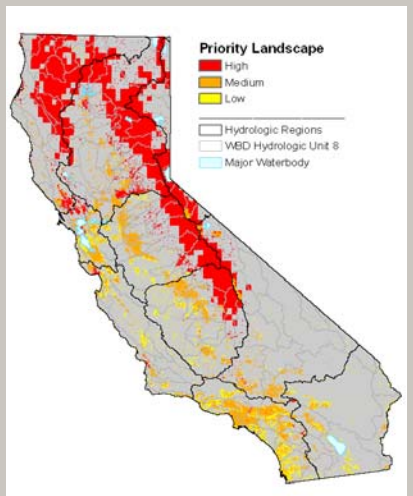
This chapter includes an analysis of threats to water supply and a second analysis that includes an evaluation of threats to water quality.

ANALYSIS: WATER SUPPLY

Key Findings

- High Priority Landscape (HPL) is concentrated in watersheds across the Sierra, Cascade, Klamath and Siskiyou Ranges.
- Projected decreases in snowpack from climate change are expected to affect the timing and distribution of runoff in watersheds throughout the Sierra Nevada.
- Restoration of mountain meadows offers an opportunity to improve the storage, groundwater recharge and the timing of runoff in Sierra Nevada upper elevation watersheds.
- The North Coast/Klamath bioregion also has substantial water supply assets, but little storage capacity. These watersheds are predominately rain fed; the water supply impacts from climate change will likely be less dramatic than in the Sierra Nevada. Impacts in the Klamath Mountains are expected to be between those in the Sierra Nevada and those in the Coast Ranges.
- Groundwater basins in the two Central Valley bioregions are an abundant resource heavily threatened due to over pumping.
- Watersheds in the South Coast bioregion mountain ranges contribute to local municipality water supplies which reduces dependence on imported water from northern portions of the state.

Priority Landscapes



High Priority Landscape Acres by Ownership

USFS	10,563,902
BLM	510,189
DOD	2,354
Tribal	59,719
NPS	1,617,618
Other Fed	15,983
Other Gov	148,109
PRVT	5,277,503
NGO	6,951

The high priority landscape (HPL) identifies locations where high value water supply coincides with high threats and thus represents areas where stewardship projects are most needed.

ANALYSIS: WATER QUALITY

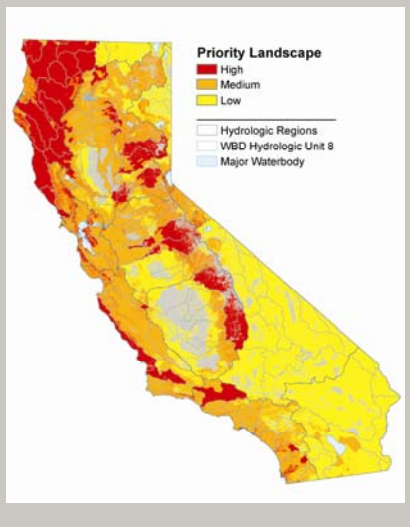
Key Findings

- Water quality impairments from forest and rangelands are most pronounced in watersheds in the North Coast/Klamath bioregion. These watersheds are critical for recovery of state and federally listed anadromous salmonids.
- The watersheds in the Sierra Nevada Mountains include a mix of medium and high priority landscape. The Lake Tahoe basin has the highest priority for the watersheds in this region.
- The watersheds of the Central Coast and South Coast bioregions are mostly ranked as medium priorities. Forest health (see Forest Pests Chapter 2.2) and fire management (see Wildfire threats Chapter 2.1) greatly influence water quality conditions in these watersheds.

Priority Landscapes

High Priority Landscape Acres by Ownership

USFS	8,840,000
BLM	1,200,000
DOD	<10,000
Tribal	40,000
NPS	1,700,000
Other Fed	400,000
Other Gov	380,000
PRVT	53,330,000
NGO	10,000



The analysis presented identifies locations where high value water assets in watersheds supporting a broad range of beneficial uses coincide with high risks that threaten water quality. For this analysis the threat of water quality in watersheds was assumed to increase with the number of water quality stressors that are present.

3.2: Urban Forestry for Energy Conservation and Air Quality

CHAPTER OVERVIEW

The California urban forest is concentrated in metropolitan areas and encompasses about five percent (7944 square miles, or approximately 5 million acres) of land and supports 94 percent of the population. Urban areas are the most populated areas in the state as defined by the U.S. Census.

Many private companies, non-profit organizations and governmental programs have worked hard to sustain and improve California's urban forest. This strong network of organizations provides many public benefits by improving the urban forest and by increasing public awareness of the importance of urban forests.

Urban forests provide recreation, pollution reduction, carbon storage, heat island mitigation, storm water control, noise reduction, wildlife habitat, energy conservation and increased property values. Benefits vary with tree size and location and increase in hotter climates and as urban population grows. In addition, urban forestry adds jobs and economic value to the California economy.

Many daily activities, such as driving, mowing lawns, dry-cleaning clothes and natural occurrences such as wind blown dust and fires pollute the air. California has some of the most polluted areas in the nation. Urban forests help filter out air pollutants by depositing pollutants in the canopy, sequestration of CO_2 in woody biomass and reduce air temperatures. The value of these benefits is considerable across the state, and maximum results achieved when the efforts and benefits are focused in highly populated areas.

Population growth and hotter summers have increased the need for electricity in California. Energy shortages and urban heat potential increase with urban development which adds impervious surfaces such as asphalt, concrete and roofs to urban areas. Urban trees reduce summer air temperatures by absorbing water through their roots and evaporating it through their leaves in a process called evapotranspiration and by providing shade. Urban trees can help conserve energy by providing shade in hot summer months.

This chapter includes two analyses:

1) Urban Tree Planting: identifies priority areas where tree planting can provide the greatest benefit to urban populations in terms of mitigating air pollution and urban heat islands.

2) Urban Tree Maintenance: identifies priority areas where maintaining existing tree canopy can provide the greatest benefit to urban populations in terms of mitigating air pollution and conserving energy.

ANALYSIS: URBAN FORESTRY TREE PLANTING

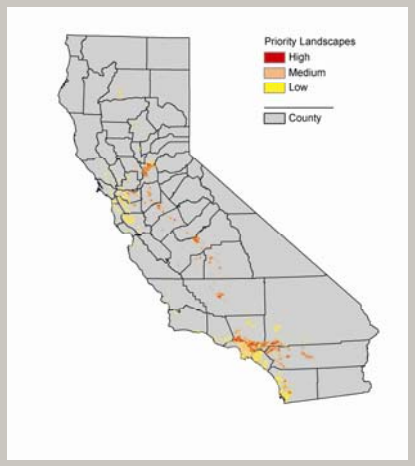
Key Findings

- Close to 800,000 densely populated urban acres or 15.1 percent of the state's urban area has been identified with high threat for air pollution and urban heat islands.
- Close to 28 percent of the state's population (9.5 million people) live in high threat areas for air quality and urban heat.
- 372 communities have been identified as high priority planting areas.

Priority Landscapes

Percent County Population in High Priority Landscape

Stanislaus	74.2
Fresno	73.9
Sacramento	73.7
Riverside	72.1
Merced	67.2
Tulare	65.0
Kings	65.0
Kern	64.1
San Joaquin	62.2
San Bernardino	56.7



This analysis identifies densely populated areas with considerable air pollution and urban heat islands. Planting efforts can reduce the amount of energy consumption due to cooling needs and filter air pollutants.

ANALYSIS: URBAN FORESTRY MAINTENANCE

Key Findings

- Close to 217,000 urban acres, about 4.3 percent of the state's urban area, has been identified as densely populated areas with substantial existing tree canopy assets.
- Activities and projects to maintain and protect overall tree canopy would benefit the close to two million people living in these areas.
- A community may be identified as a priority landscape in both maintenance and planting because results are calculated at about 10,000 square feet or approximately one-quarter acre, but reported at a community level.

Priority Landscapes

Percent County Population in High Priority Landscape

Sacramento	30.7
Butte	26.2
Yolo	25.9
San Joaquin	21.9
El Dorado	16.6
Sutter	15.9
Imperial	14.1
Placer	13.5
Shasta	12.0
Conta Costa	11.8

This analysis identifies areas in California that are densely populated with people and trees, with many days over 90° and exceeding air pollution standards. Protecting the existing tree canopy in these areas provides public benefit.

3.3: Planning for and Reducing Wildfire Risks to Communities

CHAPTER OVERVIEW

This chapter looks at the current status of collaborative, community-based wildfire planning and the extent of available planning resources relevant to community wildfire safety and protection.

In California, community involvement in wildfire planning is extensive, as evidenced, for example, by community wildfire protection plans (CWPP, as defined under the Healthy Forests Restoration Act of 2003), local and regional Fire Safe Councils, Resource Conservation Districts and community participation in the federal Firewise Communities/USA program. State laws requiring 'defensible space' around structures, building codes, and other responsibilities are aimed at helping communities reduce their risk of loss when wildfire strikes. Federal programs, such as the National Fire Plan, also help with funding for fire hazard reduction.

This chapter contains a single analysis that identifies priority communities where wildfire threat coincides with human infrastructure such as houses, transmission lines and major roads. These priority communities are then summarized in terms of the presence of a CWPP, and Firewise Communities/USA recognition. The availability of community planning resources is also examined.

ANALYSIS: COMMUNITY WILDFIRE PLANNING

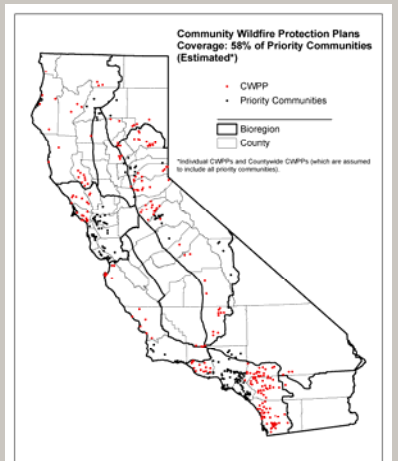
Key Findings

- It is estimated there are at least 317 communities protected by Community Wildfire Protection Plans throughout the state. Even more are covered by a countywide CWPP.
- A total of 404 priority communities were identified, representing about 2.6 million people living on about 1.1 million acres in high or medium priority landscapes. With the assumption that all priority communities in a county or countywide CWPP are covered by that CWPP, at least 234 (or about 58 percent) of the priority communities are covered by a Community Wildfire Protection Plan.
- About 250 Fire Safe Councils or their equivalent were identified (which included homeowner associations, resource and fire protection districts, local government organizations, advisory groups, CAL FIRE units, Indian Tribes and others). Of these, 47 are countywide in geographic scope. Others are community-centric or regional. There are 38 recognized Firewise Communities. These numbers are growing.
- Priority communities were present in all bioregions, with 62 percent occurring in the South Coast and Sierra bioregions.

Priority Landscapes

Priority Communities by Bioregion

S. Coast	168
Sierra	83
Bay/Delta	67
KLM/N.Coast	28
Central Coast	24
Sacto Valley	12
Modoc	9
Mojave	9
S.Joaquin Valley	3
Colorado Desert	1
Total	404



The analysis in Wildfire Threats to Ecosystem Health and Community Safety identifies priority communities at risk from wildfire. In this chapter, an analysis examines which of these priority communities have CWPPs, or are Firewise Communities and several other criteria that can suggest the presence of community planning resources and experience.

3.4: Emerging Markets for Forest and Rangeland Products and Services

CHAPTER OVERVIEW

Emerging markets for renewable energy, ecosystem services and niche products are impacting how forest and rangelands are managed. Developing appropriate policies will require a better understanding of the benefits and environmental impacts of these emerging markets and how society values the various market and non-market products and services provided by forests and rangelands.

California Renewables Portfolio Standards (RPS), established by SB 1078 (2002) and accelerated under SB 107 (2006) and Executive Order S-14-08 (2008), creates a target of 33 percent of electricity from renewable energy sources by 2020. Reaching this target will require a significant expansion of energy facilities and related infrastructure on forest and rangelands. In the Mojave and Colorado Desert bioregions the number and size of proposed solar and wind power generation sites has engendered controversy over potential impacts to wildlife habitat.

Biomass energy provides a financial incentive for treating areas for risk reduction or restoration related to wildfire and forest pests. Biomass energy from forestlands provides about one percent of California's electricity use, while having the potential to provide nearly eight times this amount. Biomass also has unutilized potential for heating homes, businesses and schools, and for conversion to liquid transportation fuels. Questions of long-term biomass supply, as well as possible ecological and other impacts of biomass removal on forest sustainability, are key issues in California. The California Energy Commission, working through the California Biomass Collaborative and various stakeholders, has produced a comprehensive strategy for sustainable development of biomass in the state.

California's forests and rangelands provide a variety of ecosystem services, for which landowners are generally not compensated. In many cases, market mechanisms for exchange of values from ecosystem services in California are still limited. Despite this, substantial investments have been made that support ecosystem services. Typically, these investments involve protecting areas that provide unique or high levels of desired services, or restoring areas impacted by past events. These investments come through a variety of programs, agencies and stakeholders. Augmenting this with emerging market-based solutions could enhance the ability to sustain these important services into the future. One example of an emerging market for an ecosystem service, carbon sequestration, is discussed in detail.

Finally, there is a substantial potential for niche markets to stimulate rural economies, for example through certified products, micro-biomass, or landowner collaboratives to produce and market timber using small scale or portable milling technologies.

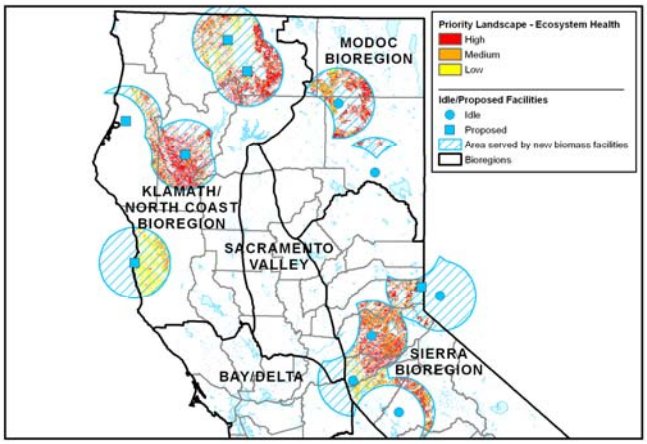
This chapter includes two unique spatial analyses, which explore the potential for treating priority landscapes for risk reduction and restoration related to wildfire and forest pests from previous chapters, if six idle and six proposed biomass facilities are made operational. The first analysis is for ecosystem health, the second for community safety.

ANALYSIS: BIOMASS ENERGY - ECOSYSTEM HEALTH

Key Findings

- Currently, only 22 percent of high priority landscapes are within 25 miles of an operational biomass facility. Adding 12 facilities would increase this number to 39 percent, and primarily benefit the Klamath/North Coast, Modoc and Sierra bioregions.
- Even with the additional facilities, 61 percent of high priority landscapes are not within the 25 mile distance. Since 57 percent of these high priority landscapes are on U.S. Forest Service lands, coordination across agency boundaries will critical.

Priority Landscapes



This analysis determines the benefits of making six idle and six proposed facilities operational, in terms of facilitating fuel reduction or restoration projects for treating priority landscapes for ecosystem health from the wildfire and forest pests analyses in previous chapters.

Key Findings

This analysis determines the benefits of making six idle and six proposed facilities operational, in terms of treating priority communities from the wildfire and forest pests community safety analyses in previous chapters.

- Currently, only 14 of the 66 priority communities are within 25 miles of an operational biomass facility. Adding the new facilities would reach 11 additional priority communities. Of the remaining 41 priority communities, 31 are in the South Coast bioregion.
- Developing a biomass industry in the South Coast bioregion that addresses the significant wildfire and forest pest threats will be challenging, since there are large acreages in shrub species that are difficult to utilize as biomass, and much of the forestland is in public ownership.

CARBON HIGHLIGHTS

Carbon sequestration is an emerging market that actually quantifies and helps pay for an ecosystem service. This section discusses how terrestrial carbon sequestration is considered in policy and at the project level, the role of carbon in compliance markets, the economics of carbon and the opportunities in California for forest and rangeland carbon.

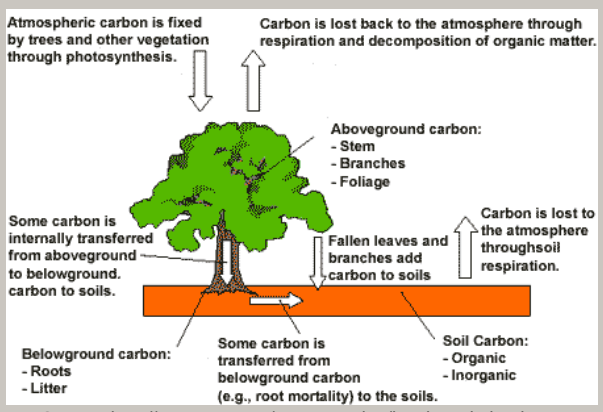
There are two kinds of carbon markets, voluntary and compliance. Voluntary carbon markets are generally unregulated by government, with transactions usually occurring directly between the buyer and seller. Specific systems, protocols and registries exist for the voluntary market. Compliance markets occur under regulatory schemes, usually cap-and-trade, where offsets are sold to emitters.

Carbon credits will be in demand for both the voluntary and compliance markets. Protocols are in place for many project types. The price of carbon, however, is generally low relative to the value for high quality timber products.

Key Findings

- Carbon sequestration is an ecosystem service for which markets are emerging. As part of these markets, the value of the service is quantified, prices determined and dollars generated for "carbon credits." Markets are arising for both voluntary exchange between parties (voluntary markets) and in response to the need to reduce carbon impacts as part of regulatory requirements (compliance markets).
- Demand for forest and rangeland-related carbon in such markets or other venues appears to be very significant.
- Carbon credit supply is constrained by economics, risk and other factors. It is estimated that only 1 to two million tonnes a year will be available to the compliance market from California forests, which is only 10-25 percent of demand.

Carbon Cycle



Source: http://www.epa.gov/sequestration/local_scale.html

- "Protocols" have already been developed for both forest and range-related carbon. The development of additional project type protocols for forests and rangelands could promote activities with ecological and economic co-benefits and increase the supply of carbon credits.
- California has large acreages of forest stands that with additional investment could provide larger future benefits in terms of forest products, jobs, and carbon storage and sequestration. Opportunities also exist on rangeland, but the markets and necessary technologies to capture carbon are not sufficiently developed to quantify these opportunities.

3.5: Plant, Wildlife, and Fish Habitat Protection, Conservation and Enhancement

CHAPTER OVERVIEW

A wide variety of climates, geology, fire and ecological processes combine to make California a hotspot of plant, animal and ecosystem diversity. But for the past decades there has been a trend towards increasing numbers of both animal and plant taxa listed under federal and state laws as threatened or endangered. Native fish species, though well-adapted to natural disturbance regimes, are also generally in decline in the face of human-related changes across many watersheds.

The California Wildlife Action Plan (CWAP), the guiding document on state wildlife conservation issues and strategies, presented at least 20 different threats to plant, wildlife and fish populations and their habitats. Four occur statewide: growth and development, water management conflicts, invasive species and climate change. Others occurring in multiple regions include pollution and urban/agricultural runoff, excessive livestock grazing, altered fire regimes (due to fire suppression and wildland-urban interface expansion), recreational pressure/ human disturbance, and other land management conflicts.

Numerous efforts in California are working towards identifying, preserving and protecting important wildlife, plant, and fish habitat. Tools for addressing wildlife habitat needs include the purchase of land and conservation easements, development planning, zoning, habitat mitigation banking, and habitat restoration, and polices, regulations and funding mechanisms that support these efforts.

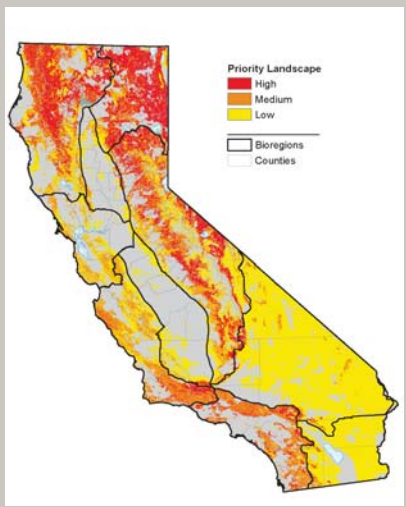
This chapter has a single spatial analysis which ranks the threat to areas of important wildlife habitat from uncharacteristic and potentially catastrophic wildfire.

ANALYSIS: WILDFIRE THREAT TO AREAS PROTECTED FOR HABITAT

Key Findings

- Based upon an analysis of wildfire threat to areas that are protected or included in a recent study on corridors, over 14 percent of the state was determined to be in high priority landscapes and over 12 percent in medium priority landscapes.
- The medium and high priority landscapes are concentrated mostly in the Sierra, Klamath/North Coast, Modoc and Central Coast bioregions. Lands managed by federal agencies dominate the priority landscapes.
- At least 45 percent of California's 62 native fish species are considered by the California Department of Fish and Game (DFG) as those of greatest conservation need, and there are 28 fish taxa listed as state or federally threatened or endangered.
- Black bear, pronghorn antelope, bighorn sheep, deer and elk populations are generally stable, but are now at much lower numbers than in the pre-European settlement era.

Priority Landscapes



High Priority Landscape Acres by Ownership

USFS	11,526,000
BLM	2,693,000
DOD	280,000
Tribal	355,000
NPS	995,000
Other Fed	110,000
Other Gov	1,203,000
PRVT	6,946,000
NGO	127,000

For this analysis the fire threat layer was used to estimate the potential for fire impacts on protected habitat.

3.6: Green Infrastructure for Connecting People to the Natural Environment

CHAPTER OVERVIEW

For the purposes of this Assessment, green infrastructure refers to all public and private forest and rangeland landscapes which provide economic, social, cultural, and environmental services such as recreation, open space, watersheds, wildlife habitat, viewsheds, and working landscapes for commodity production. This definition ignores the vital importance of smaller urban parks, bikeways, and greenbelts – areas that are not mapped statewide. In addition, although agricultural lands provide open space and other values, they are also not included in this discussion.

Current trends identified in this chapter include:

- Given decreasing budgets, agencies are struggling with how to meet public demand for diverse, safe, high-quality recreation opportunities. Ongoing fiscal challenges have already resulted in instances of reduced hours of park operation, and deferred maintenance.
- Activities such as off-highway vehicle (OHV) recreation, mountain biking, boating, and adventure recreation have increased dramatically in recent years, while at the same time population growth, urbanization and alternative energy production compete for suitable lands. To meet these demands and minimize associated impacts, it is critical that opportunities are provided to the public in a responsibly managed environment, where it is possible to efficiently apply Best Management Practices, law enforcement and education efforts, monitoring of impacts, and restoration efforts.
- Effective regional and local efforts to protect and manage green infrastructure are found throughout California. These efforts are typically cross-jurisdictional, involve stakeholders, and address multiple issues such as recreation, water, wildlife habitat and economic development.
- Public involvement in supporting green infrastructure is critical in terms of advocacy, participation in the decision-making process, and involvement in local stewardship and program activities.

Tools for protecting green infrastructure from development include acquisition, easements, establishing reserves and various state and local zoning policies. Tools for managing green infrastructure for protection from wildfire and forest pests include control burning, thinning overstocked stands, biomass projects to reduce fuel loads, and various other stand improvement projects.

California's statewide outdoor recreation strategy is formulated through a combination of:

- the California Outdoor Recreation Plan (CORP), published every five years by the California Department of Parks and Recreation, which identifies various issues and needs of statewide importance;
- the Recreation Policy, developed by the State Park and Recreation Commission, which outlines the state's strategies, priorities, and actions based on issues and needs identified in the CORP; and
- the California Department of Parks and Recreation’s Off-Highway Motor Vehicle Recreation Division legislatively mandated Strategic Plan which provides guidance for motorized recreation in the eight State Vehicular Recreation Areas (SVRAs).

This chapter includes two analyses:

1) Conserving green infrastructure: this analysis identifies unprotected (buildable) green infrastructure that serves local communities that is at risk from near-term development.

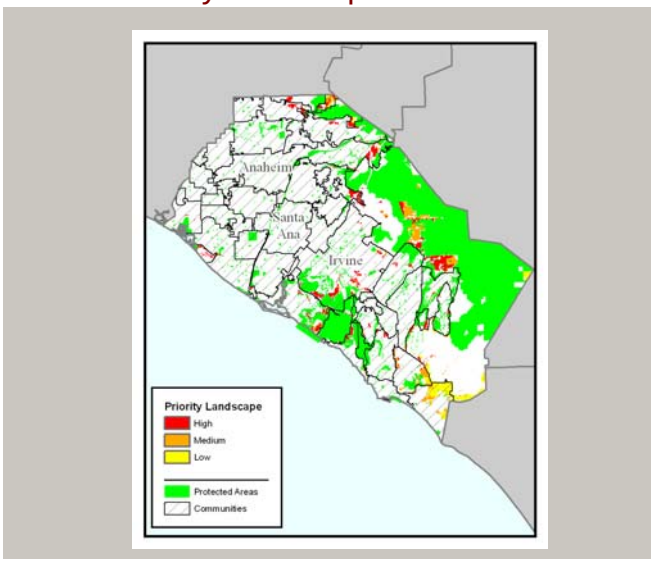
2) Managing green infrastructure: this analysis identifies important recreation areas and other green infrastructure that serves local communities that is at risk from wildfire and forest pests.

ANALYSIS: CONSERVING GREEN INFRASTRUCTURE

Key Findings

- The South Coast bioregion has by far the most high priority landscape acres since green infrastructure there serves large populations and faces high development pressures.
- In the Sacramento Valley and San Joaquin Valley bioregions, high development pressure is eliminating options for protecting remaining green infrastructure that serves local communities.
- In the Sierra bioregion, development is an emerging issue, and is mostly in the foothills.
- Counties in the Bay/Delta bioregion have achieved a significant level of green infrastructure protection despite the absence of large federal landholdings, by adopting a wide range of complementary public-private strategies and programs.

Priority Landscapes



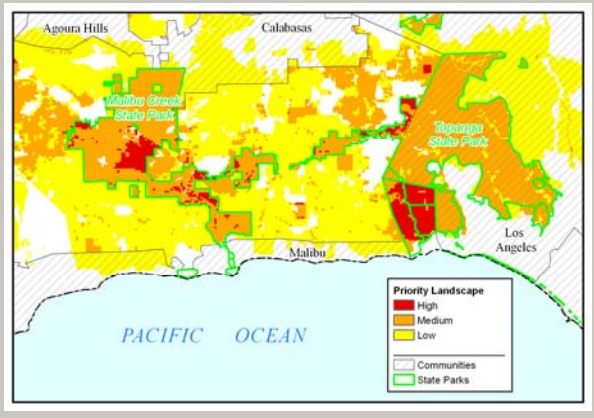
This analysis identifies priority landscapes which emphasize green infrastructure that serves larger communities and faces significant development threat. Map shows an example priority landscape for Orange County.

ANALYSIS: MANAGING GREEN INFRASTRUCTURE

Key Findings

- The densely populated and high wildfire threat South Coast bioregion has by far the most high priority landscapes.
- Bioregions such as the Bay/Delta, Sierra and Central Coast have large acreages of medium priority landscapes, which are typically high value areas at a medium threat, or medium value areas at a high threat.
- Although the threat from exotic invasive species has not been adequately mapped and ranked, they do pose a real threat in all bioregions. Similarly, the future impact from climate change cannot be analyzed given current knowledge and data, but will likely pose major challenges.

Priority Landscapes



This analysis identifies priority landscapes that emphasize green infrastructure that serves larger communities or has recreation value, and faces significant threat from wildfire or forest pests. Map shows an example priority landscape for the Santa Monica Mountains above Malibu.

3.7: Climate Change: Threats and Opportunities

CHAPTER OVERVIEW

Climate can greatly influence the dynamics of forest and range ecosystems, and result in changes to the type, mix and productivity of species. While forests and rangelands can be used to sequester carbon and offset greenhouse gas emissions, these same ecosystems may also become vulnerable to changes in climate. For example, under a warmer and drier climate water availability may be more limited with earlier snowmelt and declining snowpack; severity of drought may become more pronounced and the frequency of wildfires may increase.

While future climate scenarios differ in the expected changes to California's climate, there is general agreement that increases in both temperature and carbon dioxide are likely to result in significant changes in the composition of forests and rangelands throughout the state. In some cases, environmental effects from climate change have already been observed in California forest and rangelands. The effects from climate change are likely to include shifts in species ranges, changes in snowpack, changes in the frequency of wildfire and pest disturbance and forest productivity changes.

California's forest and rangelands can play an important role to mitigate the risk of global warming. In forestry this can include both actions that lead to additional carbon sequestration, as well as actions that reduce emissions associated with wildfires, land use conversions and other forms of disturbance. The California Department of Forestry and Fire Protection (CAL FIRE) has identified five strategies to mitigate against greenhouse gas (GHG) emissions: reforestation, forestland conservation, fuels reduction, urban forestry and forest management to improve carbon sequestration. In addition, strategies are being developed to address adaptation needs. The goal of adaptation planning is to reduce vulnerability and to increase the resiliency of forest and rangeland ecosystems to climate changes.

This chapter includes three analyses. To support the first two analyses existing vegetation data and projections from a vegetation dynamics model (MC1) were used to estimate changes in forest carbon stocks over key time periods: 2010, 2020, 2050 and 2100. The three analyses included are:

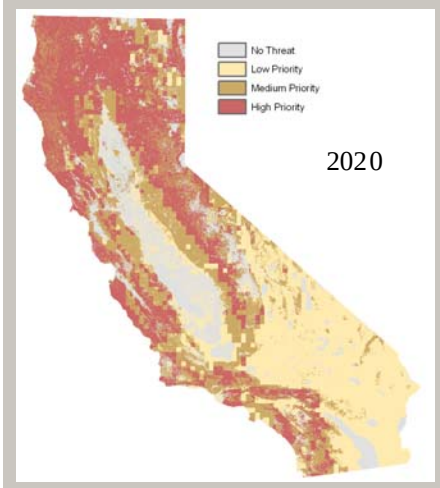
1) Evaluate threats to forest carbon from wildfire, insects and disease.
2) Evaluate potential threats to forest carbon from development.
3) Evaluate potential shifts in species ranges from future climate scenarios –using the computer software BIOMOVE.

ANALYSIS: THREATS TO FOREST CARBON FROM WILDFIRE, INSECTS, AND DISEASE

Key Findings

- The evaluation of carbon stocks from the baseline conditions for 2020 showed limited gains or losses in priority areas compared to 2010. The priority areas remain relatively stable across all bioregions through 2050 and then declining substantially through 2100.
- Belowground carbon pools showed less variation than aboveground carbon pools; however, due to the relatively limited information on belowground carbon, additional research is needed.
- The expected loss of carbon sequestration from wildfire, insects and disease was much more extensive than loss from development.

Priority Landscapes



High Priority Landscape Acres by Ownership

USFS	12,240,000
BLM	1,350,000
DOD	240,000
Tribal	310,000
NPS	800,000
Other Fed	70,000
Other Gov	1,120,000
PRVT	13,390,000
NGO	100,000

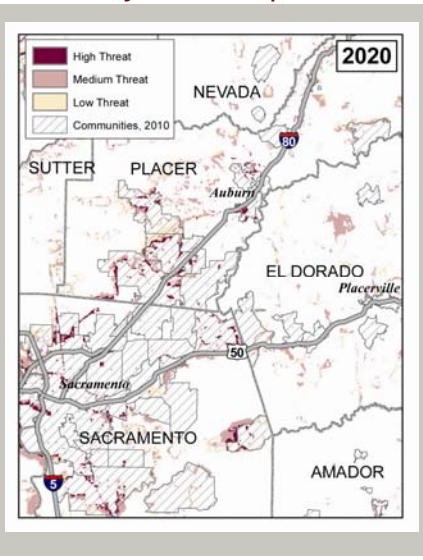
This analysis identifies landscapes for forest carbon assets that coincide with threats from wildfire, insects, and disease. The analysis resulted in priority landscapes for 2020, 2050, and 2100. The priority landscape for 2020 is shown as an example.

ANALYSIS: THREATS TO FOREST CARBON FROM DEVELOPMENT

Key Findings

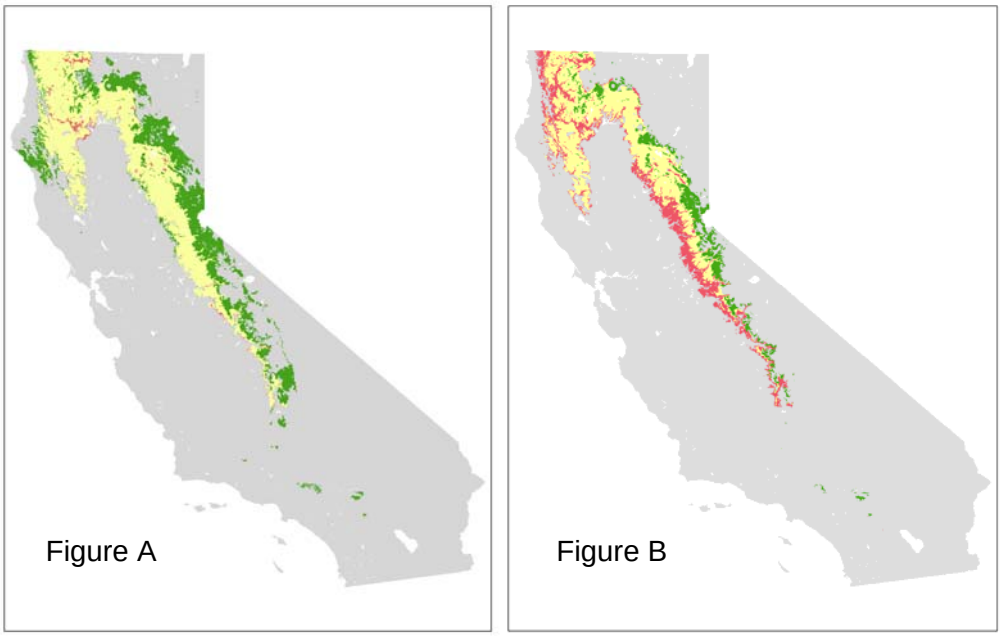
- Threats to the loss of terrestrial carbon (forest and range) from development were greatest in Bay Area, South Coast and Sacramento Valley bioregions. The current amount of moderate and high priority landscape is two to three percent in 2010 and expands to ten to fourteen percent by 2100.
- For all other bioregions the amount of high priority landscape was less than five percent of the total land area in the bioregion.
- Threats from development cover a smaller area than threats from wildfire or forest pests, but the impact to forest carbon may be greater.

Priority Landscapes



This analysis identifies priority landscapes for forest carbon assets that coincide with threats from development. The analysis resulted in priority landscapes for 2020, 2050, and 2100. The priority landscape for 2020 is shown as an example.

ANALYSIS: VEGETATION RESPONSE – BIOMOVE



Predicted shift in species range for Sugar Pine. Figure (A) shows an expanding range that is influenced by the warmer and wetter conditions predicted under the Community Climate Model (CCM). Figure (B) predicts a contraction in species range that is influenced by the hotter and drier conditions forecasted by the Hadley climate model. Areas in green show an expansion in range, while areas in red show a reduction in range, and areas in yellow are considered stable.

Key Findings

- The results show a mixed response among tree species, with some species showing an expansion in range and some species contracting in range by 2080.
- The two climate models used to estimate future conditions were reasonably consistent in predicting the shift in a species range. For several of the indicator species both Global Climate Models (GCM) predicted gains or losses in range that were within 10 percent of each other. Although, for one species (Sequoiadendron Giganteum) the estimated extent of a gain in species range varied by 58 percent between the two climate models.
- Many tree species showed a shift toward higher elevations and towards northern latitudes.

FORESTS AND RANGELANDS RESOURCE STRATEGIES

The 2010 State Forest Resource Assessment identified key forest-related issues and priority landscapes. The Strategy Report, in this next section, outlines strategies for addressing these priority issues and areas in the long-term (5+ years). The State Strategy Report is intended as an “overarching” document to guide forestry activities.

The Strategy Report has individual strategies for each topic covered in the Assessment. Both documents were built around the three national themes identified by the U.S. Forest Service:

1. Conserve Working Forest and Range Landscapes
    - 1.1 Population Growth and Development Impacts
    - 1.2 Sustainable Working Forests and Rangelands

2. Protect Forests and Rangelands from Harm
    - 2.1 Wildfire Threat to Ecosystem Health and Community Safety
    - 2.2 Forest Pests and Other Threats to Ecosystem Health and Community Safety

3. Enhance Public Benefits from Trees, Forests and Rangelands
    - 3.1 Water Quality and Quantity Protection and Enhancement
    - 3.2 Urban Forestry for Energy Conservation and Air Quality
    - 3.3 Planning for and Reducing Wildfire Risks to Communities
    - 3.4 Emerging Markets for Forest and Rangeland Products and Services
    - 3.5 Plant, Wildlife and Fish Habitat Protection, Conservation and Enhancement
    - 3.6 Green Infrastructure for Connecting People to the Natural Environment
    - 3.7 Climate Change: Threats and Opportunities

Strategy Report 1.1:
Population Growth and Development Impacts

In many parts of the United States, forests and other open space are being fragmented and converted to non-forested uses including development. Forestry agencies can work with partners, stakeholders and communities to identify and protect priority forest landscapes through land acquisition, conservation easements, and land use policies. Forestry agencies can also provide technical assistance to communities to help them strategically plan for and conserve forests and other open space. Factors contributing to loss include residential, commercial and industrial development; expansion of utility infrastructure and transportation networks; and planning, zoning, and policies that favor conversion. Consequences include the outright loss of public benefits associated with forests or the marginalization of those values provided by contiguous forested landscapes. Fragmentation also includes "parcelization," or the fracturing of large singular ownerships into numerous smaller ones. Assessments and strategies should attempt to identify, protect and connect ecologically important forest landscapes, and open space, thus maintaining a green infrastructure, particularly around and within areas of, population growth and development (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: Conserve, protect and connect ecosystems most threatened by development.

National Goal Supported: Conserving Working Forest Lands

Montreal Process/BOF Policy Goals Supported:
MPC-3: Maintenance of Forest Ecosystem Health and Vitality

State Assessment Theme:
Threats to priority ecosystems from development due to population increase.

Defined Landscape Areas

Priority Landscape(s):
Ecosystems threatened from Population Growth and Development Impacts

Priority Areas:
South Coast, Bay/Delta and Sierra bioregions.

Strategies Overview

Purpose of Strategies

Areas of high value ecosystems threatened by development require programs and measures to identify, conserve and protect them from significant damage or degradation. Intact and fully functional ecosystems provide a wide array of benefits to society, both commercial and non-commercial. These include direct benefits to aesthetic enjoyment and recreation provided by parks and open space, as well as more indirect benefits such as habitat for wildlife, areas for flood control and groundwater

recharge, and other ecosystem services. Chapter 1.1 of the assessment focused on an analysis of areas where ecosystems are threatened from development driven mainly by California's increasing population. In areas such as the South Coast bioregion, the continued development of certain ecosystems is directly threatening plant and animal species with extinction. Identifying commonalities and main issues facing these potentially threatened ecosystems can help frame strategies to minimize and mitigate damaging effects of projected development. Such strategies should speak most directly to the conservation of the threatened high priority landscapes through means such as easements, purchase, land use planning, ordinances and others.

Statement of Need

As a very desirable place to live, California has historically faced tremendous development pressures from a rapidly expanding population. Expansion of residential, commercial and industrial development, as well as transportation and energy infrastructures, consumes tens of thousands of acres each year. Many of the newly developed acres previously had functional ecosystems.

Typically, the areas most vulnerable to large-scale development have been those in close proximity to major urban and suburban settings. Natural ecosystems in those areas, particularly those occupying valley bottoms, rolling hills and other flat or gentle terrain, have been the most commonly threatened. Also threatened are other assets provided by these ecosystems, such as scenic backdrops for many California cities.

Cross-Cutting Issues

Mitigating the effects of development on priority ecosystems relates to several other themes and issues presented in the assessment document. The most important are listed below:

- Wildfire Threat–ignition sources are often a major factor limiting the frequency of large wildfires. Development, with the activities of people accessing new areas, increases the risk of ignitions and possibly the threat of wildfire.
- Forest Pests and Other Threats to Ecosystem Health–New development can be primary points of entry into new areas for exotic plant pests. Predation on native species of domestic pets can adversely affect animal populations in formerly intact ecosystems.
- Water Quantity and Quality–Wetland ecosystem conservation in urban or ex-urban areas can help water quality through practices that mitigate flooding occurrence and damage by providing areas for stream overflow containment. These ecosystems also help recharge vital groundwater in more semi-rural areas that rely on wells for their water supply.
- Urban Forestry for Energy Conservation and Air Quality–Ecosystems most threatened by development are often in close proximity to existing urban or suburban areas. By conserving these ecosystems they can help provide the same air quality improvement and temperature-lowering benefits that occur with augmenting urban forestry.

- Plant, Wildlife and Fish Habitat Protection, Conservation and Enhancement– Conservation of high value ecosystems threatened by development benefits the local wildlife and fish in the watershed.
- Green Infrastructure for Connecting People to the Natural Environment– Ecosystems under threat of development most often occur in close proximity to areas already developed. Conservation of these areas would also provide opportunities to augment the green infrastructure in nearby and neighboring communities.

Existing Supporting Plans and Programs

A number of non-regulatory organizations, both public and private, are involved in influencing future development. Some operate more locally, while others are at regional, statewide or even national scales. Coalitions of groups, some including both public and private, have formed to help direct future development in specific regions.

California does not have an official strategic planning or vision document focused primarily on guiding the location of future development at a statewide scale. As a result a coordinated planning effort taking into account conserving threatened ecosystems across large scales is also lacking at the state level.

Codes, ordinances, programs, organizations and initiatives that have bearing on strategies for land use planning, ecosystem conservation and future development include (main types with some examples):

Public:

- City ordinances
- Special districts (e.g. regional parks and recreation departments and open space districts)
- County General Plans, Local Area Formation Commissions (LAFCs) and Regional Transportation Planning Agencies (RTPAs)
- Metropolitan Planning Organization (MPO) Plans
- State bond initiatives (e.g. Prop 50, Prop 84) have established funding for measures to help conserve important lands and remove the possibility of future development.
- CAL FIRE's Forest Legacy Program allocates monies annually for the purchase of land or conservation easements in areas of high-value ecosystems.
- The Strategic Growth Council coordinates state agencies with six main objectives, one of which is to "protect natural resource and agricultural lands."

Private:

- National and regional land trusts such as The Nature Conservancy, Pacific Forest Trust, Conservation Fund, etc.
- Other non-governmental organizations (NGOs), including the Planning and Conservation League, Sierra Club, Audubon Society, Greenbelt Alliance and many more

Coalitions of Private and Public:
- Smart Growth Initiative (40 member organizations)
- North Sierra Partnership (5 member organizations)
- Bay Area Open Space Council (100+ organizations)

Governmental programs, laws, regulations and codes influencing future development:
- USFS Scenery Management System
- Forest Legacy Program
- Forest Tax Reform Act
- Williamson Act
- Natural Communities Conservation Planning (NCCP) Act
- Conservation and Mitigation Banking (DFG)
- Oak Woodlands Conservation Act
- California Environmental Quality Act (CEQA)
- National Environmental Protection Act (NEPA)
- Clean Water Act
- Clean Air Act
- Select California State Bond Issues (e.g. Prop 50, Prop 84)

Current Constraints

Real estate prices are still very high in California, particularly in areas with ecosystems most likely to be threatened with development. Program funding for the purchase of land and easements is a limiting factor. High value, highly threatened ecosystems need to be better defined spatially and targeted for conservation (similar to the analysis in the assessment).

Key Stakeholders and Partners
- Members of California Association of Councils of Government (CALCOG), municipal governments, special districts, county governments, metropolitan planning organizations (MPOs), other state and local governing bodies
- Private land developers, contractors
- Conservation-oriented Non-Government Organizations
- State of California natural resource agencies and departments
- U.S. government natural resource agencies

Strategies and Supporting Actions

Strategy: 1.1.1. Reduce urban sprawl by promoting redevelopment and infilling of available land within the urban matrix, strengthening planning at the local level, capacity building, and improving access to tools and data sources.

Action A – Provide financial and other incentives for locating new development into areas already developed (redevelopment), or infilling those areas already developed.

Action B – Develop bond measures to provide funding for Action A.

Action C – Support the implementation of incentive-based SB 375 (Redesigning Communities to Reduce Greenhouse Gases (Steinberg) through curbing sprawl.

Action D – Continue support of SB 732 Strategic Growth Council (Steinberg) to coordinate actions towards improving the availability of affordable housing, improving transportation, encouraging sustainable land use planning, implementing urban greening plans and revitalizing urban and community centers in a sustainable manner.

Action E – Amend CEQA to streamline and facilitate timely environmental review requirements for infill development projects that are a part of approved regional plans.

Action F – In the process of meeting regional housing needs allocation (RHNA) code, update county general plans consistent with promoting and prioritizing redevelopment and infilling, also with emphasis on higher density housing.

Action G – Future development in priority landscapes should be located and designed to minimize and mitigate impacts.

Strategy: 1.1.2. Aid in efforts to reduce development sprawl in rural communities.

Action A – Support actions and incentives to curb the damaging impacts of sprawl into forested areas and other sensitive natural areas. Coordinate with other state agencies and non governmental organizations to develop regulatory guidance and incentives for local governments located in rural areas to plan development in a sustainable manner to curb sprawl impacts on forest and range landscapes.

Action B – Support the implementation of incentive-based SB 375 Redesigning Communities to Reduce Greenhouse Gases (Steinberg), the Strategic Growth Council, and other similar efforts at statewide and regional sustainability planning. Consider ecosystem priority landscapes from this study and others in the development project approval process.

Strategy: 1.1.3. Support comprehensive planning at state and regional scales that is coordinated with wildlife habitat conservation efforts.

Action A – Continue support of SB 732 Strategic Growth Council (Steinberg) to coordinate actions towards improving air and water quality, natural resource protection and meet California Global Warming Solutions Act of 2006 goals.

Action B – Continue to support Natural Community Conservation Planning (NCCP) and Habitat Conservation Plans (HCPs) and their efforts to encourage

cooperation between stakeholders to conserve natural communities at the ecosystem level while accommodating compatible land use.

Action C – Encourage involvement in the Oak Woodlands Conservation Program pursuant of the Oak Woodlands Conservation Act (2001) that offers landowners, conservation organizations and regional governments' incentives to preserve oak woodlands.

Action D – Support other similar efforts at statewide and regional sustainability planning. Consider ecosystem priority landscapes from this study and others in the development project approval process.

Action E – Obtain Funds to map important areas for wildlife habitat connectivity in and around urban areas.

Strategy: 1.1.4. Support local and regional community efforts in preserving scenic landscapes.

Action A – Help local governing bodies wanting to apply to CALTRANS for scenic highway designations, especially in making eligible scenic highways become officially designated as such. Aid efforts to develop the five legislatively required elements including the prerequisite Corridor Protection Programs. http://www.dot.ca.gov/hq/LandArch/scenic_highways/scenic_hwy.htm

Action B - More generally support efforts to encourage and help counties in their general plan development to implement zoning and other restrictions to help maintain and enhance their current or planned scenic corridors.

Action C - Support communities applying for grant monies to the Federal Highway Administration of the Department of Transportation for National Scenic Byways Program to preserve/improve scenic byways. http://www.scenic.org/byways

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Area of high priority lands put under new conservation easements, purchased or otherwise protected from development.
- Percent of threatened ecosystem in conserved status.
- Local area of new "infilling" and redevelopment.
- Number of general plans in Priority Areas that include provisions for increased redevelopment, infill, open space, and habitat/ecosystem connectivity.

Strategy: 1.1.1. Reduce urban sprawl by promoting redevelopment and infilling of available land within the urban matrix, strengthening planning at the local level, capacity building, and improving access to tools and data sources.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Reduce urban sprawl by promoting redevelopment and infilling of available land within the urban matrix, strengthening planning at the local level, capacity building, and improving access to tools and data sources	South Coast, Bay/Delta, Sierra	Wildlife habitat; Green infrastructure; Climate change	Williamson Act; NCCP Act; Oak Woodlands Conservation Act; Smart Growth	Local, state and federal agencies; parks and open space districts, Land trusts, open space advocacy NGOs; developers	Zoning ordinances, Bond initiatives	Percentage of new development infilling & redevelopment	3.5; 3.6; 3.7

Strategy: 1.1.2. Aid in efforts to reduce development sprawl in rural communities.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Aid in efforts to reduce development sprawl in rural communities	Throughout state	Wildlife and fish habitat; Green infrastructure	Unknown	California Dept. of Fish and Game; Office of Planning and Research; regional planning agencies; Sierra Nevada Alliance; Sierra Business Council; et al.	State and federal programs; Bond initiatives	Acres of high value habitat conserved	3.5; 3.6

Strategy: 1.1.3. Support comprehensive planning at state and regional scales that is coordinated with wildlife habitat conservation efforts.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support comprehensive planning at state and regional scales that is coordinated with wildlife habitat conservation efforts	Mainly central and southern coastal California	Wildlife and fish habitat; Green infrastructure	Forest Legacy Program; Areas of Conservation Emphasis (DFG 2010)	California Dept. of Fish and Game; National Fish & Wildlife Foundation; The Nature Conservancy; CALFIRE	State and federal programs; Bond initiatives	Acres of high value habitat conserved	3.5; 3.6

Strategy: 1.1.4. Support local and regional community efforts in preserving scenic landscapes.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support local and regional communities efforts in preserving scenic landscapes	Dispersed throughout the state	Urban forestry; Green infrastructure	Scenery Management System (USFS)	USFS, CAL FIRE	State and federal programs; Bond initiatives; land trust easements	Acres of high value scenic landscapes conserved	3.2; 3.6

Strategy Report 1.2:
Sustainable Working Forests and Rangelands

Forestry agencies and partners can provide landowner assistance and incentives to help keep working forests working. Providing forestry assistance to landowners can improve the economics of, and encourage sustainable forest management. In urban and suburban areas, forest agencies can assist communities to develop sustainable forest management and green infrastructure programs. Assessments and strategies can identify viable and high potential working forest landscape where landowner assistance programs, such as Forest Stewardship can be targeted to yield the most benefit in terms of economic opportunities and ecosystem services. Assessment and strategies can also identify opportunities for multi-landowner, landscape scale planning and landowner aggregation for access to emerging ecosystem service markets (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of this section are to promote the long-term economic and ecological sustainability of forest and range lands. This is done by addressing the factors that most influence the ability to keep these landscapes "working", which is recognized to counter conversion and short-term exploitative practices.

National Goal Supported: Conserve Working Landscapes

Montreal Protocol/BOF Policy Goal Supported:
MPC-2: Maintenance of productive capacity of forest ecosystems/Productive Capacity
MPC-5: Maintenance of forest contribution to global carbon cycles/Forests and Climate
MPC-6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies/Socio-economic Well Being
MPC-7: Legal, institutional, and economic framework for forest conservation and sustainable management/Governance
BOF - Criteria 2: Productive Capacity
BOF – Criteria 6: Socio-Economic Well Being
BOF – Criteria 7: Governance

State Assessment Theme: Sustainable Working Forests and Rangelands

Defined Landscape Areas

Priority Landscape(s):
Primary – Risk reduction on forestlands; risk reduction on rangelands; and restoration of timberlands.
Secondary – Biomass potential and ecosystem health; biomass potential and community safety.

Priority Areas:

- Addressing risk reduction on forestlands, high priority landscapes with significant timber or biomass energy assets at risk from wildfire or insects and disease were found primarily in the Klamath/North Coast, Modoc and Sierra bioregions.
- High priority landscapes with rangeland productivity at risk from wildfire were found primarily in the Bay/Delta, Central Coast, Sierra and South Coast bioregions. Bioregions with smaller acreages of high priority landscapes or extensive areas of medium priority included the Klamath/North Coast, Modoc and Sacramento Valley bioregions.
- Regarding restoration, extensive areas of high and medium priority landscapes representing areas with significant timber or biomass energy assets that have already been damaged by past wildfires or insect/disease outbreaks were found in the Klamath/North Coast, Modoc and Sierra bioregions. Bioregions with smaller acreages of these priority areas include the South Coast and Bay/Delta bioregions.

Strategies Overview

Purpose of Strategies

The concept of “working landscapes” was developed to encompass the idea that lands used for commodity production also produce crucial ecosystem goods and services, and that future demands make it essential that these systems are managed for joint production of ecosystem services and food and fiber (Huntsinger and Sayre, 2007). The sustainability of working landscapes was addressed in the assessment by examining factors associated with sustainability, the condition of the forests and rangelands, their associated economic sectors, current and developing policy and assistance to landowners and communities.

Strategies to address the sustainability of working landscapes must encompass policy in the form of incentives and regulation, as well as factors on the landscape and in the economy. A complex array of social, economic, political and biological variables interact to determine trends in viable working forests and ranches. While specific data on vegetation, economics or demographics may be available, uncertainties in how factors combine to influence individual decisions needs more study. Targeting appropriate policy efficiently requires understanding how and why decisions are made.

Statement of Need

Significant reductions have recently been occurring in sawmills, processing facilities, loggers, livestock, and associated supporting infrastructure. Entire areas of California lose resource management options when activity falls below critical levels locally. Product demand is often not reduced concomitant with supply, which increases imports and reduces environmental impact controls.

There is a need to maintain and improve the capacity of the wood products and range industries statewide.

A strong incentives policy would complement the stringent regulatory environment found in California. Existing programs are underfunded and in some fiscal years not funded at all. Rather than focus on the benefits of new programs, a strategy to identify new funding sources for existing beneficial programs is considered.

Cross-Cutting Issues

Priority landscapes identified areas of risk reduction on forestlands; risk reduction on rangelands; and restoration of timberlands. However there are a number of cross-cutting issues that include:

- Climate Change – Strategies to address underperforming stands and carbon sequestration are addressed in the climate change section. While the focus there is on improving carbon stocks and sequestration, timber and wildlife habitat may also be improved by the same practices.
- Plant, Wildlife and Fish Habitat Protection – The plant, wildlife and fish habitat strategy is highly correlated with preserving working landscapes.
- Wildfire and Forest Pests Prevention and Restoration – Improving the resilience of forest and range lands to high-impact disturbance from fires and pests will have direct effects to landowners in avoiding investment losses.
- Emerging markets – Provide potential revenue streams to support working landscapes and reduce the costs of protective treatments.

Since strategies targeting treatment types on landscapes are more specifically addressed in other strategies, this strategy will focus on policy, regulatory and market issues. This includes increasing incentives for forest and range landowners to maintain working landscapes.

Existing Supporting Plans and Programs

- Forest Practice Act and Regulations: CEQA functional equivalent that evaluates the environmental impacts of projects on the ground and long-term sustainability; produces higher costs relative to jurisdictions outside California.
- Federal Laws, Regulations and Plans: Guides management on public forest and range lands; also covers certain wildlife and fish species management on private lands.
- Williamson Act and Timberland Production Zone (TPZ) Tax Programs: Promotes long-term stewardship and reduces costs for landowners.
- Existing programs identified in the pest and other strategy sections including federal and state landowner assistance programs, university extension and local or regional organizations.

Current Constraints

Some factors are beyond the control of this strategy such as labor or material costs of some operations; efficiencies realized in mill consolidations and retooling; and some consumer preferences. Reducing costs from regulations often results in modified regulations so constrained that they are not practical to use. California, as a state, is not authorized to regulate interstate commerce.

Key Stakeholders and Partners

Forest and range landowners and industry, consumers, environmental and other NGOs, RPFs, LTOs, associated professions, local and tribal governments, U.S. Forest Service, BLM.

Strategies and Supporting Actions

Strategy:1 2.1. Maintain and improve the capacity of the wood products and range industries statewide.

Action A – Research to identify and quantify current and long-term key drivers, barriers and opportunities, for both the forest products and range industry in California including both supply and demand sides.

Action B – Rigorously evaluate the full costs and benefits of new legislation and regulation to avoid unreasonable additional costs to landowners and producers. In particular, the environmental and economic effects of shifting supply outside California should be quantified.

Action C – Act on the most promising results from the research in Action A. Potential examples include demand-side actions such as green building standards recognition of California regulations, improvements in the development and marketing of unique product lines such as high-quality redwood lumber or grass-fed locally grown beef and lamb, and retail-level recognition of product sources. Supply-side examples might include cost reduction measures related to regulation, landowner cooperatives for reliably supplying logs/lumber or livestock, development of ecosystem services markets to increase revenues or portable mill rental and training for areas without sawmill access.

Action D – Fund existing programs such as the Williamson Act.

Action E – Implement strategies B – F, H - J from Board of Forestry and Fire Protection Policy Statement that addresses productive capacity (Criteria 2, Productive Capacity).

E-1. Support proper management to protect and enhance the multiple values of California’s urban and community forests and forests in the wildland/urban interface.

E-2. Maintain tax-related zoning, encourage county governments to support timber production through Timber Production Zoning.

E-3. Support livestock and other range-based enterprises by preserve [sic] high quality rangeland through the Williamson Act or other local zoning.

E-4. Focus part of local general plans and related project design on integration and protection of productive areas.

E-5. Increase use of easements and land banks.

E-6. Improve range management techniques to enhance range productivity.

E-7. Encourage forest landowners to manage their forests in a manner that ensures long-term wood volume growth in California equals or exceeds rates of timber harvest and mortality across all ownerships.

E-8. Support for continued assessments and research on the capability of California's forests to produce timber, non-wood forest products, recreation, water, fish and wildlife habitat, and other forest values.

Action F - Implement strategies A – D, K - AA from Board of Forestry and Fire Protection Policy Statement that addresses policy options for rising consumption and statewide limitations on California commodity output, incentives for private production of ecosystem services, maintaining large landholdings in resource industries and weak economies in local communities (Criteria 6, Socio-Economic Well Being).

F-1. Develop an economic strategy that builds on comparative advantages of California industries vis a vis local and international economies.

F-2. Promote more aggressive tax policies to favor development of innovative forest and rangeland technologies to meet production and conservation goals.

F-3. Foster development of markets for new products and services, certification of wood and livestock products, and market mechanisms for carbon sequestration.

F-4. Broaden remuneration methods to landowners for non-commodity products that complement commodity production.

F-5. By policy, recognize the overall role of private landowners in producing ecosystem services.

F-6. Focus on long-term plans and conservation easement conditions that clarify land tenure questions and are approved as alternatives under Forest Practice Rules that reduce compliance costs to landowners.

F-7. Examine use of systems of environmental management that depends on certified, insured and guaranteed operations rather than a permit with civil enforcement.

F-8. Develop watershed approaches to permits and restoration activities that reward landowners for attaining socially desired future conditions.

F-9. Refine trading and credit system for habitat provision, pollution reduction, and carbon sequestration.

F-10. Recognize the continued importance of large scale unfragmented ownerships in the working landscape that are dependent on resource based activities.

F-11. Develop analysis of profitability limits at the industry levels and examine if state policies can be improved to assure both private and public benefits of large unfragmented holdings.

F-12. Maintain tax policies that encourage retention of land ownerships in parcels that are economic to manage.

F-13. Identify where new regulatory approaches are possible such as the use of environmental certification or long-range plans.

F-14. Track the levels of management that will be permitted on federal lands and how they relate to overall resource supplies and protection strategies.

F-15. Strengthen monitoring and adaptive management approaches for individual parcels as well as larger landscapes.

F-16. Develop strategies to limit litigation costs by focusing on topics of common agreement such as exotics, pests, fuel reduction, and restoration activities.

F-17. At the state level, promote diversification and strengthening of these communities and local economies.

F-18. Foster community capacity to build restoration and other grants into support for local forest products, range, recreation, and ecosystem service industries.

F-19. Continue to leverage existing local watershed groups and Fire Safe Councils.

F-20. At the state level, develop additional supports to biomass industry.

F-21. Identify, make available, and guarantee fuel supplies from some sections of public lands.

Action G - Implement strategies A – L from Board of Forestry and Fire Protection Policy Statement that addresses policy options for levels of regulatory oversight and policy integration as well as conflicts over forest and rangeland management practices (Criteria 7, Governance).

G-1. Conduct an analysis of the impact of overlapping mandates and review processes to create an efficient structure.

G-2. Connect policies for investment in energy and carbon sequestration to landowner incentives.

G-3. Strengthen ability to use long term plans and forest certification to meet environmental protection objective.

G-4. Examine use of system of environmental management that depends on certified, insured and guaranteed operations rather than a permit with civil enforcement.

G-5. Provide an annual reporting system on rule effectiveness as a means of providing necessary feedback.

G-6. Focus on achieving agreement on desired landscape goals and then address potential practices and conflicts.

G-7. Evaluate performance based rules structures to replace existing prescriptive standards as a means to encourage innovative approaches to resource management.

G-8. Learn from experiences of The Nature Conservancy, other non-profits, and regional parks on how to explain management needs.

G-9. Review role of environmental certification in providing for broader acceptance of management tools.

G-10. Provide for public input into decision making and monitoring.

G-11. Strengthen skills of resource professionals regarding public involvement and values.

G-12. Continue strong support for focused management practices, such as fuel reduction and control of exotics and pests.

Strategy:1.2.2. Increase the capacity to provide incentives to forest and range landowners.

Action A – Research the costs and benefits to California landowners of a carbon tax on building materials including wood products. This analysis would have to be in the context of any cap and trade program, but should incorporate externalities not captured by other measures. An accurate system would likely benefit California grown products relative to other types of building materials and imported wood products.

Action B – Research the costs and benefits to California landowners of a tax/fee on building materials, including wood products.

Action C – Consider a ballot initiative that funds landowner investments in long-term stewardship from bonds.

Action D – Use proceeds from federal, regional or state cap and trade auction sales to invest in carbon storage improvements.

Action E – Develop carbon protocols for avoided wildfire emissions and biomass utilization that will make fuel reduction activities for restoring forest health eligible for offsets or other carbon-related funding.

Action F – Work with other resource protection agencies to incorporate working landscapes into their habitat protection grant programs, e.g., DFG's Forest Conservation Program (Prop 84).

Action G – Explore draft recommendations from the Range Management Advisory Committee (RMAC) to inventory state owned range lands and develop a coordinated strategic plan that utilizes public-private partnerships to reduce maintenance costs to the state while providing income opportunities to local ranchers.

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Jobs and economic activity associated with the forest and range industries.
- Conversion and subdivision rates and acreage.
- Commodity production measures such as board feet and livestock tallies.
- Periodic research to monitor trends and priorities in forest and range industry opportunities and barriers.

Strategy Matrix

Strategy: 1.2.1. Maintain and improve the capacity of the wood products and range industries statewide.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Maintain and improve the capacity of the wood products and range industries statewide.	Statewide; forest and range lands	Conversion, fire and pest hazard reduction; wildlife and fish habitat; biomass, timber and food production	Federal and state law, regulation and policy; zoning and tax laws; landowner assistance programs, extension, local and regional groups.	Forest and range landowners and industry, consumers, environmental and other NGOs, RPFs, LTOs, associated professions, local and tribal governments, USDA Forest Service, USDI BLM, USDA NRCS.	University research capacity; CAL FIRE staff, Board of Forestry & Fire Protection; grant and other program funding	Jobs and economic activity; conversion rates and acres; production measures	1.1, 1.2, 2.1, 2.2, 3.3, 3.4, 3.5, 3.7

Strategy: 1.2.2. Increase the capacity to provide incentives to forest and range landowners.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Increase the capacity to provide incentives to forest and range landowners.	Statewide; forest and range lands	Conversion, fire and pest hazard reduction; wildlife and fish habitat; biomass, timber and food production	Landowner assistance programs: CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP, APIS, PHPPS, PDCP, BPS, FCP	Forest and range landowners and industry, consumers, environmental and other NGOs, RPFs, LTOs, associated professions, local and tribal governments, USDA Forest Service, USDI BLM, USDA NRCS, ARB, CAR, DFG, WCB, Sierra Nevada Conservancy.	University and agency staff.	Jobs and economic activity; conversion rates and acres; production measures	1.1, 1.2, 2.1, 2.2, 3.3, 3.4, 3.5, 3.7

Strategy Report 2.1:
Wildfire Threats to Ecosystem Health and Community Safety

The strategic management of wildfires is crucial to the health of our nation's forests, the safety of our citizens and the contributions of forests to our economy. Assessments should identify areas where management can significantly reduce the risk of catastrophic wildfire while enhancing multiple associated forest values and services.

Many forest ecosystems are dependent on fire for their health and sustainability. Decades of fire suppression and a changing climate have disrupted natural fire regimes, resulting in fuel buildup, loss of biological diversity, changed species composition, and loss of some fire-dependent species. Assessments should identify areas where these effects of fire exclusion can feasibly be mitigated or countered through sound management, particularly where there are opportunities for federal, state and community partnerships. Resource strategies should identify appropriate treatment strategies for priority landscapes, including the use of fire as a management tool (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of this strategy are to prevent damaging wildfires, protect life and property and restore wildfire impacted areas to maintain ecosystem health, ecosystem services and public safety. This strategy also addresses goals identified at the national and state level, as noted below.

National Goal Supported: Protect Forests from Harm

Montreal Protocol / BoF Policy Goal Supported:
MPC-3: Forest Health
Board of Forestry and Fire Protection goal supported: Protect, maintain, and enhance the health of California's forest and rangeland ecosystems within the context of natural disturbance and active management.

State Assessment Theme: Wildfire Threats to Ecosystem Health and Community Safety

Defined Landscape Areas

Priority Landscape(s):
Wildfire Threats to Maintain Ecosystem Health
Wildfire Impacted Areas in Need of Restoration to Maintain Ecosystem Health
Wildfire Threats for Community Safety

Priority Areas:

Prevention

Statewide, there are 21.3 million acres of High Priority Landscape (HPL), highlighting ecosystem risk, with large concentrations in the South Coast, Sierra, and Modoc Bioregions (FRAP 2010 Assessment). Key ecosystems at risk include conifer types such as Klamath and Sierran Mixed Conifer and Douglas-fir; shrub systems at risk are highlighted by Interior Sagebrush, Coastal Scrub, and mixed chaparral types, particularly in Southern California.

Restore Wildfire Impacted Areas

Statewide, a total of 2.35 million acres are high priority for restoration after fire, statewide (FRAP 2010 Assessment). Douglas-fir, Klamath Mixed Conifer, and Sierran Mixed Conifer are high priority for post fire restoration in Northern California. In Southern California, coastal scrub and mixed chaparral deserve special attention due to loss of key ecosystem components, and the apparent trend in increased fire frequency, increased exotic invasive dominance, and loss of ecosystems due to land use practices.

Protect Life and Property

Communities with threshold levels of abundance (minimum 500 acres) of high and moderate priority lands are scattered throughout the state, occurring in 46 of 58 counties (FRAP 2010 Assessment). Areas of HPL concentration occur in the South Coast and Sierra Bioregions, and other isolated urban areas near significant wildland high threat areas, such as the East Bay and Redding. San Diego and Los Angeles are by far the largest communities in terms of High Priority Landscape acres and affected population.

Strategies Overview

Purpose of Strategies

High fuel loads, increases in fire-season length, climate change and the growing extent and intensity of wildfires, along with increased population adjacent to forests and rangelands all magnify the risk of wildfire to people and resources. This threat requires continuing focus on the vegetation management of forest and rangelands. The tools necessary to manage these areas are becoming more costly and difficult to utilize due to competing regulations, conflicting values within the Wildland Urban Interface (WUI), and the lack of necessary infrastructure for cost effective treatment (Theobold 2007).

Statement of Need

California's combination of vegetation, climate, topography and development patterns creates a recipe for large and damaging fires. Its forest and range land vegetation, which is varied across the state, grows in a Mediterranean climate with cool, moist winters and hot, dry summers. This already fire-prone environment is being further impacted by climate change, growing population, and forest and range land conversions (CA Fire Plan, Draft 2010). Many

California ecosystems depend on a particular fire regime for long-term resilience. Disruption of these natural cycles often has significant ecological ramifications regarding vegetation stability and ecosystem health (Theobold 2007).

Managing fire risks requires understanding the specific mechanisms that have disrupted the natural fire regimes that once formed the ecological stability of the ecosystem. Strategies that mimic or restore natural processes in ecosystems are needed to prevent damaging fires and must be tailored to the specific ecosystem. Consequently, strategies related to fire damage go beyond simply full fire avoidance, but rather managing for the right type of fire, in terms of frequency and severity.

The effect of population growth in the WUI results in more complex and expensive emergency response efforts. Conversion for new housing continues on rangelands and forests near metropolitan areas and in the wildland urban interface (Theobold 2007). Where once only natural resources were threatened by wildland fire in these areas, threats now extend to life and property. The delivery of wildland fire protection services in California relies on an integrated, multi-agency effort to maximize the use of firefighting resources.

To protect life and property, strategies are needed that create homes and communities that can withstand wildfires; develop policies and procedures to promote public and firefighter safety; and educate the public that wildland fire is a natural part of California's landscape. Pre-fire activities such as clearing a defensible space, planting and maintaining fire safe landscaping, utilizing prescribed fire, creating fuel breaks and managing forests effectively, are proven methods of reducing wildfire damage and protecting lives in wildland urban interface areas.

Strategies that reduce the occurrence of catastrophic wildfires or reduce losses of life, property and natural resources to wildfires can be achieved through the implementation of effective and efficient programs for fire prevention, fire protection planning and suppression, financial management and public safety.

<u>Cross-cutting Issues</u>
Forest management activities used as strategies to reduce the occurrence and severity of wildfire or reduce impacts to natural resources, life and property address other key issues identified by the California statewide assessment.

- Forest Pest Threats – Forest management activities that prevent the introduction and spread of exotic forest pests and invasive plant species by the removal of dead, dying and diseased trees and thinning operations, which also reduce hazardous fuel loads.
- Climate Change – Activities that reduce the incidence and severity of wildfires yield additional climate benefits by protecting existing carbon stocks and producing more resilient forest stands.

- Water Quality/Supply – Activities that reduce the incidence and severity of wildfires lead to more resilient forests, resulting in better water quality and supply.
- Emerging Markets – Forest management activities that reduce the incidence and severity of fires provide feedstock for emerging biomass facilities and help protect existing biomass resources. Other potential program links (e.g. *CalRecycle*) to deal with organic wastes.

Existing Supporting Plans and Programs

State Plans and Programs:

Fire Prevention (Includes pre-fire hazard mitigation strategies)

- CA Fire Plan: Strategic Fire Plan forms the basis for assessing California's complex and dynamic natural and man-made environment; and identifies a variety of actions to minimize the negative effects of wildland fire.
- OSFM - The mission of the State Fire Marshal is to protect life and property through the development and application of fire prevention engineering, education and enforcement.
- CA Unit Fire Plans - Fire Plans outline the fire situation within each CAL FIRE Unit. Planning incorporates concepts of the National Fire Plan, the California Fire Plan and individual CAL FIRE Unit Fire Plans, as well as Community Wildfire Protection Plans (CWPPs).
- Wildland Fire Prevention Engineering - Fire Engineering takes into account the best design, construction, and engineering practices for planning fire safe communities and homes. Engineering principles also apply in the safe use of industrial and recreational equipment. The Fire Engineering staff recommends and interprets laws and regulations covering wildland fire safety and assist homeowners, landowners, decision-makers, and local government planners in building and rebuilding fire safety into California communities.
- Law Enforcement - CAL FIRE's 300 plus peace officers are busy year round investigating fire causes, interviewing witnesses, issuing citations and setting up surveillance operations. Additionally, law enforcement staff provides assistance when requested by local fire and law enforcement agencies in arson, bomb, fireworks, and fire extinguisher investigations, as well as disposal of explosives.
- Wildland Urban Interface Building Code Standards - The broad objective of the Wildland-Urban Interface Fire Area Building Standards is to establish minimum standards for materials and material assemblies and provide a reasonable level of exterior wildfire exposure protection for buildings in Wildland-Urban Interface Fire Areas. The use of ignition resistant materials and design to resist the intrusion of flame or burning embers projected by a vegetation fire (wildfire exposure) will prove to be the most prudent effort California has made

to try and mitigate the losses resulting from our repeating cycle of interface fire disasters.

Fire Protection - Fire and Emergency Response

- The Department of Forestry and Fire Protection protects the people of California from fires, responds to emergencies, and protects and enhances forest, range, and watershed values while providing social, economic, and environmental benefits to rural and urban citizens.
- Fire Fighter training - It is the goal of the Department that every fire engine responding from a CAL FIRE station carries CAL FIRE firefighters, fire apparatus engineers and/or fire captains that have met, at a minimum, the extensive training requirements.
- Civil Cost Recovery Program - Wildland fires cost California taxpayers millions of dollars every year. If CAL FIRE investigation reveals a fire was caused by a violation of law or negligence, the person responsible can be charged criminally, civilly, or both.
- Cooperative Fire Program - Agreements between state, federal and local agencies are essential in response to wildland fire emergencies. The CAL FIRE Cooperative Fire Protection Program staff is responsible for coordinating those agreements and contracts for the Department.
- Conservation Camp Program - CAL FIRE is currently authorized to operate 39 Conservation Camps statewide that house more than 4,300 inmates and wards, which staff 196 fire crews year round. These hand crews are available to respond to all types of emergencies including wildfires, floods, search and rescue. Fire crews perform more than 2.5 million hours of emergency response work each year.
- Aviation Program - In support of its ground forces, CAL FIRE has an air fleet of airtankers, helicopters and airtactical planes. From 13 air attack and nine helitack bases located statewide, aircraft can reach most fires within 20 minutes.
- Fire and Resource Assessment Program (FRAP) – provides extensive technical and public information for statewide fire threat, fire hazard, watersheds, socio-economic conditions, environmental indicators, and forest-related climate change. Much of this information involves Geographic Information System (GIS) analysis, tables, maps, data and calculation tools.
- Fire Prevention (Resource Management Program) - Pre-fire activities such as clearing a defensible space, planting and maintaining fire safe landscaping, utilizing prescribed fire, creating fuel breaks and managing forests effectively, are proven methods of reducing wildfire destruction.
- The Vegetation Management Program (Resource Management Program) - A cost share program that allows public and private landowners to participate in wildland fuel reduction projects. The primary tool used is prescribed fire, although in more recent years CAL

FIRE has used the program for mechanical treatments of vegetation as well.

- Fire Weather – CAL FIRE owns and maintains Remote Automated Weather Station equipment in compliance with NWCG Standards. Trained Unit staff perform daily data management to support daily operational strategies and tactics, resource placement and emergency response.

Federal Plans and Programs:

- USFS - The U.S. Forest Service plays several important roles in California: land manager, a provider of fire protection and prevention, private landowner assistance provider, and research.
- NRCS – Emergency Watershed Protection (EWP), Conservation Stewardship program (CSP), Environmental Quality Incentives Program (EQUIP), Wildlife Habitat Incentives Program (WHIP).
- National Fire Plan – Federal strategic plan for reducing costs and losses to wildland fire.
- Healthy Forests Restoration Act – To build-up the capacity to conduct hazardous fuels reduction projects on National Forest System lands and Bureau of Land Management lands aimed at protecting communities, watersheds, and certain other at-risk lands from catastrophic wildfire.
- FEMA Multi-hazard mitigation plans.
- Community Assistance – Assistance to communities may include grants and technical assistance directly to local governments or non-profit organizations.

Current Constraints

Fire prevention and restoration activities are limited by funding, uneven community capacity to prioritize and implement hazard reduction projects, private land access and other social, environmental and regulatory constraints.

Key Stakeholders and Partners

Key stakeholders include California citizens; land owners; CAL FIRE; state, federal and local governments and agencies as well as non-profit organizations (e.g. fire safe councils).

Strategies and Supporting Actions

Strategy: 2.1.1. Reduce the occurrence of damaging wildfires and reduce life, property and natural resource losses through the implementation of effective and efficient fire prevention programs and activities.

Action A - Develop a method for the integration of fire and fuels management practices with landowner priorities and multiple jurisdictional goals within local, state and federal responsibility areas.

A-1. Increase support of landowner-initiated hazardous fuel reduction using all available authorities.

A-2. Work to remove unnecessary regulatory barriers that limit hazardous fuel reduction activities, while maintaining assurance that environmental assets (e.g. air quality, wildlife habitat, etc.) are not exposed to risk of significant damage.

A-3. Promote and enhance programmatic documents that assist and streamline regulatory processes (e.g. modified THP process for hazard reduction).

A-4. Assist collaborative partners by educating, improving grant capacity and other means that provide tools to achieve fuels reduction work on the landscape.

A-5. Promote forest and range land health, hazardous fuels reduction and the improved utilization of all forest products, including small logs, urban green waste and biomass.

A-6. Increase public education and awareness in support of ecologically sensitive and economically efficient vegetation management activities, including prescribed fire, forest thinning and other fuels treatment projects.

A-7. Promote the development of multi-agency/landowner fuels reduction policies and activities at the watershed and fireshed level.

A-8. Support the availability and utilization of CAL FIRE hand crews and other CAL FIRE resources, as well as public and private sector resources, for fuels management activities.

A-9. Continue support for statewide multi-hazard plans (FEMA).

A-10. Determine through business management, fire planning and protection information systems situations where funding does not match levels of service.

A-11. Continue to work with the California Air Resources Board and local Air Pollution Control Districts to address concerns over use of prescribed fire and particulate matter from forest and range land management activities.

Additional Actions (BOF 2007 Policy Statement)

Action B - Review and fully implement CAL FIRE Resource Management and Fire Protection Vegetation Management Programs (VMP). Work with various regulatory agencies that affect vegetation management related hazard reduction (e.g. air quality, water quality, wildlife habitat, etc.) to accomplish vegetation management goals while meeting other agency mandates.

Action C - Develop public education programs that continue to address fire protection responsibilities and increase public understanding of changes to forest health with human action or inaction.

Action D - Expand and support the biomass industry as a tool for reducing hazardous fuels including ensuring sustainable long term fuel supplies from federal lands; and research for utilization of small logs, urban green waste, and biofuels.

Action E - Review and revise as necessary wildfire design and engineering standards that support effective wildfire protection for areas where occupied properties interface with wildland areas.

Strategy: 2.1.2. Protect life and property from wildfire through efficient and effective fire protection planning and suppression, financial management, and firefighter/public safety strategies.

Action A - Articulate and promote the concept of land use planning as it relates to fire risk and individual landowner objectives and responsibilities.

A-1. Assist the appropriate governmental bodies in the development of a comprehensive set of wildland and wildland urban interface (WUI) protection policies for inclusion in each county general plan or other appropriate local land use planning documents.

A-2. Engage in the development, review and adoption of local land use plans to ensure compliance with fire safe regulations, current building standards, and general community protection objectives.

A-3. Promote the consolidation and broad availability of project-level land use planning, project implementation and wildland fire occurrence data developed throughout each county for use by all cooperating agencies.

Action B - Support and participate in the collaborative development and implementation of wildland fire protection plans and other local, county and regional plans that address fire protection and landowner objectives.

B-1. Establish a working group, consisting of Board members and Departmental staff, to develop minimum standard elements for inclusion in Unit Fire Plans.

B-2. Coordinate Unit Fire Plans with community wildfire protection plans to encourage and support one consistent approach. Develop county or regional fire plans by bringing together community-based groups, such as fire safe councils and affected fire and land management agencies.

B-3. Create and support venues in which individual community members can be actively involved in local fire safe councils, citizen emergency response teams, Firewise and other community-based efforts to develop readiness plans and to educate landowners to mitigate the risks and effects of catastrophic wildland fire.

B-4. Collaborate with federal and local governments, other state agencies, fire service and other organizations, to develop and implement emergency response plans.

B-5. Ensure planning efforts are consistent with the National Fire Plan, the Healthy Forest Restoration Act, the Statewide Hazard Mitigation Plan, as well as

local hazard mitigation plans, and other relevant statewide strategic planning documents.

B-6. Maximize available resources to strengthen planning efforts through the development of public/private partnerships.

B-7. Develop fire risk mitigation treatment decision support tools to assist in project design, implementation and validation.

B-8. Investigate changes to laws regarding fire suppression tactics to allow more flexibility in managing wildfire to meet social and ecological objectives (similar to Federal policy).

Action C - Increase awareness, knowledge and actions implemented by individuals and communities to reduce human loss and property damage from wildland fires, such as defensible space, fire prevention and fire safe building standards.

C-1. Educate landowners, residents and business owners about the risks and their incumbent responsibilities of living in the wildlands, including applicable regulations, prevention measures and preplanning activities.

C-2. Facilitate activities with individuals and organizations, as appropriate, to assist individual property owners to comply with fire safe regulations.

C-3. Improve regulatory effectiveness, compliance monitoring and reporting pursuant to Public Resources Code (PRC) §4290 and §4291.

C-4. Utilize CAL FIRE staffing as available, as well as public and private organizations, to increase the number and effectiveness of defensible space inspections and promote an increasing level of compliance with defensible space laws and regulations.

C-5. Promote the consolidation of Fire Safe Regulations contained in California Code of Regulations (CCR) Title 14 with CCR, Titles 19 and 24, to achieve uniform application of building standards.

C-6. Continue to evaluate new, ignition-resistant construction technologies and materials, and promote the strengthening of California building standards.

C-7. Seek out incentives to promote the retrofit of existing structures to meet ignition-resistant building codes.

C-8. Actively enforce and seek updates as necessary to fire prevention codes and statutes, including those regulating utilities, railroads, small engines and other categories of equipment use that contribute to fire ignition.

C-9. In a continuing effort to deter negligent behavior, actively investigate wildland fire cause and pursue appropriate civil or criminal actions, including cost recovery.

C-10. Analyze trends in fire cause and focus prevention and education efforts to modify behavior and effect change.

Action D - Support funding to correspond to statutory responsibilities and that match the levels of service and performance goals established by the Board of Forestry.

Action E - Determine the optimal mix of wildfire prevention and suppression levels to minimize fiscal cost and reduce damages.

Action F - Develop oversight policies and use of information and planning tools for analysis of cost containment alternatives, staffing, and accountability for state spending.

Action G - Determine the level of fire suppression resources for adequate protection of the values and assets at risk identified during the planning processes.

G-1. Maintain an aggressive wildland fire initial attack policy that places a priority on protecting lives, property and natural resources, while at the same time considers suppression strategies that incorporate values and assets at risk, as well as cost factors wherever possible.

G-2. Develop criteria for determining suppression resource allocation based on elements such as identified values and assets at risk, ignition density, vegetation type and condition, as well as local weather and topography.

G-3. Initiate studies and analyses to identify appropriate staffing levels and equipment needs commensurate with the current and projected emergency response environment, including a review of the National Fire Danger Rating System (NFDRS).

G-4. Seek to increase the number of CAL FIRE hand crews for use in fighting wildland fires and other emergency response activities.

G-5. Initiate and maintain cooperative fire protection agreements with local, state and federal partners that value the importance of an integrated, cooperative, regional fire protection system and deliver efficient and cost effective emergency response capabilities beneficial to all stakeholders.

G-6. Develop policies and strategies to minimize injuries or loss of life to the public and emergency responders during emergency response activities throughout the state.

G-7. Ensure all firefighters are provided the appropriate training, equipment and facilities necessary to successfully and safely meet the increasingly complicated and challenging fire and emergency response environment.

G-8. Continue to evaluate and implement new technologies to improve firefighter safety, situational awareness and emergency response effectiveness.

G-9. Provide for succession planning and employee development at all levels within CAL FIRE to maintain emergency response leadership capabilities, administrative management skills and pre-fire planning expertise.

G-10. Effectively engage and train employees across all disciplines to address both planning and emergency response utilizing a “total force” approach.

G-11. Implement defensible space strategies pursuant to PRC 4290, 4291 and the parallel Government codes for non SRA. Develop defensible space regulatory effectiveness/compliance monitoring/reporting program. Develop strategies to address hazardous fire protection situation in established neighborhoods/WUI areas that have substandard protection characteristics.

G-12. Determine and establish a fire suppression level of service for personnel and equipment consistent with well defined standards and goals.

G-13. Determine and establish capital structure needs to support well defined fire protection.

G-14. Determine and establish aviation needs to support well defined fire protection.

G-15. Determine appropriate equipment replacements needs to supports levels of service goals and fire fighter safety needs.

G-16. Ensure all emergency response staff are trained and equipped to safely conduct efficient and effective operations.

G-17. Develop fire safety planning information/incident intelligence to prevent fatalities and serious injures to the firefighters and the public.

G-18. Develop interoperable communications needs of fire and emergency personnel.

Strategy: 2.1.3. Reduce the impacts of wildfire on ecosystem health, public safety and private property through appropriate scientific research, education and training.

Action A - Identify and evaluate wildland fire hazards and the associated values and assets at risk. Facilitate the sharing of all analyses and data collections across all ownerships for consistency in type and kind.

A-1. Identify and provide appropriate automated tools to facilitate the collection, analysis and consistent presentation of datasets (fire reports, etc.).

A-2. Update and maintain consistent, detailed vegetation and fuels maps across all ownerships in an efficient and cost-effective manner.

A-3. Provide regular updates to the Department’s Very High Fire Hazard Severity Zone maps.

A-4. Develop and validate weather and climatology information for use in predicting fire behavior and assessing fire probabilities.

A-5. Update fire history information and re-evaluate existing fire prediction models to get composite fire threat across all ownerships.

A-6. Update existing data for values and assets at risk utilizing GIS data layers and other mapping solutions, including fire behavior-specific effects (i.e. fire risks).

A-7. Develop improved modeling of air quality impacts of wild and prescribed fire.

A-8 Promote development of fuel reduction and forest management alternatives that minimize use of fire and production of air contaminants.

A-9. Use science-based approaches to evaluate, understand and protect against the negative impacts of new and emerging threats such as climate change, insect and disease outbreaks or land use changes on forest health and public safety, including the build up of hazardous fuel conditions and resulting fire behavior.

A-10. Engage and participate with local stakeholder groups (i.e., fire safe councils and others) to validate and prioritize the assets at risk.

Strategy: 2.1.4. Address post-fire responsibilities for natural resource recovery including watershed protection, reforestation, and ecosystem restoration.

Action A - Encourage rapid post-fire assessment, as appropriate, and project implementation to minimize flooding, protect water quality, limit sediment flows, maintain soil productivity and reduce other risks on all land ownerships impacted by wildland fire.

Action B - Work with landowners, land management agencies and other stakeholders across the state to design burned area rehabilitation actions that encourage salvage and reforestation activities, create resilient and sustainable landscapes, and restore functioning ecosystems.

Action C - Effectively utilize available resources, including CAL FIRE hand crews, to accomplish restoration and protection activities.

Action D - Assess the effects of pre- and post-fire treatments to refine best management practices.

Action E - Assist landowners with evaluating the need to utilize features developed during a fire, taking into consideration those identified in previous planning efforts (e.g. fire lines).

Action F - Aid landowners in recently burned areas in developing and implementing vegetation treatment plans to manage the re-growth of fuels to reduce hazardous conditions.

Action G - Promote the maintenance of a native species seed bank and seedling production capacity to provide the availability of appropriate tree species for reforestation within all of the state’s diverse seed zones.

Action H - Use after-action reports to evaluate and implement new technologies and practices to improve future firefighting efforts.

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Area and percent of forest and range land affected by processes or agents beyond the range of historic variation (Theobold 2007).
- Acres treated to reduce the risk of catastrophic wildfire.
- Acres of fuels treated in the WUI.
- Acres of non-WUI fuels treated.
- Number of acres treated to restore fire-adapted ecosystems to achieve desired conditions.
- Number of watersheds and total acres within condition class I.
- Number of watersheds and total acres within condition class II.
- Number of watersheds and total acres within condition class III.
- Forest acres needing reforestation treatment.
- Acres of forest vegetation established.
- Percentage and total acres needing reforestation or timber stand improvements that were treated.
- Acres of forestland vegetation improved.
- Percentage of treated acres identified in CWPPs or equivalent plans.
- Acres maintained/improved by fuels treatment category.
- Number of acres treated to restore fire-adapted ecosystems maintained in desired conditions.
- Number of communities at risk from catastrophic wildfire.
- Communities at risk with current and completed CWPP or equivalent.
- Communities receiving firefighting capacity building SFA.
- Small communities receiving firefighting capacity building VFA.
- No. of ARRA funded fuels reduction projects – nonfederal.
- Percentage of Local, State and Federal wildland fire agencies with a current Fire Danger Operating Plan and firefighter Fire Danger Pocket Cards.

Strategy Matrix

Strategy: 2.1.1. Reduce the occurrence of damaging wildfires and reduce life, property and natural resource losses through the implementation of effective and efficient fire prevention programs and activities.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Reduce the occurrence of damaging wildfires and reduce life, property and natural resource losses through the implementation of effective and efficient fire prevention programs and activities	18.4 million ac HPL in S. Coast, Sierra, Modoc, SMC, DFR, SGB and CSC habitats	Forest pest threats; sustainable carbon, biomass, timber; biodiversity; water quality and quantity;	CAL FIRE resource management and fire protection programs; CA and National Fire Plan; OSFM; FRAP; VMP;	California citizens, land owners, CAL FIRE, state, federal and local governments and agencies as well as non-profit organizations	State and Federal programs and funding for fire protection and resource management activities; Grants, bond funding	Acres treated to reduce the risk of catastrophic wildfire Acres of fuels treated in the WUI	Protect Forests From Harm; Enhance benefits from trees and forests.

Strategy: 2.1.2. Protect life and property from wildfire through efficient and effective fire protection planning and suppression, financial management, and firefighter/public safety strategies.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Protect life and property from wildfire through efficient and effective fire protection planning and suppression, financial management, and firefighter/public safety strategies	South Coast, Sierra bioregions, East Bay and Redding.	Forest pest threats; sustainable carbon, biomass, timber; biodiversity; water quality and quantity;	Cal Fire resource management and fire protection programs; CA and National Fire Plan; OSFM; FRAP; VMP;	California citizens, land owners, CAL FIRE, state, federal and local governments and agencies as well as non-profit organizations	State and Federal programs and funding for fire protection and resource management activities; Grants, bond funding	Acres treated to reduce the risk of catastrophic wildfire Acres of fuels treated in the WUI	Protect Forests From Harm; Enhance benefits from trees and forests.

Strategy: 2.1.3. Reduce the impacts of wildfire on ecosystem health, public safety and private property through appropriate scientific research, education and training.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Reduce the impacts of wildfire on ecosystem health, public safety and private property through appropriate scientific research, education and training	2.25 million acres statewide; DFR, KMC, SMC in Northern CA; CSC, MCH in Southern CA	Forest pest threats; sustainable carbon, biomass, timber; biodiversity; water quality and quantity;	Cal Fire resource management and fire protection programs; CA and National Fire Plan; OSFM; FRAP; VMP;	California citizens, land owners, CAL FIRE, state, federal and local governments and agencies as well as non-profit organizations	State and Federal programs and funding for fire protection and resource management activities; Grants, bond funding	Acres treated to reduce the risk of catastrophic wildfire Acres of fuels treated in the WUI	Protect Forests From Harm; Enhance benefits from trees and forests.

Strategy: 2.1.4. Address post-fire responsibilities for natural resource recovery including watershed protection, reforestation, and ecosystem restoration.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Address post-fire responsibilities for natural resource recovery including watershed protection, reforestation, and ecosystem restoration.	Post-fire areas as they occur.	Forest pest threats; sustainable carbon, biomass, timber; biodiversity; water quality and quantity;	CAL FIRE resource management and fire protection programs; CA and National Fire Plan; FRAP; USFS BAER teams	California citizens, land owners, CAL FIRE, state, federal and local governments and agencies as well as non-profit organizations	Federal, State and local programs and funding for fire protection and resource management activities; Grants, bond funding	Acres, miles of fireline, and miles of watercourses treated	Protect Forests From Harm; Enhance benefits from trees and forests.

Strategy Report 2.2:
Forest Pests- Restore and Protect Ecosystem Health

A healthy forest landscape has the capacity for renewal and for recovery from a wide range of disturbances, while continuing to provide public benefits and ecosystem services. Threats to forest health include insects, disease, invasive plant and animal species, air pollution, and climate change. Assessments should identify high value forest landscape areas that are especially vulnerable to existing or potential, forest health risk factors, where forest management practices are most likely to prevent and mitigate impacts. Assessments should also identify areas where management could successfully restore impacted forests. Resource strategies should include feasible long term strategies for addressing forest health risks and opportunities within important forest landscape areas (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of these strategies are to restore areas damaged by forest pests and to prevent, minimize and control to the extent feasible, future pest outbreaks, in order to maintain ecosystem health, preserve ecosystem services and avoid public safety hazards associated with large scale tree mortality events. This strategy also addresses goals identified at the national and state level, as noted below.

National Goal Supported: Protect Forests from Harm

Montreal Process /BOF Policy Goal Supported:
MPC-3: Forest Health
Board of Forestry and Fire Protection goal supported – Goal 3: Forest and Range Ecosystem Health; Protect, maintain, and enhance the health of California's forest and rangeland ecosystems within the context of natural disturbance and active management.

State Assessment Theme: Restore forest pest-impacted areas; Protect ecosystem health and public safety from future forest pest outbreaks.

Defined Landscape Areas

Priority Landscape(s):
Restoring Forest Pest Impacted Areas to Maintain Ecosystem Health
Restoring Forest Pest Impacted Communities for Public Safety
Preventing Forest Pest outbreaks to Maintain Ecosystem Health
Preventing Forest Pest Outbreaks for Community Safety

Priority Areas:
Restore Forest Pest Impacted Areas - Sierra Nevada, Modoc, Klamath/North Coast, South Coast bioregions.
Prevent Forest Pest Outbreaks - Sierra Nevada, Modoc, Klamath/North Coast, South Coast bioregions.

Strategies Overview

Purpose of Strategies

The purpose of these strategies are to protect public safety from fire and falling trees in communities and recreation areas damaged by forest pests; and to maintain ecosystem health and public safety by preventing or mitigating impacts associated with large outbreaks of forest pests and invasive species.

Strategies that remove dead trees in areas damaged by forest pests, or that improve forest health (e.g., forest thinning activities, reforestation) to reduce the occurrence of catastrophic mortality from future forest pest outbreaks, air pollution or invasive species help to protect public safety, prevent spread of forest pests and invasive species to new areas and maintain ecosystem services that yield high quality water, habitat and other forest based resources for California's citizens.

Statement of Need

Timberland growing stock volumes and densities have been increasing as a result of reduced harvesting and exclusion of wildfire. While this trend has had beneficial impacts for many terrestrial and aquatic habitats it has also led to increasing biomass of vegetation and density of forest stands. This results in a lost opportunity to generate wood products used by Californians; and also results in reduced tree health and vigor, which increases detrimental impacts caused by insect and disease outbreaks, catastrophic fire, and the loss of biological diversity for species dependent on open, less dense forest settings.

Forest pests (insects and diseases) annually destroy 10 times the volume of timber lost due to forest fires (FRAP, 2010). Extensive areas of forests and rangelands have already been impacted by current and historical forest pest outbreaks. Additionally, many other areas are at significant risk to future outbreaks of forest pests (FRAP, 2010). Both conditions (already impacted and at risk) have a direct impact on timber production, carbon storage and forest ecosystem function and sustainability and can also increase the threat of future impacts.

Experiences such as those witnessed during the large Southern California tree mortality event (2002-2004) suggest that public safety is also at risk from falling trees and limbs, as dead, dying and diseased trees decay in forest areas damaged by pests that are near communities and high-use recreation areas. In addition, increased fuel loading resulting from dead trees can drive dangerously hot fires in wildland urban interface areas. Strategies that incorporate the application of various tools and implement actions to restore impacted areas near communities, or prevent new outbreaks, are greatly needed.

Cross-Cutting Issues

Strategies that prevent the introduction and spread of exotic forest pests and invasive plant species involve forest management activities such as removal of exotics, dead, dying and diseased trees, thinning operations to prevent future outbreaks of forest pests

and restoration of areas taken over by invasive plant species. These forest management activities support other themes and issues in the assessment.

- Wildfire Threats – Forest management activities can reduce hazardous fuel loads that feed wildfires.
- Climate Change – Forest management activities can yield additional climate benefits by protecting existing carbon stocks and producing more resilient forest stands.
- Emerging Markets – Forest management activities can improve stand health and increase growth of trees, allowing them to produce more wood fiber thus increasing wood product flow and biomass availability.
- Monitoring efforts to address exotic pests and invasive plants can benefit multiple strategies by collecting a broader range of forest health and vegetation related information as well as disturbance and management activities, while simultaneously reducing overall costs. Strategies that can benefit from a broader monitoring effort would include those that address wildlife habitat, climate change, emerging markets, water resources, sustainable forests, development impacts and wildfire.

Existing Supporting Plans and Programs

Supporting plans include:

California Fire Plan, California Air Resources Board Scoping Plan for the Global Warming Solutions Act of 2006, California Department of Fish and Game Wildlife Action Plan, National Fire Plan.

Existing programs that support forest pest protection and restoration strategies include:

- California Forest Practices Rules – provides rules and procedures to avoid or lessen adverse effects on the environment from timber harvesting on local, state and privately owned lands.
- CAL FIRE Pest Management Program - forest pest specialists help protect the state's forest resources from native and introduced pests, conduct surveys and provide technical assistance to private forest landowners and promote forest health on all forest lands throughout the state.
- California Forest Improvement Program (CFIP) – improve productivity of non-industrial private timberlands and includes the improvement of other forest resources, including fish and wildlife habitat, soil, and water quality.
- Urban and Community Forestry Programs (UCF) - Under the authority of the Urban Forestry Act (PRC 4799.06 - 4799.12) this program offers to plant trees and related projects in urban communities throughout California. Urban Forestry Field Specialists provide expert urban forestry support to communities to create and maintain sustainable urban forests.
- California Forest Stewardship Program – Designed to promote long-term stewardship of private forest lands.
- University of California Cooperative Extension (UCCE) – Serves forest and range land owners through outreach efforts and technical assistance.

- The U.S. Forest Service plays several important roles in California: land manager, a provider of fire protection and prevention, private landowner assistance provider, and researcher as well as various technical support and evaluation monitoring programs.
- Forest Health Protection has specialists in forest entomology and pathology, invasive plants, pesticide use, survey and monitoring, suppression and control, technology development and other forest health-related services that assist with protecting and improving the health of rural, wildland and urban forests.
- Forest Health Protection has pest specific funding to implement integrated pest management strategies on federal and state and private lands.
- NRCS – Emergency Watershed Protection (EWP), Conservation Stewardship program (CSP), Environmental Quality Incentives Program (EQUIP), Wildlife Habitat Incentives Program (WHIP).
- Healthy Forests Restoration Act – To build-up the capacity to conduct hazardous fuels reduction projects on National Forest System lands and Bureau of Land Management lands aimed at protecting communities, watersheds, and certain other at-risk lands from catastrophic wildfire.
- Community Assistance – Assistance to communities may include grants and technical assistance directly to local governments or non-profit organizations.

Current Constraints

Forest pest restoration and prevention activities are limited by funding, lack of long-term planning, uneven community capacity to prioritize and implement stand improvement projects, private land access and other social, environmental and regulatory constraints.

Key Stakeholders and Partners

Key stakeholders include land owners, CFA, CAL FIRE, DWR, State Water Resources Control Boards, CEC, ARB, DFG, USFS, NRCS, USFWS.

Strategies and Supporting Actions

Strategy: 2.2.1. Restore forest lands impacted by current and historical forest pest outbreaks, air pollution and invasive species.

Action A – Retain strong pest control, fuel reduction, and fire protection programs.

Action B – Provide landowner assistance through the delivery of programs that address technical and financial assistance, restoration, risk reduction and stand improvements.

Action C – Support public and private nurseries to ensure that a reliable supply of seed for commercial and non-commercial tree species is available for appropriate genotypes, for the purpose of reforestation and forest health improvement.

Action D – Implement policies that emphasize use of an appropriate mix of species, that are well adapted to local conditions (i.e. from appropriate seed zone and elevation gradients) when re-foresting areas after harvest or fire.

Action E – Enhance cooperation and coordination between agencies, landowners and groups with an interest in forests.

Action F – Expand research on control methods, including the potential for impact on ecosystem health.

Action G – Develop a contingency plan for ecological impacts of climate change, including seed banks and land trades adjusted to ranges of vegetation types.

Action H – Implement effective training, education and outreach programs to inform landowners, government officials and the general public and to develop a well educated cadre of forest pest management professionals in California.

Action I – Continue to work with the California Air Resources Board and local Air Pollution Control Districts to address concerns over use of prescribed fire and particulate matter from urban areas as well as forest and range land management activities.

Action J – Maintain periodic assessments of impacts of ozone and other pollutants on forest and rangeland vegetation and aquatic resources.

Strategy: 2.2.2. Reduce/prevent forest pest outbreaks and control their spread to maintain ecosystem health, preserve ecosystem services and avoid public safety hazards associated with large scale tree mortality events.

Action A – Enhance forest resiliency through the strategic placement of stand improvement projects in high priority landscapes.

Action B – Streamline environmental review processes related to stand improvement projects.

Action C – Develop or improve monitoring and reporting systems for forest pests, including early detection.

Action D – Provide landowner assistance to reduce susceptibility to future threats in priority landscapes and improve benefits from trees and forests.

Action E – Develop overall plan to guide forest and range land pest research and control, including public involvement.

Action F – Maintain California Department of Food and Agriculture quarantine capacity.

Action G – Enhance support for County Agricultural Commissioners, University of California researchers and landowner participation.

Action H – Develop communication tools to inform the public of the positive benefits of active forest management.

Recommended Performance Measures:

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Area and percent of forest and range land affected by forest pests and in need of restoration (total area affected).
- Area and percent of forest land treatments to address potential forest pests outbreaks, invasive species or air pollution related tree mortality (area treated).
- Area and percent of forest and range land in need of restoration due to damage from air pollutants or ultraviolet B that may cause negative impacts on the forest ecosystem (areas in need of treatment).
- Number of communities covered by a CWPP or equivalent
- Area and percent of forest and range land with invasive plant species, particularly those that disrupt physical ecosystem processes such as fire regimes, sedimentation, erosion, light availability, hydrology and nutrient cycling.
- Number of structures, roads and other facilities protected by the removal of forest pest killed trees.

Strategy Matrix

Strategy: 2.2.1. Restore forest lands impacted by current and historical forest pest outbreaks, air pollution and invasive species.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Restore forest lands impacted by current and historical forest pest outbreaks, air pollution and invasive species	SMC, EPN, RFR, WFR, oak woodlands/rangeland habitats; Sierra Nevada, Modoc, Klamath/North Coast, South Coast bioregions. USFS ownership, private lands	Fire hazards; sustainable carbon, biomass and timber supply; biodiversity	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP, WBB –USFS, veg. management, - USFS, Pest specific programs in SOD, GSOB, WPBR, POC root disease – USFS.	USDA-APHIS; State; USFS; CFA; CDFA ;NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Acres of Forestland Restored; Reduced activity of future forest pests (acres)	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 2.2.2. Prevent forest pest outbreaks to maintain ecosystem health, preserve ecosystem services and avoid public safety hazards associated with large scale tree mortality events.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Prevent forest pest outbreaks to maintain ecosystem health, preserve ecosystem services and avoid public safety hazards associated with large scale tree mortality events	SMC and EPN , oak woodlands and rangeland, CAL.White fir, red fir, and lodgepole pine WFR, RFR, LPN, MHW habitats; Klamath/North Coast, Sierra and Modoc bioregions. USFS ownership, private lands	Fire hazards; sustainable carbon, biomass and timber supply; biodiversity	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP WBB - USFS	State; USFS; CFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Acres of Forestland protected; Reduced future forest pest activity (acres)	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy Report 2.2
Forest Health-Exotic Pests and Invasive Plants Control

A healthy forest landscape has the capacity for renewal and for recovery from a wide range of disturbances, while continuing to provide public benefits and ecosystem services. Threats to forest health include insects, disease, invasive plant and animal species, air pollution, and climate change. Assessments should identify high value forest landscape areas that are especially vulnerable to existing or potential, forest health risk factors, where forest management practices are most likely to prevent and mitigate impacts. Assessments should also identify areas where management could successfully restore impacted forests. Resource strategies should include feasible long term strategies for addressing forest health risks and opportunities within important forest landscape areas (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of these strategies are to reduce the introduction and spread of exotic pests and invasive plant species in California forests and rangelands to maintain ecosystem health. These strategies also address goals identified at the national and state level, as noted below.

National Redesign Goal Supported: Protect Forests from Harm.

Montreal Protocol/BOF Policy Goal Supported:
MPC-3: Forest Health
Board of Forestry and Fire Protection goal supported – Goal 3: Forest and Range Ecosystem Health; Protect, maintain, and enhance the health of California's forest and rangeland ecosystems within the context of natural disturbance and active management.

State Assessment Theme: Forest pests and other threats to ecosystem health: control of exotic pests (insects and diseases) and invasive plant species.

Defined Landscape Areas

Priority Landscape(s):
Statewide

Priority Areas:
Priority areas include forest and range land areas, as well as streams and lakes affected by aquatic invasive plant species.

Strategies Overview

Purpose of Strategies

Exotic pests are non-native insects and diseases. Invasive plant species refer to non-native introduced plant species affecting California ecosystems. Exotic pests and invasive plants of concern in California are those that adversely affect the habitats they invade either economically, environmentally or ecologically. Exotic and invasive species are expected to thrive as climate change increases because their reproductive timing tends to be more resilient to fluctuations. Globalization and free trade place great pressure on our forests, rangeland and agricultural protection systems. The increased movement of goods and people increases the risk of introduction of exotic pests and invasive plant species. This increasing risk of introductions puts greater strain on our detection and control systems and ultimately the environment (U.S. Department of Agriculture, 2007).

The number of exotics and the ratio of exotics to native pests has been increasing over time, with up to one third of the total number of significant pests non-native to California. Exotics have killed millions of trees in California, causing significant commercial, aesthetic, economic and environmental impacts. Exotic pests continue to threaten California forests, rangelands and agriculture. For example, if the Mediterranean fruit fly and Asian longhorned beetle, two major agricultural and urban forest pests, were left unchecked, they could easily result in several billions of dollars in production and marketing losses annually (USDA, 2010).

Unlike native pests, exotic insects and diseases do not have natural enemies that help prevent outbreaks and bring outbreaks under control; and local host species often have not evolved defenses to repel them. The growing number of exotic introductions of insects, diseases and invasive plants remains a great concern to ecosystem health in the state. Exotics pests and invasive plants can have significant local impacts that threaten the health of forest ecosystems. Certain exotic pests may not have impacted large acreages so far, but have the potential to spread and may already have significant local impacts on forest ecosystems. Rapid recognition and quick control efforts are key strategies to reduce the impacts from exotic forest pests and invasive plant species.

Statement of Need

Pitch canker disease, sudden oak death, white pine blister rust and Port-Orford-Cedar root disease are examples of exotic diseases currently of major concern to California forest management agencies. At present, there are Zones of Infestation (ZOI) for the impacted counties in California where sudden oak death and pitch canker are found. The potential for spread and impact of gypsy moth, the gold spotted oak borer and exotic bark beetles is also a major concern.

Bark beetles such as the banded elm bark beetle, the Mediterranean pine engraver beetle and redhaired pine bark beetle all have potential for spread and

impact on California's native and urban forest landscapes. As of 2009, the gold spotted oak borer (GSOB) covered an area of about 30 square miles in the interior of San Diego County and has killed over three quarters of the mature black oak, and coast live oak in the impacted area. White pine blister rust is thought to be gradually moving south, through the range and into higher elevation five needle pine species. Port-Orford-Cedar root disease has largely filled in its potential range in California, leaving few viable options for control.

Activities that prevent the introduction of new exotic pests or invasive plant species into California, provide an early detection and monitoring capability, or improve control methods are needed.

Cross-Cutting Issues

Strategies that prevent the introduction and spread of exotic forest pests and invasive plant species involve forest management activities such as removal of dead, dying and diseased trees; thinning operations to prevent future outbreaks of forest pests and restoration of areas taken over by invasive plant species. These forest management activities support other themes and issues in the assessment.

- Wildfire Threats – Forest management activities can reduce hazardous fuel loads that feed wildfires.
- Climate Change – Forest management activities can yield additional climate benefits by protecting existing carbon stocks and producing more resilient forest stands.
- Emerging Markets – Forest management activities can improve stand health and increase growth of trees, allowing them to produce more wood fiber thus increasing wood product flow and biomass availability.
- Wildlife Habitat Enhancement – Strategies that restore areas taken over by invasive plant species can yield additional benefits for wildlife habitat and nutrient cycling.
- Water Quality and Supply – Forest management activities can improve water quality and supply.
- Monitoring efforts to address exotic pests and invasive plants can benefit multiple strategies by collecting a broader range of forest health and vegetation related information as well as disturbance and management activities, while simultaneously reducing overall costs. Strategies that can benefit from a broader monitoring effort would include those that address wildlife habitat, climate change, emerging markets, water resources, sustainable forests, development impacts and wildfire.

Existing Supporting Plans and Programs

In California, exotic forest pests are regulated by the USDA-APHIS and California Department of Food and Agriculture (CDFA), who work to keep non-native pests out of the state and attempt to control or eradicate them. When exotic forest pests become established or are declared to not be actionable, responsibility for

their control often falls to CAL FIRE (on state and privately owned lands) and the U.S. Forest Service (on federal lands). Also, non-profit organizations play an important role in identifying and controlling exotic forest pests and invasive plant species in California, often through the delivery of outreach, education and research programs.
Existing plans and programs that support strategies to control exotic pests include:

- The Plant Health and Pest Prevention Services Division of CDFA is responsible for protecting California's agricultural and natural resources against damage caused by exotic pests and diseases.
- Pierces Disease Control Program (PDCP) is to minimize the statewide impact of Pierce's disease and its vectors in California.
- Border Protection Stations are the first line of defense for protecting our environment and resources from invasive plants and exotic pests. CDFA has 16 agricultural inspection stations along shared borders with Nevada, Oregon and Arizona. Each year, inspectors intercept thousands of lots of prohibited plant material that potentially threaten the food supply and the environment.
- CAPS program run by CDFA for APHIS.
- The Agricultural Commissioner for each county promotes agricultural production by protecting it from injurious pests and diseases. Trained agricultural biologists monitor pest conditions in agricultural and horticultural settings. Each of California's 58 Counties has an Agricultural Commissioner.
- The California Department of Forestry and Fire Protection mission emphasizes the management and protection of California's natural resources; a goal that is accomplished through ongoing assessment and study of the State's natural resources and an extensive CAL FIRE Resource Management Program.
- California Forest Practices Rules – provides rules and procedures to avoid or lessen adverse effects on the environment from timber harvesting on privately owned lands.
- State Technical and Financial Assistance programs.
- CAL FIRE Pest Management Program - forest pest specialists help protect the state's forest resources from native and introduced pests, conduct surveys and provide technical assistance to private forest landowners and promote forest health on all forest lands throughout the state.
- California Forest Improvement Program (CFIP) – improve productivity of non-industrial private timberlands and includes the improvement of other forest resources, including fish and wildlife habitat, soil, and water quality.
- California Forest Stewardship Program – Designed to promote long-term stewardship of private forest lands.
- Vegetation Management Program (VMP) - cost-sharing program between private landowners and CAL FIRE to reduce fire-prone vegetation, reduce the risk of large damaging wildfires, improve the growing conditions of

native plant and wildlife species and control the spread of noxious and invasive weeds and restore productivity of grazing lands.

- University of California Cooperative Extension (UCCE) – Serves forest and range land owners through outreach efforts and technical assistance.

- The Mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend.
- Wildlife Action Plan – Required by the 2008 Farm Bill, this document focuses on stressors affecting wildlife in California and the additional actions needed to maintain wildlife diversity and abundance in the future.
- California Association of Resource Conservation Districts (RCD).
- California Inter-agency Noxious Weed Coordinating Committee (CINWCC)
- Special Districts - There are numerous types of special districts throughout the state set up to administer needs of local people for pest control, fire fighting, water distribution, and a host of other services.
- Invasive Species Council of California (ISCC) - The ISCC is an inter-agency council that helps to coordinate and ensure complementary, cost-efficient, environmentally sound and effective state activities regarding exotic pests and invasive plant species.
- USDA Animal and Plant Health Inspection Service (APHIS) – This program works to protect America's animal and plant resources from agricultural pests and diseases. In many cases, APHIS is expected to lead emergency response efforts related to animal and plant pest and disease outbreaks.
- USFS Forest Health Protection (FHP) – This program has specialists in forest entomology and pathology, invasive plants, pesticide use, survey and monitoring, suppression and control, technology development and other forest health-related services that assist with protecting and improving the health of rural, wildland and urban forests.
    - Forest Health Protection has pest specific funding to implement integrated pest management strategies on Federal and State and Private lands. Pest specific funding for goldspotted oak borer, sudden oak death, white pine blister rust, Port-Orford-cedar root disease are available.
    - FHP supports implementation of Early Detection and Rapid Response (EDRR) programs and the Cooperative Agricultural Pest Survey (CAPS) program.
- HP conducts annual aerial pest detection surveys on all forest lands.
- NRCS – Emergency Watershed Protection (EWP), Conservation Stewardship program (CSP), Environmental Quality Incentives Program (EQUIP), Wildlife Habitat Incentives Program (WHIP), Resource Conservation Districts (RCD's).
- National Fire Plan – Federal strategic plan for reducing costs and losses to wild land fire.

- Healthy Forests Restoration Act – To build-up the capacity to conduct hazardous fuels reduction projects on National Forest System lands and Bureau of Land Management lands aimed at protecting communities, watersheds, and certain other at-risk lands from catastrophic wildfire.
- Community Assistance – Assistance to communities may include grants and technical assistance directly to local governments or non-profit organizations.
- California Invasive Plants Council (CAL-IPC) – Protects California's wildlands through research restoration and education.
- California Native Plant Society – (CNPS) works to protect California's native plant heritage and preserve it for future generations.
- CalFlora – Maintains an online database of almost 8000 species. Species reports provide taxonomical, ecological and distribution information. Includes photographs of native and non-native plants, a library of individual plant sightings and a plant name library that allows you to search for synonyms for scientific names.
- California Regional Invasive Species Information Catalog - Part of the National Biological Information Infrastructure, this site contains data on invasive species in California.
- California Noxious Weed Control Project Inventory - A searchable database on noxious weed control projects in California, compiled by a committee of state and federal agencies.

Current Constraints

Activities are limited by funding, uneven community capacity to detect, identify and control exotic pests and invasive plants, private land access and other social, environmental and regulatory constraints.

Key Stakeholders and Partners

Key stakeholders include land owners, Consumers, CDFA, CFA, CAL FIRE, DWR, State Water Resources Control Boards, ARB, DFG, USFS, NRCS, USFWS, USDA-APHIS and a host of non-profit organizations such as CAL-IPC and CNPS.

Strategies and Supporting Actions

Strategies and supporting actions that reduce/prevent the introduction of new exotic pests or invasive plant species into California, improve control methods, or provide an early detection/rapid response capability are needed.

Strategy: 2.2.3. Prevent the introduction and spread of new exotic pests and invasive plant species.

Action A – Develop an overall policy for California resources that integrates approaches to density reduction to reduce fuel loading and increase tree health and vigor, fire detection and protection, and prevention and control of exotics pests and invasive plants.

Action B – Continue strong support for focused best management practices, such as restriction on movement of plant material, use of prescribed fire, and use of equipment to control or prevent the spread of exotic pests and invasive plants.

Action C – Support the implementation of the Noxious Weed Strategic Plan and treatment of Cooperative Weed Management Areas (WMA's).

Action D – Promote viable, diverse populations of native and valued fish species by reducing risks of harm from invasive plant species and exotic pests.

Action E – Restore large areas of interconnected riparian habitats where feasible.

Action F – Coordinate or integrate federal, state, university and other diagnostic resources to support surveillance, detection and identification efforts focused on preventing the introduction of new exotics into California.

Action G – Strengthen support for California Department of Food and Agriculture program on prevention, detection, eradication, education and taxonomic identification.

Action H – Enhance support for county Agricultural Commissioners, University of California researchers and landowner participation.

Action I – Use science-based approaches to evaluate, understand and protect against the negative impacts of new and emerging threats such as exotic pests and invasive plants; and strategies to control them.

Action J – Develop and maintain a list of invasive plant species and exotic pests that have a reasonable likelihood of entering, or have entered, California for which an exclusion, detection, eradication, control or management action by the state might be taken.

Action K – Create, consolidate and publicize a system for reporting sightings of invasive plant species and exotic pests and referring those reports to the appropriate agency.

Action L – Undertake educational and outreach activities to increase awareness of invasive plant species and exotic pest issues.

Action M – Develop an invasive plant species and exotic pest Action Plan, a statewide plan for dealing with invasive plant species and exotic pests, including a Rapid Response Plan.

Action N – Develop funding mechanisms for early detection, rapid response, eradication and education projects.

Strategy: 2.2.4. Rapidly control or contain outbreaks of exotic forest pests and invasive plant species.

Action A – Maintain and improve early detection and rapid response capability.

Action B – Develop an overall plan to guide forest and range land pest research and control, including public involvement.

Action C – Strengthen the emergency response preparedness regarding exotic pests and invasive plant species including the network of responders, internal/external coordination and the capability to quickly trace origins of outbreaks.

Action D – Implement effective training, education and outreach programs to inform landowners, government officials and the general public. This includes developing a well educated cadre of forest pest management professionals in California, including arborists, to address threats in urban forests.

Action E – Maintain quarantine capacity and other control services at the California Department of Food and Agriculture, including continued support and training for border stations that conduct inspections of agricultural products.

Action F – Focus on the development of control methods, both chemical and non-chemical.

Action G – Expand research on control methods.

Action H – Promote efficient and effective control programs and strategies characterized by efforts that address current outbreaks, prevent new invasions and quickly detect new occurrences so that the species may be removed or contained before spreading.

Action I – Aggressively and quickly address exotic pest outbreaks through 1) emergency harvesting of infected, infested or damaged trees; 2) sanitation removal of insect or disease attacked trees to maintain or improve the health of a stand; 3) salvage removal of trees killed by pests or other causes; 4) treatment of slash from timber operations in a manner that avoids build-up of insect pest populations and; 5) implement and enforce regulatory control of movement of invasive infested materials and products.

Strategy: 2.2.5. Monitor forestland to quickly identify new, and evaluate current, outbreaks of exotic forest pests and invasive plant species to protect the most vulnerable and valued forest and range land assets.

Action A – Develop, improve and maintain monitoring and reporting systems for exotic forest pests and invasive plants, including early detection.

Action B – Update and maintain consistent, detailed vegetation and exotic species location maps across all ownerships in an efficient, collaborative and cost-effective manner.

Action C – Update existing data for values and assets at risk utilizing GIS data layers and other mapping solutions.

Action D – Facilitate the sharing of all analyses and data collections across all ownerships for consistency in type and kind.

Recommended Performance Measures:

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Area of forest and range land affected by exotic forest pests and invasive plant species that are in need of restoration (total area affected).
- Area and percent of forest and range land treatments to address potential exotic forest pests and invasive plant species outbreaks and related tree mortality (area treated).
- Area and percent of forest and range land in need of restoration due to damage from exotic forest pests and invasive plant species that may cause negative impacts on the forest ecosystem (areas in need of treatment).
- Number of structures, roads and other facilities protected by the removal of forest pest killed trees.
- Number of exotic pest species affecting forest and rangeland compared to the total number of pest species in California.

Strategy Matrix

Strategy: 2.2.3. Prevent the introduction and spread of new exotic pests and invasive plant species.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Prevent the introduction and spread of new exotic pests and invasive plant species.	Statewide; forest and rangelands, including urban forests.	Fire hazards; sustainable carbon, biomass and timber supply; biodiversity	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP, APIS,PHPPS, PDCP, BPS, EDRR, CAPS, Aerial and ground surveys, Citizen awareness program	USDA-APHIS; State; USFS; CFA; CDFA ;NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Acres of Forestland Restored; Reduced activity of future forest pests (acres)	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 2.2.4. Rapidly control outbreaks of exotic forest pests and invasive plant species.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Rapidly control outbreaks of exotic forest pests and invasive plant species	Statewide; forest and rangelands, including urban forests	Fire hazards; sustainable carbon, biomass and timber supply; biodiversity	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP, APIS,PHPPS, PDCP, BPS	USDA-APHIS; State; USFS; CFA; CDFA ;NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Acres of Forestland Restored; Reduced activity of future forest pests (acres)	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 2.2.5. Monitor forestland to quickly identify new and evaluate current outbreaks of exotic forest pests and invasive plant species, to protect the most vulnerable and valued forest and rangeland assets.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Monitor forestland to quickly identify new and evaluate current outbreaks of exotic forest pests and invasive plant species, to protect the most vulnerable and valued forest and rangeland assets	Statewide; forest and rangelands, including urban forests	Fire hazards; sustainable carbon, biomass and timber supply; biodiversity	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP, APIS,PHPPS, PDCP, BPS, aerial and ground surveys	USDA-APHIS; State; USFS; CFA; CDFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Acres of Forestland Restored; Reduced activity of future forest pests (acres)	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy Report 3.1:
Assessing Water Quantity and Water Quality

Forests and forestry practices can help protect, restore, and sustain water quality, water flows, and watershed health. Healthy urban and rural forested watersheds absorb rainfall and snow melt, slow storm runoff, recharge aquifers, sustain stream flows, and filter pollutants. Assessments should identify watersheds where continued forest conservation and management is important to the future supply of clean municipal drinking water, or where restoration or protection activities will improve or restore a critical water source. Resource strategies should include actions for managing and conserving these priority watersheds for water quality and supply, and other ecosystem services (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of these strategies are to maintain and enhance water supply and water quality in forested watersheds that support a broad range of downstream uses.

National Goal Supported: Enhancing Public Benefits from Forests

Montreal Process/BOF Policy Goals Supported:
MPC-4: Conservation and Maintenance of Soil and Water

State Assessment Theme: Water Resources: Assessing Water Quantity and Water Quality

Defined Landscape Areas

Priority Landscape(s):
Primary – Water Supply, Water Quality
Secondary – Wildfire Ecosystem Health and Community Safety, Development, Climate Change, Forest Carbon, Restoring and Preventing Pest Outbreaks, Watersheds with Threatened and Endangered Fish

Priority Areas:
Water Supply – Sierra, Cascades and Klamath/North Coast bioregions
Water Quality – North Coast and Central Sierra (i.e., Tahoe Basin)

Strategies Overview

Purpose of Strategies
Watershed protection is needed to ensure a consistent supply of clean water that supports the beneficial uses for both instream and downstream users. Forested watersheds across California provide clean water that supports a broad range of beneficial uses. Nearly 85 percent of California's average annual runoff is produced from forested watersheds. Forests filter and meter the movement of rainfall; and at higher elevations the forest snow pack acts as a natural reservoir. The rainfall in turn, replenishes aquifers and delivers water to streams. Forest and range vegetation and

soils are valuable for absorbing snowmelt and rain, storing moisture, cooling and cleansing water and slowing storm runoff. Physical and biological processes combine to create the ecological condition of a watershed and define the environmental services that the watershed can support. The natural variability of these processes in space and time gives rise to a diverse array of environmental conditions across a watershed. Over time, environmental conditions vary with disturbance from both natural sources and land management activities.

Statement of Need

Protection and restoration of upper watersheds, including wilderness areas, is needed in high priority areas that contribute to water supply and help meet water quality objectives. In addition, riparian areas and mountain meadows were identified as a critical resource that is in need of restoration. Based on findings from the Forest and Range Assessment Report, the upper watersheds in the Sierra Nevada and Cascade Range have the greatest concentration of high priority landscape for water supply, and the Klamath/North Coast bioregion had the greatest amount of high priority landscape for concerns related to instream water quality. Although less significant from a statewide water supply perspective, forest and shrublands in Southern California provide important watershed protection and represent a regional priority. These areas tend to be underrepresented in the Forest and Range Assessment Report. Collectively, water resources in priority watersheds were found to be under threat from:

- declining snowpack,
- wildfire,
- development,
- erosion following wildfire,
- increasing water demand,
- water pollution (increased temperature, sediment and nutrients),
- timber operations, including road design, construction, maintenance and other land management activities.

The California Water Plan includes a chapter on Forest Resource Management Strategies. The strategies in that document serve as the primary guide for water resource strategies on forest lands. The proposed strategies and actions in this report incorporate key elements from the water plan and other existing state plans. Collectively, the strategies and actions listed below will support implementation of the water plan, support Regional Water Quality Control Board Basin Plans, improve the quantity and quality of water to downstream users and contribute to important restoration objectives (i.e., Bay Delta, Lake Tahoe and Klamath Basin).

Cross-Cutting Issues

Priority landscapes were developed for threats to water supply and water quality. However, there are a number of cross-cutting issues that include:

- Protecting Ecosystems from Wildfire Threat – High severity wildfire can directly affect water quality. Priority areas for protecting ecosystems from wildfire threat have substantial overlap with priority areas for protecting water resources.

- Meadow and Riparian Forest Restoration – Restoring riparian forests and meadows can enhance water supply, water quality, flood protection, wildlife habitat and carbon sequestration.
- Development – Increased development in forested landscapes can impair the quality of water from source watersheds.
- Climate Change – Climate modification is expected to lead to substantial declines in Sierra snowpack; this in turn will affect the timing and delivery of water from upper elevation watersheds.

Existing Supporting Plans and Programs

Supporting plans include:

California Water Plan Update (www.waterplan.water.ca.gov) – Forest Resource Management Strategy, Board of Forestry and Fire Protection's Monitoring Study Group Strategic Plan, Regional Water Quality Control Board Basin Plans, USFS Region V Water Quality Management Program, including its Best Management Practices Evaluation Program.

Existing programs that support the water quantity and quality strategies include:

- Board of Forestry and Fire Protection – Forest Practice Implementation and Effectiveness Monitoring Program (FORPRIEM), evaluates the implementation and effectiveness of selected Forest Practice Rules on protecting water quality.
- Surface Water Ambient Monitoring Program (SWAMP) – Responsible for assessing water quality in California's entire surface waters (http://www.swrcb.ca.gov/water_issues/programs/swamp/).
- DWR river runoff, precipitation and snowpack monitoring.
- Regional Water Quality Control Board Waiver monitoring programs.
- TMDL implementation plans for sediment and water temperature listed waterbodies.
- Department of Fish and Game's Fisheries Restoration Grant Program.
- NOAA Fisheries Restoration Center.
- Sierra Nevada Adaptive Management Project.
- California Forest Improvement Program (CFIP) – includes the improvement of all forest resources, including fish and wildlife habitat, soil, and water quality.
- California Forest Stewardship Program – Designed to promote stewardship of private forest lands.
- California Wildlife Conservation Board – programs to acquire land and restore habitat including the California Forest Conservation Program (CFCP), the Ecosystem Restoration on Agricultural Lands program (ERAL), and the Rangeland, and the Grazing Land and Grassland Protection Program.
- NRCS Programs – Environmental Quality Incentives Program (EQIP), Wetlands Reserve Program (WRP), and Wildlife Habitat Incentives Program (WHIP). (http://www.ca.nrcs.usda.gov/programs/)
- USFS–Region V Best Management Practices Evaluation Program.
- DFG – Lake and Streambed Alteration Program.

- Board of Forestry and Fire Protection's 2010 Forest Practice Rules, including the Anadromous Salmonid Protection Rules (effective January 1, 2010).
- Cooperative Instream Monitoring Programs (e.g., Caspar Creek watershed study, Cal Poly San Luis Obispo Swanton Pacific Ranch Little Creek Watershed Study, etc.).
- Forest Service 10-Year Wilderness Challenge and FSM (Forest Service Manual) 2020 – Ecological Restoration.

Current Constraints

Watershed protection and restoration are limited by funding, staffing constraints, limited technical assistance, state and federal agency regulatory constraints, lack of long-term planning, outreach, uneven community capacity to prioritize and implement restoration projects, legacy watershed problems and the influence of priorities driven by statewide bond initiatives.

Key Stakeholders and Partners

USFS Region V; USFS-PSW; US EPA; NOAA Fisheries; USFWS; NRCS; SWRCB; RWQCBs, DFG; CAL FIRE; Conservation-CGS; UC Berkeley, HSU, Cal Poly SLO, industrial and non-industrial timber companies; Sierra Nevada Conservancy and other land conservancies; DWR Integrated Regional Water Management; NGOs including National Fish & Wildlife Foundation; Sierra Nevada Alliance, and other community based wildfire and watershed protection groups.

Strategies and Supporting Actions

Strategy: 3.1.1. Promote Watershed Protection and Restoration in Priority Watersheds.

Action A – Promote restoration, enhancement and management of mountain meadows to enhance timing and delivery of runoff. This includes financial and technical assistance to private landowners willing to voluntarily restore mountain meadows and riparian habitats. Utilize easements and provide other financial incentives as needed where livestock are temporarily or permanently excluded from grazing in mountain meadows.

Action B – Promote restoration of riparian forests to enhance flood protection, water quality, recovery of aquatic habitat, terrestrial wildlife habitat and carbon sequestration.

Action C – Increase public awareness of existing landowner incentives, and expand incentives where possible; for restoration projects in high priority watersheds that maintain and enhance high quality water supply to downstream users.

Action D – Enhance watershed protection through the strategic placement of fuel reduction projects in high priority water supply watersheds.

Action E – Implement resource management strategies for forest management as stated in the California Water Plan Update. (www.waterplan.ca.gov/strategies)

Action F – Increase funding for monitoring runoff in upper elevation watersheds that are a priority for water supply.

Action G – Conduct necessary research to improve understanding of wildfire and pre-fire management effects on forest hydrology.

Strategy: 3.1.2. Improve Water Quality through Implementation of Best Management Practices and Monitoring in High Priority Watersheds.

Action A – Implement strategies A – G from the Board of Forestry and Fire Protection's Policy Statement that protect beneficial uses of water (Criteria 4, Soil and Water Quality; objective 2). BoF Strategic elements are paraphrased as:

A-1. Continue support for watershed assessments using common watershed models and risk assessment methods to advance understanding of cumulative watershed effects.

A-2. Continue monitoring, especially to link in-stream conditions to hillslope processes.

A-3. Increase options for long-term plans by forest and range landowners and connect plans to ease regulatory process requirements and improve resources protection at the plan level.

A-4. Foster collaboration between regulatory agencies, the general public, and private landowners including integrating Timber Harvest Plan review and rules and Total Maximum Daily Load requirements.

A-5. Maintain funding and increase landowner incentives for restoration projects and maintain support for urban stream restoration.

A-6. Use the Demonstration State Forests as a venue for testing and demonstrating watershed assessment approaches and restoration techniques.

A-7. Conduct focused research on the dynamics of fish populations and their linkages to instream conditions and land uses.

Action B – Implement recommendations in the Board of Forestry and Fire Protection Monitoring Study Group's Strategic Plan to evaluate the implementation and effectiveness of forest practices related to water quality.

Action C – Continued state and federal support for long-term watershed studies that lead to increased understanding of cumulative watershed effects; changes in annual water yield, peak flows, and summer low flows; changes to water quality parameters; and impacts of current forest management practices to key aquatic habitat metrics.

Action D – Support implementation and evaluation of the effectiveness of Best Management Practices (BMPs) for protection of water quality on both private and federal lands.

Recommended Performance Measures (modified from BOF Policy Statement)
Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Acres treated for watershed restoration in high priority watersheds.
- Acres treated for reduced threat from catastrophic wildfires.
- Stream miles treated for channel and streambank improvement work.
- Miles of water quality impacting forest roads either properly upgraded or properly decommissioned.
- Area and percent of forest land managed primarily for protective functions, including conservation easements, wilderness areas, parks, etc.
- Percent of stream miles in forested catchments with altered stream flow and timing.
- Percent of impaired water bodies in forest watersheds. Pollutants of primary concern include: sedimentation and water temperature change.
- Data supporting conclusions that current forestry practices are resulting in improved trends in selected water quality parameters and aquatic and riparian habitat metrics.

Strategy Matrix

Strategy: 3.1.1. Promote Watershed Protection and Restoration in Priority Watersheds.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Improve water storage, delivery and water quality through watershed protection and restoration	Statewide for high priority watersheds	Wildlife habitat; grazing	CAL FIRE Vegetation Management Program; IRWM, Forest Legacy Program; WCB's CA Riparian Habitat Conservation Program; Wetland Reserve Program; USFWS Partners for Fish & Wildlife	National Fish & Wildlife Foundation; Sierra Nevada Alliance; USFS; DFG; CAL FIRE; Private Landowners	Land Trusts; IRWMP grants; SNC grants; Intermountain West Joint Venture; Central Valley Joint Venture	Acres treated, Stream miles treated, Acres in conservation easements	Water Resources; Climate Change

Strategy: 3.1.2. Improve Water Quality through Implementation of Best Management Practices and Monitoring in High Priority Watersheds.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Improve water quality through implementation of BMPs and Monitoring	Statewide for high priority watersheds	Riparian and aquatic habitat	BoF/CAL FIRE FORPRIEM Monitoring Program; SWRCB SWAMP program; RWQCB Waiver Monitoring Programs; USFS BMPEP; Cooperative Instream Monitoring Programs (e.g., Caspar Creek watershed study); timber company monitoring programs.	USFS Region V; USFS-PSW; SWRCB; RWQCBs, DFG; CAL FIRE; industrial and non-industrial timber companies; NGOs; HSU, UCB, Cal Poly SLO	Federal & State Grants (USEPA; SWRCB; DWR); CA General Fund; CA Special Funds; Federal appropriations; private funding	Percent change of impaired waterbodies in forested watersheds; improving trends in BMP/CA Forest Practice Rule implementation and effectiveness over time; data supporting conclusions that current forestry practices are resulting in improved trends in selected water quality parameters and aquatic and riparian habitat metrics.	Water Resources; Climate Change

Strategy Report 3.2:
Urban Forests- Assessing Energy Conservation and Air Quality

Urban and exurban forest cover, including agroforests can improve air quality, reduce energy consumption, and produce biomass for energy production. Assessments should identify areas where management or restoration of the urban or exurban forest canopy will have significantly positive and measurable impact on air quality and produce substantial energy savings (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goal of this strategy is to improve air quality and reduce energy consumption through expansion, management and restoration of urban forests. This strategy also addresses goals identified at the national and state level, as noted below.

National Goal Supported: Enhancing Public Benefits from Forests

Montreal Process/BOF Goals Supported:
MPC-3: Maintenance of Forest Ecosystem Health
MPC-6: Socio-economic Well Being

State Assessment Theme: Urban Forestry for Energy Conservation and Air Quality

Defined Landscape Areas:

Priority Landscape(s):
Urban Tree Planting to improve air quality, and conserve energy
Urban Tree Maintenance for energy conservation and improved air quality

Priority Areas:
Central Valley, South Coast, and Mojave bioregions concentrated in urban areas for both planting and maintenance

Strategies Overview

Purpose of Strategies

Urban forests in California provide a broad range of benefits to the public including recreation, pollution reduction, carbon storage, heat island mitigation, storm water control, noise control, increased wildlife habitat, increased property values and energy conservation. The many benefits are well documented and trees are increasingly recognized as a highly valued part of community infrastructure and environment. Urban forests help filter out air pollutants by depositing pollutants in their canopy and also sequester CO_2 in their woody biomass. Trees help reduce energy consumption by providing shade, which reduces the overall air temperature. Strategies that promote

restoration and maintenance of urban forests improve the quality of urban environments and enhance the public benefit.

Statement of Need

Population growth and warmer summer temperatures have increased the need for electricity in California. Additionally, development to keep up with the growing population has created urban heat islands that also increase the overall air temperature. Many daily activities, such as driving, mowing the lawn, dry cleaning clothes and natural occurrences such as wind blown dust and fires, pollute the air. Sixty percent of Americans live in counties where particulate or ozone pollution has reached dangerous levels. In California, close to 28 percent of the population lives in a high threat area for air pollution and urban heat; and over two-thirds of the counties received a failing grade for high ozone days by U.S. EPA ozone pollution standards. Maintenance and restoration of urban forests is needed in high priority areas that have higher risk factors and are densely populated places. Based on findings from the forest assessment, communities located in the Central Valley and the South Desert regions have the greatest concentration of high priority landscapes.

Cross-Cutting Issues

Mitigating the effects of air pollution and energy consumption in urban areas relates to several other themes and issues presented in the assessment document. The most important are listed below:

- Wildfire and Pest Threats – Ignition sources are often a major factor in relation to the frequency of large wildfires. In high wildfire threat urban areas, tree maintenance and selection is imperative. With public education to plant the right tree in the right place, defensible space, tree maintenance, pest transportation and control, and reduction of human activities with high fire or pest spread risk, a sustainable urban forest can be achieved.
- Water Quantity and Quality – Wetland ecosystem conservation in urban or ex-urban areas can help water quality by mitigating flooding occurrence and damage by providing areas for stream overflow containment. These ecosystems also help recharge vital groundwater in more semi-rural areas that rely on wells for their water supply.
- Development – Ecosystems most threatened by development are often in close proximity to existing urban or suburban areas. Conserving these ecosystems with “Smart Growth” and planning can help provide the same air quality improvement and temperature-lowering benefits that occur with augmenting urban forestry.
- Green Infrastructure for Connecting People to the Natural Environment – Ecosystems under threat of development most often occur in close proximity to areas already developed. Conservation of these areas would also provide opportunities to augment the green infrastructure in nearby communities.

Existing Supporting Plans and Programs

Supporting plans include: Individual urban forest plans are available for many local and county governments, but a document to guide the entire State currently does not exist. The California Urban Forestry Advisory Committee (CUFAC) has been recently

established to advise the Director on the State's Urban Forestry Program. This committee will develop a comprehensive urban forestry action plan to guide program activities.

Existing programs that support urban forestry strategies include:

- The U.S. Forest Service National Urban and Community Forestry Program (U&CF) – Provides financial support and guidance to state urban forestry programs. The national program provides financial and technical assistance to restore and sustain natural and human environments in urban areas.
- Local Community Urban Forest Plans – Urban forests are generally developed and managed at a local level, as directed by local entities, and unlike rural forests are dominated by human activity. The state's role in urban forest sustainability is to build capacity, reduce threats and promote efficiency by identifying areas where efforts can be optimized and would maximize community benefits.
- CAL FIRE Urban & Community Forestry Program (U&CF) (www.fire.ca.gov) – Guides urban forest activities in the State to create and maintain sustainable urban forests, per the Urban Forestry Act of 1978 (PRC 4799.06-4799.12). The goal of the U&CF program is to improve the quality of life in cities and communities by promoting a healthy ecosystem through urban forest management. The program seeks to ensure the vitality of communities by engaging people where they live, work, and play.
- Proposition 84, (the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006) – Bond expenditures also support urban forestry in the State based on guidance from the California Urban Forestry Act of 1978.
- Proposition 40, (the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002) – authorized $2.6 billion in bonds to be used for development, restoration, and acquisition of state and local parks, recreation areas and historical resources; and for land, air, and water conservation programs. The Urban and Community Forestry Program allocation was for $10 million over a four year period, which began in 2006.

Current Constraints

- Funding: Maintaining adequate funding is a challenge all programs experience. During recessionary times, programs that may be considered discretionary are often hit the hardest. Urban forestry is an emerging discipline and just starting to be recognized for the public benefits it provides. Quantification of these benefits can be difficult to obtain and may result in lowering of program importance when allocating resources; thus leading to fragmentation and lack of coordination for program responsibilities. Public policy supporting a sustainable urban forest financially, administratively and legally is critical to program success.

- Community and Government Commitment: Communication, education, and public awareness of urban forest benefits are key components to maintain community and government commitment.

Key stakeholders and Partners

Urban forest expansion and improvement efforts are often the result of regional and local collaborations. Cooperative working relationships between government, non-profit, and community leaders are essential to program success and sustainability. Each community and citizen has a stake and contributes to the success of the urban forest. Urban forestry expansion is a “grass-root” effort that requires continuous outreach and education. For this reason, citizen support, key stakeholders, and partners are an essential part of the program. The list of key stakeholders and partners that support urban forestry is extensive, including but not limited to:

- Community Planners and Developers: Both governmental and non-governmental planners and developers that make decisions that impact urban forests including commercial and residential development. Urban forestry depends on supportive public policy to be sustained and effective.
- The Center for Urban Forest Research (CUFR): The Center for Urban Forest Research (CUFR) is part of the USDA Forest Service Research and Development program. CUFR conducts research that describes the structure of urban forests and quantifies related benefits and costs. Efforts are focused towards communities to have an increased understanding and appreciation of the urban forest and choose to make an investment in the care and maintenance of community trees to ensure continued health of the urban forest.
- The Urban Forest Ecosystems Institute (UFEI – www.ufei.org), which was developed by the Natural Resources Management department faculty at Cal Poly San Luis Obispo to address the increasing need for improved management of urban forests in California. The UFEI website houses SelecTree online tree selection software, UrbanWood online tree utilization marketplace, downloadable publications, current events, job listings, links to other related sites and much more.
- The California ReLeaf organization, an association of 100+ non-profit tree planting groups, coordinates volunteer efforts at Urban Forestry in California and offers pass-through grants to non-profit partners.
- The California Urban Forest Council (CaUFC) focuses on technical, strategic, and institutional issues of urban forest management and coordinates seven regional councils that provide feedback and recommendations to the U&CF Program, as well as advocate for Urban Forestry in their respective regions.
- The Western Chapter of the International Society of Arboriculture (WCISA) is a member-driven organization dedicated to fostering a greater appreciation for trees by promoting research and education to advance the professional practice of arboriculture.

Strategies and Supporting Actions

Two urban forestry strategies were identified to aid in energy conservation and improve air quality. The first strategy is to increase tree planting efforts that will produce public benefit. The second strategy is to maintain existing tree canopy assets.

Strategy: 3.2.1. Promote urban tree planting to improve air quality and energy conservation.

Action A – Promote urban forestry ordinances and development standards to increase tree planting.

- Promote tree planting as a condition for new developments and renovation projects.
- Promote minimum tree canopy standards in public parking lots to mitigate urban heat islands.
- Encourage native tree plantings, and right place, right tree philosophy to increase sustainability.
- Encourage integration of design, management, and enforcement to increase program efficiency; and minimize impacts on ecosystems and natural areas.

Action B – Retain strong cooperative working relationships with key stakeholders.

Action C – Develop a comprehensive State Plan to increase benefits from urban forests.

- Establish a committee to develop and guide program activities.
- Encourage public support and input.

Action D – Enhance cooperation and coordination between agencies, municipalities and non-profit organizations.

Action E – Increase public awareness regarding the benefits of urban forests and impacts of urban heat islands, impervious surfaces, fire hazards and ecological change.

Action F – Encourage new research related to urban forestry including those associated with air pollution and energy conservation.

Action G – Support urban workforce development programs, such as the California Conservation Corps (CCC), to help meet urban forestry goals.

Strategy: 3.2.2. Maintain urban tree canopy to conserve energy and improve air quality.

Action A – Promote adoption of tree policies that protect valuable tree assets.

Action B – Promote policy and plans to manage urban forests.

Action C – Promote efforts to increase space available for large trees in urban areas.

Action D – Increase age and species diversity in urban forests.

Action E – Promote regular maintenance schedules to protect urban tree assets.

Recommended Performance Measures (modified from BOF Policy Statement)
Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Annual removal of urban trees, compared to number of urban trees planted.
- Area and percent of urban forest land managed primarily for protective functions.
- Area and percent of urban forest land with significant compaction resulting from human activities such as development.
- Total urban forest ecosystem biomass and carbon pool.
- Number of priority communities with an urban forest plan.
- Expenditures on urban forest planting and maintenance.
- Number of jobs and dollars the urban forest industry contributes to State economy.
- Estimated energy savings provided by shade trees.

Strategy Matrix

Strategy: 3.2.1. Promote urban tree planting to improve air quality and energy conservation.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Promote Urban Tree Planting to improve air quality and energy conservation	Central Valley, South Coast	Urban heat; wildlife habitat; recreation		Urban Communities; Counties; UF Council; State and Federal UF programs	Grants; TreeCity USA; Proposition funds; Carbon Markets; GHG offset revenues	Increased tree canopy; Trees planted	3.2 3.6 3.7

Strategy: 3.2.2. Maintain urban tree canopy to conserve energy and improve air quality.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Maintain Urban Tree canopy to conserve energy and improve air quality	Central Valley; Mojave	Urban heat islands; renewable resources; development standards		Urban Communities; Counties; UF Council; State and Federal UF programs	Grants; TreeCity USA; Proposition funds	Sustained Tree Canopy; Replaced Trees	3.2 3.6 3.7

Strategy Report 3.3:
Community Wildfire Planning

Assessments should identify communities where State and Private programs can substantially mitigate the risk of catastrophic wildfire occurrence and associated risks to human safety and property. Assessments should incorporate existing CWPPs and identify communities in especially vulnerable areas that need a CWPP. Resource strategies should include a plan for effectively addressing those communities that are most at risk (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goal of this strategy is to increase the number of communities directly involved in coordinated wildfire planning and the number of community wildfire protection plans where needed to reduce wildfire risks. This strategy also addresses goals identified at the national and state level, as noted below.

National Goal Supported: Enhancing Public Benefits from Trees and Forests

Montreal Process/BOF Policy Goals Supported:
MPC-6: Socio-Economic Well Being
BOF Policy Supported: Goal 3-Forest and Range Ecosystem Health, Protect, maintain and enhance the health of California's forest and rangeland ecosystems within the context of natural disturbance and active management.

State Assessment Theme: Community protection to reduce costs and losses due to wildfire.

Defined Landscape Areas

Priority Landscape(s):
Community Wildfire Threat

Priority Areas: Communities with at least 500 people or 1,000 acres in Medium or High Priority Landscapes (all bioregions)

Strategy Overview

Purpose of Strategies
California's fire-prone environments and extensive urban wildland interface present substantial challenges ranging from individual landowners to all levels of government. There is an extensive network of Fire Safe Councils throughout the state representing substantial resources for community planning guidance. Many communities have created a Community Wildfire Protection Plan (CWPP) or are in the process of doing so. However, more communities could benefit from increased local participation in planning for wildfire.

When planning occurs at the community level, greater community awareness can lead to better compliance with laws and regulations (such as defensible space and fire safe building codes) designed to improve the ability of a community to face a wildfire with as few losses as possible.

California encourages the formation of local and community Fire Safe Councils and participation in the national Firewise/USA program, with a goal of creating a CWPP. A CWPP or its equivalent (such as a countywide fire plan with substantial community input) focuses a community on the nature of wildfire hazards and risks, and necessary proactive action. Homes fortified with adequate defensible space and fire resistant roofing, for example, may tend to present fewer risks to firefighters during fire suppression operations and reduce overall firefighting costs by not creating a tactical diversion of scarce firefighting resources to protect people and structures. The process of creating a CWPP also forges a strong partnership with local, state and federal fire services.

Statement of Need

Outreach to priority communities identified in the 2010 assessment is needed. These communities are under substantial threat from wildfire.

Cross-Cutting Issues

Priority landscapes identified wildfire threats to ecosystem health and community safety, however there are a number of cross-cutting issues that include:

- Emerging Markets – Promote hazardous fuel reduction by improved utilization through forest products, small logs, urban green waste and biomass facilities. Promote the use of State and federal incentives for utilization of biomass harvested during wildfire hazard reduction activities, such as the CEC's Renewable Energy Program (California Renewable Portfolio Standard), and the USDA's Biomass Crop Assistance Program (BCAP). Improve community understanding about inherent economic incentives and examples for collection and delivery to biomass processing plants where the cost of transportation is defrayed by selling the biomass.
- Wildfire and Forest Pest Threats to Community Safety – Reduce the occurrence of catastrophic mortality from future forest pest outbreaks or wildfire to protect public safety from fire and falling trees through efficient and effective fire protection planning and suppression and financial management.

Existing Supporting Plans and Programs

Supporting plans include:

California Fire Plan (Unit Plans may serve as CWPP certification for some communities, depending on participation), California State Disaster Mitigation Plan and local disaster mitigation plans, National Fire Plan, county fire plans and regional fire plans.

Existing programs that support strategies include:

- California Fire Alliance http://www.cafirealliance.org/ maintains a list of "communities at risk" and member agencies that support the community assistance goals of the National Fire Plan.
- The Fire Safe Council http://www.firesafecouncil.org/index.cfm provides information on forming local Fire Safe Councils, homeowner information, educational tools for communities, and serves as a grants clearinghouse.
- County Fire Safe Councils address multiple community wildfire planning needs.
- Local Fire Safe Councils serves individual or clustered communities.
- CAL FIRE Unit fire planning process assesses wildfire risks and assets for CAL FIRE Direct Protection Areas, designs and prioritizes fuel hazard reduction projects while encouraging community involvement.
- National Fire Plan may fund local fuel hazard reduction projects that would reduce risks to adjacent lands under federal ownership.
- Joint Fire Science Program develops information to help communities understand how to accomplish community fire planning.
- The Sierra Nevada Conservancy funds hazard mitigation projects.
- Tahoe Conservancy.

Current Constraints

Currently, grant money for fuel hazard reduction may not be used for administrative purposes. This constrains the operations of many local Fire Safe Councils and probably hinders the formation of new local Fire Safe Councils.

The lack of a statewide comparative compilation of information on CWPP's, projects, successes, problems, etc. hinders long-term planning. Uneven community capacity to prioritize and implement fuel hazard mitigation projects may result in wide disparities in wildfire protection levels.

Key Stakeholders and Partners

County Fire Safe Councils, Local Fire Safe Councils, USFS, BLM, DFG, Sierra Nevada and Tahoe Conservancies and other land conservancies, NGOs including Sierra Nevada Alliance and other community based wildfire and watershed protection groups.

Strategies and Supporting Actions

Strategy: 3.3.1. Promote formation of Local Fire Safe Councils for priority communities.

Action A – Assess outreach efforts and recommend enhancements.

Action B – Increase funding for community planning administration.

Strategy: 3.3.2. Promote participation in the National Firewise/USA program.

Action A – Assess current outreach efforts and recommend enhancements.

Strategy: 3.3.3. Establish a statewide comparative database of community wildfire planning.

Action A – Determine key indicators needed for monitoring.

Action B – Develop a web-based and spatially-enabled information system for knowledge sharing.

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Number of communities covered by a CWPP or equivalent.
- Number of Priority Communities covered by a CWPP or equivalent.
- Number of Priority Communities with a local Fire Safe Council.
- Number of people or structures within CWPP coverage.
- Area where projects have reduced fire hazard.
- Area where projects are planned to reduce fire hazard.
- Level of grant funding for wildfire management activities.

Strategy Matrix

Strategy: 3.3.1. Promote formation of Local Fire Safe Councils for priority communities.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Improve support for community wildfire planning.	Priority Communities and currently designated Communities at Risk	Fire suppression costs and losses; Firefighter safety	Fire Safe Councils, California Fire Alliance	Communities; Counties	Local Government	New funding sources	

Strategy: 3.3.2. Promote participation in the National Firewise/USA program.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Improve local fire planning process	Priority Communities and currently designated Communities at Risk	Need for a method to develop CWPP	Firewise, Current recognized communities	Communities	CFA, FSC	Firewise recognition; CWPP; Projects implemented/planned	

Strategy: 3.3.3. Establish a statewide comparative database of community wildfire planning.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Increase collaboration and knowledge sharing in community wildfire planning	Priority Communities and currently designated Communities at Risk	CWPP monitoring and evaluation	CFA Website	USFS, BLM, Counties	CFA	Improved monitoring, better statistics	3.1; 3.7

Strategy Report 3.4:
Emerging Markets for Forest and Rangelands Products and Services

Assessments should identify forest landscape areas where there is a real, near term potential to access and supply traditional, non-timber, or emerging markets such as those for biomass or ecosystem services. These might be areas where necessary infrastructure currently exists, is planned or developing, where group certification of landowners has created market supply aggregation potential, or where retention and management of forest cover presents a money saving alternative to an engineered fix – such as a water filtration facility. Strengthening and developing new market opportunities for forest products and benefits provide incentives for forest stewardship and conservation (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of these strategies are to facilitate the sustainable development of a biomass industry and to develop carbon and other ecosystem service markets as a way to achieve hazard reduction, improved ecosystem health and services, and lowered greenhouse gas emissions in California.

National Goals Supported: Enhance Public Benefits from Trees and Forests, Conserve Working Forest Lands, protect Forests from Harm

Montreal Process/BOF Policy Goal Supported:
MPC-6: Maintenance and Enhancement of Long-Term Multiple Socio-economic Benefits to Meet the Needs of Societies
MPC-2: Maintenance of Productive Capacity of Forest Ecosystems
MPC-3: Maintenance of Forest Ecosystem Health and Vitality
MPC-5: Maintenance of Forest Contribution to Global Carbon Cycles

State Assessment Theme: Emerging Markets for Forest and Rangeland Products and Services.

Defined Landscape Areas

Priority Landscapes:
Primary – Biomass potential for ecosystem health, biomass potential for community safety.

Secondary – Wildfire threat to ecosystem health, restoring wildfire impacted areas, forest pest threat to ecosystem health, restoring forest pest impacted areas, wildfire threat to community safety, forest pest threat to community safety, restoring forest pest impacted communities, sustainable working landscapes.

Priority Areas:
All bioregions except the Mojave and Colorado Desert. The Sacramento and San Joaquin Valley bioregions are lower priority than the more heavily forested bioregions.

Strategies Overview

Purpose of Strategies

Biomass energy is an underutilized resource and an expanded biomass energy industry would provide numerous public benefits including facilitating treatments to reduce wildfire and forest pest threat, restore areas impacted by wildfire and forest pests, and improve productivity of forestlands to sustain working landscapes. Biomass energy is also an important component for meeting the Renewable Portfolio Standard and reducing greenhouse gas emissions.

Ecosystem service markets are emerging in a number of areas including carbon, water, and habitat. Development of these markets provides a means to accomplish both societal and landowner objectives with efficient allocation of resources.

Statement of Need

Biomass energy provides at least a partial economic compensation for treatments that reduce wildfire or forest pest threat, or restore areas impacted by previous events. This is contingent on a biomass facility being within a reasonable distance such that the economic returns are not consumed by transportation costs. Currently, a majority of priority landscapes and priority communities for threat reduction and restoration are too far from existing biomass facilities to make biomass removal a viable option. Sustainable supply, access to markets and technology, as well as additional research, education and policies will be needed to guide development of the emerging biomass industry in California.

Carbon is the most developed ecosystem market and it is still in an early stage. A number of carbon registries and protocols have developed for the voluntary market, but California still lacks a mandatory compliance market where forest and range may participate. Voluntary carbon markets in California for forestry offsets thus far have used the Climate Action Reserve (CAR) forestry protocols, forest management project type. Compliance markets that use sequestration as an offset are in various stages of development at the local, state, regional, national and international levels. Additional experience with other project types such as avoided conversion, reforestation and urban forestry are needed. Soil sequestration and fuels reduction protocols may also be useful.

Other ecosystem services besides carbon can be market driven, such as water quality. Power producers have long recognized that energy conservation is much less costly than new plants. The same logic applies to water management versus costly new treatment options. For example, New York City spends billions of dollars on watershed improvement programs to avoid costly infrastructure improvements. Also, increased private market prices for water quality could encourage landowners to supply more of these public benefits.

Current market conditions offer virtually no incentives to land owners to adopt biodiversity and conservation related ecosystem services. Conservation benefits society

as a whole, but will not be adopted by landowners unless these markets are sufficiently high to make ecosystem services provisions financially competitive. Examples of conservation practices that benefit ecosystem services where private costs exceed private benefits include enhancing wildlife habitat and species conservation, maintaining or improving aesthetics and riparian habitat, forest and range land restoration, including oak woodland re-establishment and afforestation. Conservation banking and green tourism are examples of ecosystem services that have existing markets, but have room for growth. Both payment programs and markets for conservation practices that enhance ecosystem services are needed to achieve forest and range land conservation and the preservation of habitat to increase the flow of ecosystem services.

Cross-Cutting Issues

Priority landscapes identify areas for expanding the current biomass industry or maintaining current facilities. This includes all bioregions with areas of high wildfire or forest pest threat as well as areas already impacted. Carbon production depends on healthy forests for long-term production. There are a number of cross-cutting issues that include:

- Wildfire and Forest Pests Threats to Ecosystem Health – Forest management activities that improve stand health and increases tree growth also promotes wood fiber production and increases wood product flow for biomass facilities.
- Wildfire and Forest Pests Threats to Community Safety – Removal of dead, dying and diseased trees and thinning operations to address forest pests and to improve wildfire protection can also generate additional biomass.
- Sustainable Working Forests – The development of biomass and carbon markets could enhance long-term socio-economic benefits from working forests.
- Urban Forests – Maintenance of urban forests improves urban forest health and sustainability while simultaneously providing potential biomass feedstock to emerging markets.

Existing Supporting Plans and Programs

Supporting plans include:

- *A Preliminary Roadmap for the Future Development of Biomass in California* (CEC, 2006), California Fire Plan – California's strategic plan for reducing wildfire threats, National Fire Plan
- Executive Order S-06-06 (2006): Established a biomass target of 20 percent within the established RPS goals for 2010 and 2020.
- Executive Order S-14-08 (2008): Established accelerated RPS targets (33 percent by 2020) as recommended in the Energy Action Plan II. The order also called for the formation of the Renewable Energy Action Team, comprised of the Energy Commission, Department of Fish and Game, Bureau of Land Management, and U.S. Fish and Wildlife Service. Through the team, the Energy Commission and the Department of Fish and Game are to prepare a plan for renewable development in sensitive desert habitat.
- Executive Order S-21-09 (2009): establishes a target that all retail sellers of electricity shall serve 33 percent of their load with renewable energy by 2020

and directs the ARB to work with the CPUC, the California ISO, and the Energy Commission to adopt regulations by July 31, 2010.
- Global Warming Solutions Act of 2006, Scoping Plan, which identifies five strategies for forest carbon management and includes forest carbon as an offset under a cap-and-trade program; managed by California Air Resources Board.

Existing programs that support the emerging markets strategies include:

- The Sustainable Agriculture Research and Education Program(SAREP) provides leadership and support for scientific research and education in agricultural and food systems that are economically viable, conserve natural resources and biodiversity, and enhance the quality of life in the state's communities.
- California Forest Practices Rules – provides rules and procedures to avoid or lessen adverse effects on the environment from timber harvesting on local, state and privately owned timberlands.
- CAL FIRE Pest Management Program - forest pest specialists help protect the state's forest resources from native and introduced pests, conduct surveys and provide technical assistance to private forest landowners and promote forest health on all forest lands throughout the state
- California Forest Improvement Program (CFIP) – improve productivity of non-industrial private timberlands and includes the improvement of other forest resources, including fish and wildlife habitat, soil, and water quality.
- California Forest Stewardship Program – Designed to promote long-term stewardship of private forest lands.
- University of California Cooperative Extension (UCCE) – Serves forest and range land owners through outreach efforts and technical assistance.
- California Safe Harbor – Encourages land owners to conserve and manage land for endangered species and biodiversity conservation by removing the threat of financial penalties and violations.
- NRCS – Emergency Watershed Protection (EWP), Conservation Stewardship program (CSP), Environmental Quality Incentives Program (EQUIP), Wildlife Habitat Incentives Program (WHIP), Conservation Reserve Enhancement Program (CREP), Wetlands Reserve Program (WRP).
- Healthy Forests Restoration Act – To build-up the capacity to conduct hazardous fuels reduction projects on National Forest System lands and Bureau of Land Management lands aimed at protecting communities, watersheds, and certain other at-risk lands from catastrophic wildfire.
- Existing carbon protocols and registries - Climate Action Reserve (CAR), American Carbon Registry (ACR), Chicago Climate Exchange (CCX), Voluntary Carbon Standard (VCS), and others.
- Developing cap-and-trade systems that incorporate forest offsets: AB32 for California, Western Climate Initiative for regional program, and bills introduced in Congress.

Current Constraints
Relative to fossil fuels, biomass energy provides a wide variety of public benefits for which biomass energy investors are not economically and equitably compensated. Under current economic and policy conditions it is very difficult for biomass energy to compete with fossil fuels (e.g. natural gas).

Markets require adequate supply and demand. They also require transparency as to the quality of the goods for sale. Participation in a new market carries risk for both the producer and consumer of new commodities.

Key Stakeholders and Partners
California Energy Commission, California Biomass Collaborative, California Biomass Energy Alliance, California Air Resources Board, California Forestry Association (CFA), regional air quality districts, timber industry, landowners, local government and NGOs.

Strategies and Supporting Actions

The overall biomass strategy presented here is to support implementation of the California Energy Commission's roadmap for future biomass development (http://www.energy.ca.gov/2006publications/CEC-500-2006-095/CEC-500-2006-095-D.PDF). The first five strategies identified roughly outline steps detailed by this report. Additional details on strategies and actions can be found in the complete report entitled "A preliminary Roadmap for the Development of Biomass in California" (Jenkins, 2006). A strategy for developing carbon markets and a strategy for developing other markets is presented.

Strategy: 3.4.1. Facilitate development of sustainable biomass harvest practices to grow, collect and store forest, range and urban biomass resources and deliver it as feedstock to biomass markets.

Action A – Develop and apply best management practices for resource development, production, and extraction allowing both industry and state enforcement of standards. Where standards do not yet exist, new standards should be developed.

Action B – Determine the long-term biomass supply, if any, that is available from federal lands in or near to California. This will take collaborative processes, planning and long-term stewardship contracts/agreements (Heinz and Pinchot, 2010).

Action C –Establish a process for independent certification of sustainable practices.

Action D – Establish a biomass commodity market and commodity board or commission to facilitate biomass marketing, development of infrastructure, and coordination.

Action E – Develop production, collection, transportation, storage, and processing infrastructure.

Action F – Establish sustainable business certifications.

Action G – Credit sustainable suppliers of feedstock through tax incentives or subsidies in recognition of other costs avoided.

Action H – Provide initial state assistance in funding collection and processing efforts.

Action I – Provide access to extensive biomass resource and market information.

Strategy: 3.4.2. Facilitate the expansion of biomass markets through improved infrastructure (e.g., transmission lines), monetization of external benefits (e.g., hazard reduction), feedstock collection, and generation capacity.

Action A – Ensure adequate feedstock collection, separation, and harvesting equipment Infrastructure is available to all landowners.

Action B – Ensure adequate physical infrastructure is available, such as electricity transmission lines, interconnection, feedstock storage, transportation, and processing capacity.

Action C – Establish policies and enact necessary laws to monetize external benefits and stimulate needed investment through tax credits, price supports and loan guarantees, carbon markets, environmental credits, and other financial incentives.

Action D – Add new power generation capacity including distributed generation.

Action E – Encourage replacement of existing power facilities with more advanced systems such as biomass integrated combined cycles (BIGCC) and increasing use of combined heat and power (CHP) technologies.

Action F – Ensure that new and existing facilities utilize state of the science and technology to provide effective controls on smokestack emissions and other pollutants from biomass burning and conversion facilities.

Strategy: 3.4.3. Support and conduct biomass research and development including life cycle analysis, best management practices, monitoring and sustainability.

Action A – Conduct comprehensive life cycle assessments and health risk assessments systematically comparing waste and resource utilization alternatives.

Action B – Determine and maintain best management practices and conduct monitoring of environmental, health, and safety impacts from feedstock production, handling, processing, conversion, manufacturing, and utilization.

Action C – Conduct basic research to improve sustainability of biomass production systems, increase yields, reduce water and other agronomic inputs, increase resistance of biomass crops to disease and pests, and improve the conversion processes and product quality.

Action D – Conduct applied research and demonstrate commercial scale biomass conversion and biorefinery techniques.

Action E – Conduct market studies and other research to assess the effect of emerging carbon markets (LCFS and cap-and-trade) as drivers to utilize biomass for bioenergy/fuel production and the interplay between biomass, timber, and carbon markets and their impacts on supply and sustainability of forest and range land resources (including carbon sequestration) in California.

Action F – Develop or improve modeling, remote sensing, systems analyses, and systems optimization for land use monitoring, climate change impacts, economic impacts, feedstock production, acquisition logistics, and power plant siting and design.

Strategy: 3.4.4. Support education and training and the development of curricula to inform citizens, consumers, and decision makers and develop well trained biomass industry professionals in California.

Action A – Conduct outreach to local, state and federal government decision makers, schools, non-governmental organizations (NGOs), sustainability groups, and other public interest groups.

Action B – Provide outreach on biomass utilization and establish early dialog with affected communities where facilities are proposed to ensure environmental justice and direct public involvement, and to communicate the benefits of biomass to local communities.

Action C – Provide technical training by and for industry and expanding university curricula and programs to ensure the availability of adequate numbers of skilled professionals and technicians.

Action D – Augment existing cooperative extension programs to inform and educate farmers, producers, operators, investors, and others of results emerging from research and development efforts.

Strategy: 3.4.5. Address existing constraints and develop new policies, laws and regulations that promote and facilitate the expanded use of biomass while protecting the state’s environment.

Action A – Align State and Federal energy and resource policies in the area of bioenergy so they compliment each other and enhance support for this emerging market, while maintaining and enhancing environmental and consumer protections.

Action B – Establish or augment financial incentives, including carbon markets, tax credits, production incentives, and access to capitol.

Action C – Revise waste management policies (e.g., alternative daily cover diversion credits), and practices.

Action D – Revise permitting requirements to enhance interagency communication and create a clear permitting pathway for applicants.

Action E – Establish new or invest in existing enterprise zones with responsibilities and opportunities to support biomass development including assistance identifying biomass power plant locations, local support, and environmental review.

Action F – Implement environmental justice review.

Action G – Enhance access to transmission lines, pipelines, and other infrastructure; and provide equitable policies for net metering, opening direct access, and other incentives intended to stimulate markets.

Strategy: 3.4.6. Support the development of voluntary and compliance carbon markets.

Action A – Encourage the use of registries to track both voluntary and compliance carbon credits. Use registry figures to track market progress.

Action B – Monitor the development of protocols related to forest and range lands to ensure quality and compatibility with laws and regulations.

Action C – Provide technical assistance to landowners, registries and buyers to encourage open and fair markets.

Action D – Facilitate landowner aggregation mechanisms to widen participation.

Action E – Promote funding mechanisms such as low interest loans for project development of high-yielding projects with co-benefits. Reforestation projects often fit this category.

Strategy: 3.4.7. Support the development of other emerging voluntary markets including water, habitat and green tourism.

Action A – Promote an understanding of the costs and benefits of watershed and other management.

Action B – Develop watershed approaches to permits and restoration activities that reward landowners for attaining socially desired future conditions.

Action C – Identify the need for government stimulus of registries, protocols or markets for non-carbon commodities.

Action D – Encourage trade credit systems for habitat provisions and pollution reductions.

Action E – Promote market incentives to encourage landowners to conserve forest and range working landscapes.

Action F – Promote local community and government efforts to acquire and manage additional open space and recreation lands.

Action G – Encourage relevant ecosystem services capabilities expansion on private land.

Action H – Focus on long-term plans and conservation easement conditions that clarify land tenure questions, are approved as alternatives under Forest Practice Rules and reduce compliance costs to landowners.

Action I – Examine use of systems of environmental management that depends on certified, insured and guaranteed operations rather than a permit with civil enforcement.

Strategy: 3.4.8. Support expansion of transmission infrastructure for emerging renewable energy generation from sources such as biomass, wind, hydro and solar in a way that minimizes environmental impact to forest and rangelands.

Action A – Avoid developing in areas that are environmentally sensitive or are prohibited from development by law or policy.

Action B – Support the findings and recommendations of the Renewable Energy Transmission Initiative (RETI) stakeholder steering committee to adopted energy policies that increases generation of electricity from renewable resources.

Action C – Support improvements needed for California's electric transmission infrastructure to get the electricity generated by new renewable power facilities to consumers with minimum impact to forest and rangelands.

Action D – Encourage a transparent, stakeholder based planning process that includes environmental organizations, regulatory and permitting agencies, major transmission providers and renewable energy generators.

Action E – Coordinate corridor designation in accordance with appropriate environmental protections by working with state and federal agencies, environmental groups, BLM Solar Energy Zones, Desert Renewable Energy Conservation Plan, NCCPs and Competitive Renewable Energy Zones (CREZ) defined by RETI.

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Numbers of operational biomass facilities that utilize forest biomass.
- Acres treated to protect from wildfire/forest pest threat or restore impacted areas.
- Percent of total electrical generation obtained from biomass energy.
- Green tons from small diameter and low value trees removed from NFS lands and made available for bio-energy production.
- Carbon tonnes traded annually in the voluntary and compliance markets.
- Annual revenues to forest and range landowners from ecosystem markets.
- Number of rural jobs created.

Strategy Matrix

Strategy: 3.4.1. Facilitate development of sustainable biomass harvest practices to grow, collect and store forest and range biomass resources and deliver it as feedstock to biomass markets.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Facilitate development of sustainable biomass harvest practices to grow, collect and store forest and range biomass resources and deliver it as feedstock to biomass markets.	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Wildfire Threats Forest Pest threats Sustainable working landscapes Rural economic development.	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Number of facilities; Acres of Forestland Restored; Reduced wildfire/pest damages; total energy produced	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.2. Facilitate the expansion of biomass markets through improved infrastructure (e.g. transmission lines), monetization of external benefits (e.g. hazard reduction), feedstock collection, and generation capacity.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Facilitate the expansion of biomass markets through improved infrastructure, monetization of external benefits, feedstock collection, and generation capacity	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Wildfire Threats Forest Pest threats Sustainable working landscapes Rural economic development.	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA: NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Number of facilities; Acres of Forestland Restored; Reduced wildfire/pest damages; total energy produced; rural jobs created	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.3. Support and conduct biomass research and development including life cycle analysis, best management practices, monitoring and sustainability.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support and conduct biomass research and development including life cycle analysis, best management practices, monitoring and sustainability	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Wildfire Threats Forest Pest threats Sustainable working landscapes Rural economic development.	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Number of facilities; Acres of Forestland Restored; Reduced wildfire/pest damages; total energy produced; rural jobs created	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.4. Support education and training and the development of curricula to inform citizens, consumers, and decision makers and develop well trained biomass industry professionals in California.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support education and training and the development of curricula to inform citizens, consumers, and decision makers and develop well trained biomass industry professionals in California	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Wildfire Threats Forest Pest threats Sustainable working landscapes Rural economic development.	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Number of facilities; Acres of Forestland Restored; Reduced wildfire/pest damages; total energy produced; rural jobs created	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.5. Address existing constraints and develop new policies, laws and regulations that promote and facilitate the expanded use of biomass while protecting the state's environment.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Address existing constraints and develop new policies, laws and regulations that promote and facilitate the expanded use of biomass while protecting the state's environment	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Wildfire Threats Forest Pest threats Sustainable working landscapes Rural economic development.	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Number of facilities; Acres of Forestland Restored; Reduced wildfire/pest damages; total energy produced; rural jobs created	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.6. Support the development of voluntary and compliance carbon markets.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support the development of voluntary and compliance carbon markets	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Climate Change	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA; NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Carbon tonnes traded annually in the voluntary and compliance markets.	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.7. Support the development of other emerging voluntary markets including water, habitat and green tourism.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support the development of other emerging voluntary markets including water, habitat and green tourism	Primarily Klamath/North Coast, Modoc, and Sierra bioregions. Secondarily Sacramento and San Joaquin.	Rural Economic Development	CFIP, CFSP, UCCD, CFLP, HFRA, NFP, EWP, CSP, EQUIP, WHIP	USDA-APHIS; State; USFS; CFA; CDFA ;NGO's; landowners; Other Forest industry	Bond Funding; Grants; State and Federal Programs	Annual revenues to forest and range landowners from ecosystem markets.	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy: 3.4.8. Support expansion of transmission infrastructure for emerging renewable energy generation from sources such as biomass, wind, hydro and solar in a way that minimizes environmental impact to forest and rangelands.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support expansion of transmission infrastructure for emerging renewable energy in a way that minimizes environmental impact to forest and rangelands.	Entire state	Wildfire Threats Sustainable working landscapes Rural economic development.	BLM Solar Energy Zones, Desert Renewable Energy Conservation Plan, NCCPs, RETI	State, federal, NGO's, landowners	Bond Funding; Grants; State and Federal Programs	total energy produced, rural jobs created	Protect Forests From Harm Primary: T2.2, Secondary: Enhance Benefits; T3.4, T3

Strategy Report 3.5:
Plant, Wildlife, and Fish Habitat Protection, Conservation and Enhancement

Protection, conservation, and restoration of forested wildlife habitat are critical to maintaining and enhancing the rich biodiversity of our nation. Major threats to fish and wildlife habitat include the patchwork of public-private ownership, threats associated with urbanization and uncharacteristic wildfire. Assessments and resource strategies should identify forest landscapes that represent or contribute to viable wildlife habitats (contiguous or connected), contain high species richness, endemism, and/or that represent core habitat for focal conservation species (i.e. species of concern, threatened and endangered species or keystone species that are representative of a healthy ecosystem). Assessment and resource strategies should incorporate State Wildlife Action Plans. Resource strategies should include actions for conserving and enhancing habitat attributes in priority landscape areas (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: The goals of these strategies are to address the broad need to protect and conserve wildlife and fish habitat in order to enhance high species richness, endemism and core habitat. The strategies are also intended to address the more focused issue of restoring wildfire-impacted lands and reducing risk of wildfire impacts on protected lands that the priority landscape has identified. These strategies also address goals identified at the national and state level, as noted below.

National Goal Supported: Enhancing Public Benefits from Trees and Forests

Montreal Process/BOF Policy Goal Supported:
MPC-1: Conservation of Biological Diversity

State Assessment Theme: Conserve Fish and Wildlife Habitat

Defined Landscape Areas

Priority Landscape(s):
Primary - Wildfire threats to areas protected for habitat
Secondary - Restoring wildfire impacted lands to maintain ecosystem health, preventing and restoring forest pest impacted areas to maintain ecosystem health, maintaining and enhancing water quality through watershed protection, and reducing potential threats to forest species due to climate change.

Priority Areas:
The priority landscape is concentrated in the Sierra, Klamath/North Coast, Modoc and Central Coast bioregions and dominated by federally managed lands interspersed with private lands, although the strategies addressed in this section can apply to the majority of California.

Strategies Overview

Purpose of Strategies

One of the most important functions of California's diverse landscape is to provide essential habitats for the incredible variety of plants, fish and wildlife that occur in the state. These biological resources are entrusted to the state by the public to be managed responsibly. Currently, over 400 animals and 2,200 plants are afforded regulatory protection of various degrees due to population declines. These strategies support efforts in conserving, maintaining and restoring wildlife habitat to reduce stress on ecosystems and protect the state's valuable biodiversity.

Statement of Need

California has an unprecedented level of biodiversity and number of endemic species. Many species are in decline. As the state's human population continues to grow and expand, wildlife, fish and plants are facing compounded threats and stressors. Fire suppression, forest management practices and an elevated number of human-caused ignitions have altered natural fire regimes, resulting in an increased potential for high severity fires. These wildfires destroy valuable forestlands, damage watersheds and significantly alter critical landscapes. Fire suppression activities can also have a detrimental affect on ecological processes such as soil compaction and erosion, water sedimentation, chemical pollution, biodiversity and the introduction of invasive species. As a result, stark habitat alterations occur resulting in acute fish and wildlife impacts and mortality. Many at-risk fish and wildlife species depend on mature forest or woodland conditions for a critical part of their life stage. Due to public safety risks, fire suppression has led to elevated levels of fuel in mature forests, making them highly susceptible to severe fires when they do occur. High severity fires eliminate fire-resistant trees, reducing the proportion of mature forest stands and the wildlife species associated with them.

The California Wildlife Action Plan conducted an extensive evaluation of stressors and needs for wildlife and habitat across the state by bioregion. The plan proposes strategies and actions to address these needs. Implementation of the plan's proposed strategies would greatly benefit wildlife resources. Additionally, strategies to control exotic plant invasions, manage water resources for native fish and protect specialized habitats where rare plants occur need to be implemented across the state.

Cross-Cutting Issues

A number of issues from other chapters are closely related to the well-being of plants, fish and wildlife, and their habitat.

- Wildfire and Forest Pests – Preventing catastrophic wildfire and forest pests' threat to maintain healthy ecosystems and restoring the ecosystems if they are negatively affected by these threats is a direct benefit to wildlife.
- Development – Development and fragmentation are rapidly depleting valuable habitat throughout the state. Land management plans must ensure long-term protection of biological resource values in addition to community development and economic growth.

- Climate Change – The effects of climate change will influence plant and animal species distribution, critical resources and available habitat. Strategies to capture and conserve forest carbon stocks may also simultaneously protect wildlife habitat into the future.
- Water Quality/Quantity – Water quality and quantity can directly affect native fish populations and associated terrestrial plant and wildlife habitat. Watershed protection and improved water quality will benefit fish and wildlife and their habitat.

Existing Supporting Plans and Programs

Supporting plans include:

California Wildlife Action Plan, California Natural Community Conservation Plans, and Habitat Conservation Plans. California Partners in Flight Conservation Plans, State Fire Plan, National Fish Habitat Action Plan, Bay Delta Conservation Plan, USF&WF Recovery plans, Sierra Nevada Conservancy, California Desert Renewable Energy Conservation Plan.

Existing programs and funding authorities include:

State programs:

- California Forest Practice Rules.
- The Wildlife Conservation and Restoration Program – Congressionally authorized federal funding program for wildlife conservation and related recreation and education. While the program has been authorized, it is not currently receiving any funding.
- Inland Wetlands Conservation Program – Administered by the Wildlife Conservation Board to implement the Central Valley Habitat Joint Venture in wetland acquisition and restoration.
- Habitat Conservation Fund – Funding from Proposition 117 to acquire or develop wildlife corridors and trails, and to provide for nature interpretation and other programs which bring urban residents into park and wildlife areas.
- Conservation Banks – Generally protects threatened and endangered species habitat. Credits are established for the specific sensitive species that occur on the site. This program is administered by the Department of Fish and Game.
- Mitigation Banks – The same concept as conservation banking, but is specifically for wetland restoration, creation, and enhancement undertaken to compensate for unavoidable wetland losses.
- California Department of Fish and Game programs include: Biodiversity Conservation, Ecosystem Restoration Program, Hunting, Fishing and Public Use Facilitates, Management of Department Lands, Law Enforcement, Communications, Education and Outreach, Spill Prevention and Response, Significant Natural Areas Program, Natural Communities Program, California Forest Stewardship Program, University of California Cooperative Extension (UCCE).
- CAL FIRE programs include:
  - Vegetation Management Program.
  - Forest Improvement Program (CFIP).

    - Forest and Range Assessment Program.
- CA Department of Pesticide Regulation – Endangered Species Project.

Federal programs:

- NRCS – Emergency Watershed Protection (EWP), Healthy Forest Reserve Program (HFRP), Conservation Stewardship program (CSP), Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Conservation Reserve Enhancement Program (CREP), Wetlands Reserve Program (WRP). Wetland and stream restoration projects, fuel reduction projects when developed and implemented for fish or wildlife benefit.
- BLM – California Desert Conservation Area Plan (CDCA), Resource Management Plans (RMPs).
- US Fish and Wildlife Service – Endangered Species Program, Partners for Fish and Wildlife Service Program, Safe Harbor.
- USFS - Sierra Nevada Forest Plan.

Non-profit organization programs:

- California Native Plant Society's Conservation Program - preserves native plant species and their habitats on public and private lands in California by advocating for the maximum protection of native plants and promoting science-based and ecologically-sound land management practices.
- CalFish - Calfish is the leading source for California anadromous fish and stream habitat data, as well as the standards and tools needed to collect, understand, manage, analyze, and share those data.
- CA Deer Association.
- CA Waterfowl Association.
- Land conservation and land trust organizations.

<u>Current Constraints</u>

Budgets constrain most protection, conservation and restoration programs, which are often cut in economic downturns. Reduction in funds results in inadequate wildlife enforcement and conservation staffing levels during the lean years. Deferred conservation and maintenance can have irreversible impacts on habitat protection and conservation. Inconsistent funding sources are detrimental to restoration and maintenance of conservation areas; parks, ecological reserves, and wildlife areas. Long-term funding mechanisms are generally lacking, which limits adequate continued success criteria, monitoring and adaptive management feedback.

Regional efforts may lack a comprehensive plan that considers biological resource needs. This may lead to unchecked population expansion into previously undeveloped landscapes, inadequate water quality/quantity for fish and wildlife, regulatory inconsistencies and interpretation, in addition to direct mortality and habitat loss from high severity wildfire.

Data collection on fish and wildlife populations, particularly on private lands is a continual challenge of logistics and funding. Current and relevant data is imperative to program success.

Key Stakeholders and Partners
State partners: DFG, CAL FIRE, State Water Resources Control Board, California Department of Parks and Recreation, California Energy Commission, Department of Conservation, California Resources Agency, Wildlife Conservation Board, Cal Trans, Universities, state conservancies.
Federal partners: USFS, BLM, NPS, NRCS, USFWS, USGS, Army Corp of Engineers. NGOs.

Strategies and Supporting Actions

Strategy: 3.5.1. Reduce the loss and modification of habitat that supports wildlife, and maintains California's unique biodiversity.

Action A – Increase land conservation and long-term land protection incentives, particularly focusing on areas of high biodiversity and that contain species of greatest conservation need.

Action B – Target funding to recover sensitive species through improved data collection strategies, conservation planning on private lands, and effectiveness monitoring to validate selected avoidance and mitigation measures.

Action C – Develop a continuous funding mechanism for restoration and maintenance of conservation areas.

Action D – Continue to support funding for increased warden presence and effectiveness throughout the state.

Action E – Map, monitor and effectively eradicate invasive plant and animal species.

Action F – Reduce excessive grazing in montane meadows, aquatic riparian habitat, blue oak woodlands, and bighorn sheep habitat.

Action G – Ensure that hydropower projects provide adequate flow regimes for aquatic species and ecosystems.

Strategy: 3.5.2. Develop policies and incentives to facilitate better integration of wildlife conservation considerations into local and regional planning and land-use decision making.

Action A – Develop policies and incentives to facilitate better wildlife conservation needs into local and regional land-use planning and decision making. For example securing sensitive and key linkage habitat, and ensuring infrastructure and transportation development avoid sensitive species habitat.

Action B – Implement resource management strategies for wildlife management as stated in the California Wildlife Action Plan (CWAP). Maintain a current CWAP by regularly updating it. (http://www.dfg.ca.gov/wildlife/WAP/docs). Continue working toward the completion of the Areas of Conservation Emphasis project.

Action C – Support ongoing vegetation and species mapping, monitoring, technological (GIS and remote sensing) and field data improvements. Continue support to collect baseline inventory and life history information on priority species and their habitats, and maintain current assessments of wildlife species of greatest conservation need.

Action D – Improve public awareness of California's unique natural resource values and the strategies needed for their protection. Enhance communication, education and outreach.

Action E – Develop and enhance partnerships that protect and conserve wildlife habitat. Support collaboration between regulatory agencies, communities and organizations in addressing fish, wildlife and rare plant concerns.

Action F – Implement future regional development plans that consider wildlife habitat, fire prevention and long term maintenance of associated conservation lands.

Action G – Implement planning efforts aimed to establish a system of sustainable habitat connectivity and wildlife corridors, reduce mortality from roadways and increase fish passage. Refine existing large scale tools, such as DFG and CalTrans California Essential Habitat Connectivity Project, so that they can be used for regional and local planning efforts.

Action H – Utilize an adaptive management approach to optimize decision making in implementing conservation programs by adjusting existing management strategies as information is improved through monitoring and research.

Action I - Develop comprehensive watershed management programs that aim to bring private and public stakeholders together to work cooperatively towards an environmentally healthy watershed. This may include conserving, protecting and

restoring aquatic systems, riparian and sensitive habitat and identifying and controlling stressors and pollutant sources.

Action J – Evaluate current regulatory framework regarding wildlife and habitat. Recommend legislative changes as necessary.

Action K – Promote agricultural and rangeland management practices that are compatible with wildlife and habitat conservation.

Action L – Consider predicted climate change effects during conservation planning and restoration.

Strategy: 3.5.3. Sustain healthy forest ecosystems to maintain California's unique biodiversity.

Action A – Include the role of fire in forest and range habitats through managed fire and fire surrogate projects that reduce the potential of high severity wildfire.

Action B – Include minimum impact fire suppression tactics to reduce environmental degradation to natural resources during fire suppression activities.

Action C – Re-establish the landscape to support appropriate fire regimes: reduce fuel accumulation through mechanical and prescribed fire treatments, while minimizing loss of property and life.

Action D – Maintain mixed age, multi-story and ecologically complex forests through landscape management, planning and protection policies, developing old-growth characteristics in forest and plantations and minimizing catastrophic fires to enhance biodiversity.

Action E – Increase environmental monitoring and testing of herbicide application in forest management practices and enforce herbicide and pesticide regulations and oversight under the US EPA and California Department of Pesticide Regulations (DPR).

Action F – Improve building codes for new and expanding communities in fire-adapted landscapes to be more fire compatible in order to allow the state to reduce the need for fire suppression.

Action G – Ensure that the best available science is used to develop timber harvest plans and that they consider cumulative impacts to protect aquatic ecosystems and conserve wildlife habitat for each watershed.

Action H – Continue to support studies intended to better understand the effects of vegetation treatments in regards to wildfire risk, forest health, wildlife and water quality, such as the Sierra Nevada Adaptive Management Project.

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Increased number of regional plans adopted that incorporate biological resource needs.
- Increased number of listed species removed from exceptional regulatory protection.
- Increased number of effective avoidance/mitigation measures developed.
- Increased number of landscape- level analyses that describe important conservation areas and habitat features to aid land use decision-making.
- Increased number of wardens and successful convictions.
- Number of acres of conservation areas increased. Habitat quality objectives outlined, achieved and maintained for each area.
- Number of wildlife corridors, exceptionally lethal roadways and fish barriers identified, prioritized and improved for wildlife protection and free movement.
- Increased number of watershed-level plans developed, implemented, monitored and maintained.
- Acres of wildlife habitat restored or improved to achieve desired wildlife habitat conditions and fire resiliency.

Strategy Matrix

Strategy: 3.5.1. Reduce the loss of wildlife species, their habitats, and maintain California's unique biodiversity.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Reduce the loss of wildlife species and habitat and maintain biodiversity	All bioregions	Development Wildfire Forest Pests Climate change Water quality	CWAP National Fish Habitat Action Plan	NGOs, DFG, CAL FIRE, RWQCB, State Parks, USFS, BLM, NPS, USFWS	Policies, NGOs Grants, Land trusts	Number of acres protected	3.5, 1.1, 2.1, 2.2, 3.1, 3.7

Strategy: 3.5.2. Develop policies and incentives to facilitate better integration of wildlife conservation considerations into local and regional planning and land-use decision making.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Develop policies and incentives to facilitate better integration of wildlife conservation considerations into local and regional planning and land-use decision making	All bioregions	Development Wildfire Forest Pests Climate change Water quality	CWAP National Fish Habitat Action Plan	NGOs, DFG, CAL FIRE, RWQCB, State Parks, USFS, BLM, NPS, USFWS	Policies, NGOs Grants, Land trusts	Number of acres protected	3.5, 1.1, 2.1, 2.2, 3.1, 3.7

Strategy: 3.5.3. Sustain healthy forest ecosystems to maintain California's unique biodiversity.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Sustain healthy forest ecosystems to maintain California's unique biodiversity.	Wildlife threats to areas protected for habitat	Development Wildfire Forest Pests Climate change Water quality	CWAP National Fish Habitat Action Plan	NGOs, DFG, CAL FIRE, RWQCB, State Parks, USFS, BLM, NPS, USFWS	Policies, NGOs Grants, Land trusts	Number of acres protected	3.5, 1.1, 2.1, 2.2, 3.1, 3.7

Strategy Report 3.6:
Green Infrastructure for Connecting People to the Natural Environment

Our nation's federal, state, urban and private forests are the natural backyards for many communities and serve as society's connection to nature. Assessments and resource strategies can attempt to conserve and enhance a green infrastructure that effectively connects people with their natural environment. Resource strategies can include programs that provide opportunities for children, teens and adults to recreate while gaining an appreciation for the importance of forests and open space with respect to the health, security and well-being of society (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies.

GOALS: The goals of these strategies are to improve the opportunities for people to connect with natural environment through conserving and enhancing green infrastructure.

National Goal Supported:

Primary: Enhance Public Benefits from Trees and Forests

Secondary: Conserve Working Forest Lands
Protect Forests from Harm

Montreal Process/BOF Policy Goal Supported:
Primary: MPC-6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

Secondary:
MPC-1: Conservation of biological diversity
MPC-2: Maintenance of productive capacity of forest ecosystems
MPC-3: Maintenance of forest ecosystem health and vitality
MPC-4: Conservation and maintenance of soil and water resources
MPC-5: Maintenance of forest contribution to global carbon cycles

State Assessment Theme:
- Conserve green infrastructure
- Manage green infrastructure
- Support programs that connect people to green infrastructure

Defined Landscape Areas

Priority Landscape(s)/Areas:

Conserve Green Infrastructure

1. Bioregions with the most high and medium priority landscapes (green infrastructure that serves large populations that are at risk from development): South Coast, Bay/Delta, Sierra (northern)
2. Bioregions with limited options for preserving remaining green infrastructure: San Joaquin, Sacramento Valley
3. Green infrastructure that provides unique amenity or cultural values: all bioregions

Manage Green Infrastructure

1. Bioregions with the most high and medium priority landscapes (green infrastructure that is an important recreation area or that serves large populations, that is at risk from wildfire or forest pests): South Coast, Bay/Delta, Central Coast
2. Bioregions with green infrastructure threatened by exotic invasive species, climate change, and other threats not addressed in the assessment analysis, or by budget constraints that create deferred maintenance backlogs, reduced law enforcement, shorter hours of operation, or reduced staffing/programs that impact diversity or quality of services provided: all bioregions

Strategy Overview

Purpose of Strategy

California's statewide outdoor recreation strategy is formulated through a combination of two documents. First, the California Outdoor Recreation Plan (CORP), published every five years by the California Department of Parks and Recreation, identifies various issues and needs of statewide importance. The CORP "provides guidance for the planning, acquisition and development of needed recreation lands and facilities by detailing these concerns and identifying actions to address them" (CORP, 2009). In addition, the CORP serves to prioritize expenditures of the Land and Water Conservation Fund (LWCF).

Secondly, the Recreation Policy, developed by the State Park and Recreation Commission, and adopted by the Director of the California Department of Parks and Recreation, outlines the state's strategies and priorities based on issues and needs identified in the California Outdoor Recreation Plan (CORP). California's 2005 Recreation Policy addresses five general policy areas:

- adequacy of recreation opportunities
- leadership in recreation management

- recreation's role in a healthier California
- preservation of natural and cultural resources
- accessible recreational experiences

The statewide recreation policy provides direction to the various government entities and other organizations actively involved in acquiring, managing, and connecting people to green infrastructure. A coordinating strategy can allow them to work collectively towards common goals. There are examples in different parts of California of successful regional green infrastructure strategies. In general they appear to have the following characteristics in common, which are consistent with direction provided by the statewide policy:

- Address multiple issues beyond just recreation, such as wildlife habitat, water quality, economic development and quality of life.
- Are regional rather than community based, to adequately address landscape-level issues such as wildlife habitat, water and linkages between recreation facilities and organizations
- Involve a variety of stakeholders
- Utilize mapping technologies such as GIS and quality data sources as a way to involve stakeholders in the decision-making process
- Address acquisition priorities for green infrastructure, as well as ongoing maintenance, and protection from various threats.
- Result in an ongoing process rather than a one-time document
- Address innovative solutions for funding sources
- Involve local populations in becoming stewards or sponsors

In addition to strategies identified in the CORP and State Recreation Policy, there are three recommended green infrastructure strategies to support these regional efforts:

- Provide assistance to facilitate regional collaborative efforts to develop an ongoing strategy for protecting, managing, and connecting people to green infrastructure.
- For regions with a strategy in place, provide assistance for reaching the shared goals.

These strategies are not a substitute for statewide recreation policy; they should be viewed as effective implementation of statewide policy direction at the regional and local level through coordination and stakeholder involvement. In addition, it should be recognized that regional green infrastructure strategies are broader in scope than recreation, since they also address issues related to conserving working landscapes and other open space, wildlife habitat, water, economic development and quality of life.

Statement of Need

Green infrastructure refers to all forest and rangeland landscapes, which provide critical economic, social, cultural, and environmental services such as recreation, open space, watersheds, wildlife habitat, and working landscapes for commodity production. Green infrastructure is being lost to development, particularly in the areas where it is needed

most, near large population centers. In some bioregions, options for protecting remaining green infrastructure are already limited. In others, extensive development pressures threaten to severely reduce remaining protection options in the coming decades. Finally, all bioregions have areas worthy of protection due to unique amenity or cultural characteristics.

Ongoing management is needed to protect green infrastructure from a variety of threats such as wildfire, forest pests, exotic invasive species, and climate change, and to restore areas impacted by previous threat events. Management is also needed for addressing facility maintenance and law enforcement, which are critical for meeting the demand for diverse and safe high quality outdoor experiences. Finally, economic conditions are impacting the programs that connect people to green infrastructure, including those directed towards children.

Cross-Cutting Issues

Priority landscapes were developed to conserve and manage green infrastructure and to connect people to green infrastructure. However, there are a number of cross-cutting issues that include:

- Development – Development and fragmentation are rapidly depleting open space throughout the state. Land-use planning influences the quality and quantity of accessible green infrastructure that is conserved and maintained throughout communities and regions.
- Sustainable Working Forests and Rangelands – Protecting forest and rangeland from catastrophic fires or the use of fire to improve forest or rangeland ecosystems can also improve recreation opportunities and green infrastructure.
- Urban Forestry – Conserving and improving urban forests enhances socio-economic well being and benefits community infrastructure. Areas identified as urban forests that would benefit from management or restoration are often areas that can act as green infrastructure, thus strategies for conserving urban forests may also improve and enhance green infrastructure.

Existing Supporting Plans and Programs

Within California there are examples of effective regional and local efforts to protect and manage green infrastructure. Many individual agencies have well developed plans in addition to the ones listed below.

Supporting plans include:

California Outdoor Recreation Plan (CORP), California State Coastal Conservancy Strategic Plan, California State parks Off-Highway Motor Vehicle Recreation Division Strategic Plan and California Recreational Trails Plan.

Existing programs that support strategies include:

Regional programs:

- *Golden Lands, Golden Opportunity* (Bay Area Open Space Council, Greenbelt Alliance, 2008) is a cooperative effort to create a coordinated, strategic approach to creating access, funding conservation and adapting strong planning policies for protecting Bay Area lands to support people, wildlife, health and the economy.
- Central Valley Vision Draft Implementation Plan **-** focuses on helping to meet the public's recreation needs in the Central Valley through building economic and volunteer partnerships, acquiring new park lands and developing new and improved recreation opportunities.

State programs:

- Statewide Park Development and Community Revitalization Program (Proposition 84) – made $368 million available to develop new parks and recreation facilities in proximity to the most critically underserved communities across California.
- The California State Parks Statewide Trails Program - provides public information and technical assistance for trail-related issues affecting all California trails and greenways.
- Local Coastal Programs – offers planning tools for local governments to guide development in the coastal zone to help protect, conserve, restore, and enhance environmental and human-based resources, in partnership with the Coastal Commission.

Federal programs:

- Land and Water Conservation Fund – provides federal funding for state and local outdoor recreation projects.
- Federal Lands to Parks Program (NPS) – helps communities create new parks and recreation areas by transferring surplus Federal land to state and local governments. This program helps ensure public access to properties and stewardship of the properties' natural, cultural and recreational resources.
- The Rivers, Trails, and Conservation Assistance Program (NPS) – community assistance program helps communities conserve rivers, preserve open space, and develop trails and greenways.

Current Constraints

Funding is the primary constraint, for facilitating development of regional strategies, implementing existing and new strategies, and supporting programs that connect people to green infrastructure. Funding is lacking to continue the maintenance and access to existing facilities and opportunities.

Opportunities for new park and open space systems and access to green infrastructure are being threatened as climate change, habitat degradation and development pressures are depleting green landscapes.

Key Stakeholders and Partners

State entities such as California Department of Parks and Recreation, California Department of Fish and Game, State Park and Recreation Commission. NGOs such as Rails to Trails Conservancy, The Trust for Public Land, Bay Area Open Space Council,

California State Parks Foundation, The Nature Conservancy, Pacific Forest Trust, and many others. Federal entities such as NPS, USFS, BLM, USF&WS, and groups and private entities within each region that provide funding to conserve, manage, and connect people to green infrastructure.

Strategies and Supporting Actions

Strategy: 3.6.1. Support efforts to develop and maintain regional strategies to conserve, manage, and connect people to green infrastructure.

Action A – Encourage regional efforts and partnerships in developing green infrastructure strategies in priority bioregions by providing start-up funding to launch initial regional planning efforts.

Action B – Encourage the California Biodiversity Council to facilitate communication among regions by posting web documents related to the current status of green infrastructure strategies in each bioregion.

Action C – Provide assistance for successful regional green infrastructure planning efforts to continue, expand in scope, and evolve to meet additional threats and challenges in the future.

Action D – Maintain appropriate datasets, such as ownership, parcel, landuse and wildlife data, and make it accessible to planning groups.

Action E – Plan for conservation across political boundaries in regional park systems to ensure that all communities have access to green space.

Strategy: 3.6.2. Support implementation of regional green infrastructure strategies.

Action A – Provide funding to assist in regional implementation efforts for regional plans developed in strategy 3.6.1.

Action B – Encourage and enhance opportunities for regional coordination efforts to apply for grant monies through programs such as Land and Water Conservation Fund (LWCF) grant allocations, and other bond monies allocated to parks, recreation and resource related projects.

Action C – Continue to support regional programs that are successful at conserving, managing and connecting people to green infrastructure.

Action D – Increase funding for acquisition locally to leverage state funds to create and safeguard green infrastructure in perpetuity through existing bonds, local measures and budget appropriations at all levels of government.

Action E – Adopt urban growth boundaries and tighten growth controls at the city and county levels to protect natural areas.

Action F – Promote landuse policies that direct development away from natural areas and protect resources to prevent habitat fragmentation and destruction.

Action G – Provide access to parks and keep parks safe, clean and continue funding for ongoing maintenance.

Strategy: 3.6.3. Support efforts to develop, implement and maintain state strategies to conserve, manage, and connect people to green infrastructure

Action A – Implement state level policies and plans, for example the California Outdoor Recreation Plan as the statewide master plan for parks, outdoor recreation and open space for California, and continue its responsibility in prioritizing LWCF grant allocations.

Action B – Implement the Off-Highway Vehicle (OHV) California State Parks Off-Highway Motor Vehicle Recreation Division Strategic Plan which aims to connect people with nature through OHV recreation while minimizing environmental impacts.

B-1. Sustain existing opportunity by implementing sound level and dust level management programs, and identifying and reducing threats of urbanization on existing and future OHV opportunities and the loss of open space.

B-2. Increase OHV opportunities in response to future demand.

B-3. Develop an informed and educated community by creating an education program, increase availability of training classes and insure that OHV advertising accurately represents responsible OHV use.

B-4. Maintain cooperative relationships and improve communication, coordination and integration between agencies and stakeholders, and improve and increase public involvement.

Action C – Sustain state efforts to connect people to their environment by continuously improving recreational opportunities.

Action D – Continue to support legislation and bond measures that are allocated to protect forests, preserve open space and repair and improve state and neighborhood parks.

Action E – Strengthen support for conservancies and programs that strive to acquire or maintain coastal land, open space and park public access.

Recommended Performance Measures

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

(Modified from BOF Policy Statement)

- Area and percent of forest and rangeland (green infrastructure) managed for general recreation and tourism.
- Number and type of facilities available for general recreation and tourism (adjusted for hours of operation).
- Number of visitor days attributed to recreation and tourism, in relation to population and forest and rangeland area.

Based on assessment chapter and analyses;

- Percent of green infrastructure in protected status by county.
- Acres of green infrastructure protected by non-government organizations by county.
- Acres of HPL and HMPL green infrastructure added to protected status annually.
- Acres of HPL and HMPL green infrastructure treated annually to reduce threats from wildfire, forest pests, and exotic invasive species.
- Acres of HPL and HMPL green infrastructure treated annually to restore areas previously impacted by wildfire, forest pests, or exotic invasive species.
- Participation in outdoor recreation activities by youth, low income economic youth, and low income adults.

Strategy Matrix

Strategy: 3.6.1. Support efforts to develop and maintain regional strategies to conserve, manage, and connect people to green infrastructure.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support efforts to develop and maintain regional strategies to conserve, manage, and connect people to green infrastructure	South Coast, Bay/Delta, Sierra (northern), San Joaquin Valley, Sacramento Valley, Central Coast	Wildlife habitat, water quality, economic development, quality of life, climate change, working landscapes	Bay Area's *Golden Lands, Golden Opportunity*, Central Valley Vision Draft Implementation Plan	Conservancies, land trusts, local government, local citizens and businesses, state and federal agencies, academics	Funding to develop strategies can come from a variety of sources such as local government, non-government organizations, and grants from foundations	Percent of HPL and HMPL green infrastructure covered by a regional strategy	All

Strategy: 3.6.2. Support implementation of regional green infrastructure strategies.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support implementation of regional green infrastructure strategies	South Coast, Bay/Delta, Sierra (northern), San Joaquin Valley, Sacramento Valley, Central Coast	Wildlife habitat, water quality, economic development, quality of life, climate change, working landscapes	Numerous strategies are in place or under development in different areas of the state	Conservancies, land trusts, local government, local citizens and businesses, state agencies, academics	Funding for land acquisition and easements typically comes from conservancies, land trusts, local government, state and federal agencies.	Acres of HPL and HMPL green infrastructure added to protected status annually	All

Strategy: 3.6.3. Support successful programs to conserve, manage, and connect people to green infrastructure.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support efforts to develop, implementation and maintain state strategies to conserve, manage, and connect people to green infrastructure	All bioregions	Wildlife habitat, water quality, economic development, quality of life, climate change, working landscapes	Statewide Park Development and Community Revitalization Program, The California State Parks Statewide Trails Program.	Conservancies, land trusts, various non-profit organizations, federal agencies.	Government programs are funded through local, state, and federal agencies. Various non-profits are funded via donations, grants, or foundations.	Number of visitor days attributed to recreation and tourism, in relation to population and forest and rangeland area; Participation in outdoor recreation activities by youth, low income economic youth, and low income adults.	All

Strategy Report 3.7:
Climate Change: Threats and Opportunities

America's forests offset a significant portion of the nation's annual carbon emissions. Additional climate change mitigation benefits could be achieved through partnerships and management measures. These measures include supporting the development of markets for carbon offsets, utilizing woody biomass for energy, wood product substitution, and promoting tree growth in urban areas. Assessments should identify opportunities for promoting carbon emissions offsets through forestry.

The important benefits that forests provide, such as biodiversity, wildlife habitat, and water storage and flows are affected by climate change. Forest range, type and composition are projected to change significantly– with corresponding changes in wildlife habitat, biodiversity, water flows, and fire regimes. Assessments should consider how climate change will affect important public benefits from forests. Resource strategies should attempt to maintain and enhance resilient and connected forest ecosystems that will continue to provide public benefits in a changing climate (excerpted from the US Forest Service State and Private Forestry Farm Bill Requirement and Redesign Strategies).

GOALS: Promote actions to preserve and enhance carbon sequestration (i.e. mitigation) and actions to promote ecosystem health and resilience under changing climate conditions (i.e., adaptation).

National Goal Supported: Enhancing Public Benefits from Forests

Montreal Process/BOF Policy Goals Supported:
MPC-5: Forests and Climate

State Assessment Theme: Threats to forest carbon and long-term carbon sequestration; potential threats to key forest species

Defined Landscape Areas

Priority Landscape(s):
Primary – Forest Carbon & Ecosystem Threats; Forest Carbon & Threats from Development
Secondary – Wildlife, Sustainable Forests, Wildfire Threat to Ecosystems, Forest Pests

Priority Areas:
Sierra and North Coast bioregions (threats from wildfire & pests)
Bay Area, South Coast, and Sacramento Valley (threats from development)

Strategies Overview

Purpose of Strategies

Climate change is likely to alter California's forests and affect a broad range of ecosystem services that forests produce. These services include: carbon sequestration, wildlife habitat, conserving biodiversity, nutrient cycling, maintenance of air quality, and protecting water produced in upstream watersheds. Under future climate conditions forest management will need to identify forest ecosystems that are most vulnerable to climate change and develop appropriate strategies that both minimize the impacts and adapt to changing environmental conditions.

Collectively, the proposed strategies for climate change address actions to preserve and enhance carbon sequestration (i.e., mitigation) and actions to promote ecosystem health under changing climate conditions (i.e., adaptation). In California, extensive work has already been done to develop strategies that address both mitigation and adaptation needs in forestry. The California Adaptation Strategy (CAS) and the AB32 Scoping Plan are recent statewide plans that serve as the primary guides for climate change strategies on forest lands.

Statement of Need

Climate can greatly influence the dynamics of forest and range ecosystems. Climate influences the type, mix and productivity of species. Future climate change scenarios predict increases in temperature, increases in atmospheric CO2 concentrations and changes in the amount and distribution of precipitation (Cayan et al., 2006). Altering these fundamental drivers of climate can result in changes in tree growth, changes in the range and distribution of species and alteration to disturbance regimes (e.g., wildfires, outbreaks of pests, invasive species).

The assessment report projects trends in forest carbon from the present through 2100. The findings suggest that forest carbon will remain stable through 2050 and then decline through 2100. There are substantial threats to forest carbon from projected increases in high severity wildfire and increased mortality associated with outbreaks from forest pests. Losses from wildfire and other types of mortality are a natural part of the forest carbon cycle, but the extent and magnitude of losses to forest carbon stocks are anticipated to increase under future climate change scenarios. In addition, findings suggest that forest carbon stocks will be impacted over time with increasing development. Threats to forest carbon from expanding development are less extensive than losses from wildfire or forest pests, but represent a more permanent loss and also reduce the potential area that can support forests. Strategies are needed to address both types of threats and to protect and enhance carbon stocks over time. In summary, primary threats to forests and forest carbon from climate change include:

- Wildfire
- Forest pests
- Development

- Shifts in species range

Cross-Cutting Issues

Priority landscapes were developed for threats to forest carbon from wildfire, forest pests, and development. However, the impacts brought on by climate change can produce a number of cross-cutting issues. These priority issues include:

- Wildfire – climate change expected to increase frequency and extent.
- Forest pests – increased frequency of outbreaks possible under warmer temperature scenarios.
- Shifts in species ranges – the distributions of tree, shrub, and herbaceous plant species are affected by climate; expected shifts will likely have secondary effects on vegetation composition, fire regimes, and wildlife habitat.
- Forest hydrology – warming conditions under future climate scenarios are expected to lead to declining snowpack and earlier snowmelt. This in turn will affect the timing and distribution of water and soil moisture in summer months.
- Interacting and synergistic effects.

Existing Supporting Plans and Programs

Supporting plans include: California Adaptation Strategy (CAS), Assembly Bill 32 Scoping Plan, Forest Service Global Change Research Strategy, 2009 – 2019, Forest Service Strategic Framework for Responding to Climate Change.

Existing programs that support strategies include:

- California Forest Improvement Program (CFIP) - includes the improvement of all forest resources, including fish and wildlife habitat, soil, and water quality.
- Vegetation Management Program – supports fuels reduction actions to decrease the likelihood of high severity fire damage to forest carbon and to increase forest resilience to predicted increases in wildfires and pests.
- California Forest Stewardship Program – Designed to promote stewardship of private forest lands.
- Wildlife Conservation Board.
- NRCS - Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), and Conservation Stewardship Program (CSP).
- USFS—Region V Best Management Practices Evaluation Program, State and Private Forestry programs.
- Voluntary markets for carbon offsets; Climate Action Reserve
- Possible future compliance markets under AB32, WCI, or national programs.
- CEC’s AB 118 program.
- ARB’s Low Carbon Fuel Standard program.
- Renewable Energy Standard.
- USFS National Insect and Disease Risk Model program.
- PIER Program – Climate Monitoring, Analysis, and Modeling

Current Constraints

Protection and maintenance of existing carbon stocks and reforestation to expand or replace lost forest stands are limited by: funding, lack of long-term planning, limited market based solutions, infrastructure, limited public education and outreach capacity to understand potential climate related impacts and to identify effective solutions at the community level.

Key Stakeholders and Partners

USFS, CALFIRE, Department of Fish and Game (DFG), California Energy Commission (CEC), California Air Resources Board (CARB), Natural Resources Conservation Service (NRCS), local government entities, industrial and non-industrial timber companies, Sierra Nevada Conservancy and other land conservancies, and NGOs.

Strategies and Supporting Actions

Strategy: 3.7.1. Protect and enhance the capacity of California's forests to sequester carbon through reducing risk of loss from disturbance, protecting existing forest land, and expanding forest area through tree planting.

Action A – Implement key strategy elements from the AB32 Climate Change Scoping Plan on forestry. Key actions include:

A-1. Increase reforestation of previously deforested areas.

A-2. Avoid deforestation.

A-3. Urban tree planting for carbon sequestration and energy reductions from increased tree shading.

A-4. Reduce risk of losses from wildfire by removing forest fuels and utilize materials for bioenergy.

A-5. Protect existing carbon stocks through forest conservation. maintain and enhance carbon stocks through forest management.

Action B – Implement key elements from the California Adaptation Strategies (CAS) report that promote and enhance forest carbon sequestration.

Action C – Improve methods for conducting periodic inventories of forest carbon.

Action D – Prioritize fuel treatments in watersheds that support multiple benefits and address a range of cross-cutting issues (i.e. reduction of fire threat, watershed protection, forest health, habitat protection).

Action E – Implement strategies A - C from Board of Forestry Policy Statement that protect or enhance carbon sequestration (Criteria 5, Forests and Climate) and related actions.

E-1. Promote conservation and management of forest lands and vigorous stands, which can significantly contribute to large-scale air pollution reduction. Maintain healthy forests which are vital to protecting resources

from air borne waste impacts and which provide opportunities to contribute to pollution reduction through carbon sequestration.

E-2. Promote forest health and conserve forest lands from land use changes by providing financial opportunities to land owners who are managing their lands in ways that positively influence sustainable carbon storage.

E-3. Create markets for carbon and other ecosystem services to provide additional funds to landowners, including mechanisms to facilitate participation by small landowners (e.g., carbon aggregators).

E-4. Develop carbon protocols for fuels reduction to reduce wildfire emissions.

E-5. Work with CEC and ARB to evaluate life cycle carbon benefits of biomass utilization to ensure participation and funding for forest sector wood waste contributions to bioenergy.

E-6. Maintain existing ecosystem services/market infrastructure.

Action F: Support forest sector research and monitoring; including needs identified by the Climate Action Team (CAT) Research Committee and Subgroup.

F-1. Promote the use of CAL FIRE's Demonstration State Forest system in conducting research on the effects of climate and forest management on carbon and GHG emissions.

F-2. Support monitoring projects to evaluate the effectiveness and possible environmental impacts of management actions designed to mitigate or adapt to climate change.

Strategy: 3.7.2. Support Adaptation Needs for Forests by Assessing Climate Vulnerabilities, Improving Institutional Capacity, and Promoting a Priority Research Agenda.

Action A – Implement long-term actions from the California Adaptation Strategies (CAS) report that address adaptation needs. Key elements include:

A-1. Refine priority landscapes by promoting regionally-based vulnerability assessments.

A-2. Implement forest and rangeland actions that create forest stands that are more resilient to expect future climate conditions.

A-3. Building institutional capacity and decision support systems.

A-4. Promoting local emergency response planning.

Action B – Support priority research needs identified in CAT Research Committee, CAS and Forest Service Global Change Research Strategy, 2009 – 2019.

B-1. Support collaboration among land-based forest research institutions (USFS, DSF, PSW and UC demo forests (Blodgett)) to create representative geographic and elevation transects of forest habitats to

monitor the effects of climate and of potential mitigation and adaptation actions.

Action C – Implement strategies E and F from Board of Forestry Policy Statement that support adaptation (Criteria 5, Forests and Climate).

C-1. Maintain and adjust capacity and flexibility of emergency services related to natural process such as flooding, disease, and wildfire.

C-2. Develop a contingency plan for ecological impacts of climate change, including seed banks and land trades adjusted to ranges of vegetation types.

Action D – Implement projects that demonstrate climate adaptation actions, such as reforestation of high severity wildfire burns, (e.g., Cuyamaca project with DPR, American Forest Foundation, Odwalla) and riparian flood plain forest.

Strategy: 3.7.3. Support Actions that Maintain, Enhance, and Protect Ecosystem Functions to Promote Biodiversity and Increase Resilience to Climate Change.

Action A – Implement strategies identified in the California Climate Adaptation Strategy under Biodiversity and Habitat. This includes strategic planning for conservation areas, ecosystem restoration, regulatory requirements, research needs, and public outreach.

Action B – Maintain connectivity across forest landscapes by reducing fragmentation and identifying important habitat corridors and key linkages between conservation areas.

Action C – Restore degraded forest and rangelands to enhance biodiversity and related ecosystem services.

Action D – Support restoration actions to reduce impacts from invasive species and pest outbreaks on forest and rangelands.

Action E – Maintain biodiversity multiple spatial scales, including: stand, landscape, and bioregional.

Action F – Evaluation, monitoring and protection of habitat that serves as key refugia on forests and rangelands.

Recommended Performance Measures (modified from BOF Policy Statement; CAS report)

Note: Where appropriate, use one or more of the measures listed below to report on effectiveness. Extent of reporting is contingent on funding.

- Trend in aboveground carbon sequestration and stocks from California forest (see T1.2 of assessment report).
- Trends in extent and frequency of wildfires; include trends in fire severity pending data availability.
- Volume and value of forest carbon offset markets and revenues for other ecosystem services
- Trends in extent of outbreaks from forest pests.

Strategy Matrix

Strategy: 3.7.1. Protect and enhance the capacity of California's forests to sequester carbon through reducing risk of loss from disturbance, protecting existing forest land, and expanding forest area through tree planting.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Protect and enhance the capacity of California's forests to sequester carbon through reducing risk of loss from disturbance, protecting existing forest land, and expanding forest area through tree planting	Sierra & North Coast	Wildfire threat, forest health, watershed protection	CALFIRE – CFIP, VMP, Urban Forestry NRCS – EQUIP, WHIP, PIER Climate Research, GHG Inventory, IFWG; USFS NIRDM	USFS; CALFIRE; NRCS, CEC, ARB, CalEPA, DPR, Climate Reserve	Land Trusts; IRWMP grants; SNC grants; voluntary carbon market; WESTCARB	Trend in carbon sequestration ; acres reforested; volume and value of forest carbon offsets and ecosystem services revenues	Climate Change

Strategy: 3.7.2. Support Adaptation Needs for Forests by Assessing Climate Vulnerabilities, Improving Institutional Capacity, and Promoting a Priority Research Agenda.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support Adaptation Needs for Forests by Assessing Climate Vulnerabilities, Improving Institutional Capacity, and Promoting a Priority Research Agenda	Statewide for high priority areas	Ecosystem health; wildlife habitat; community capacity	CALFIRE – CFIP, VMP, Urban Forestry NRCS – EQUIP, WHIP, PIER; USFS NIRDM	USFS; DFG; CALFIRE; NRCS; DPR; DWR; CEC	Federal & State Grants (USEPA; SWRCB; DWR)	Trends in forest health	Climate Change

Strategy: 3.7.3. Support Adaptation Needs for Forests by Assessing Climate Vulnerabilities, Improving Institutional Capacity, and Promoting a Priority Research Agenda.

Long-term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Existing Programs	Partners / Stakeholders	Resources Available	Measures of Success	National Objectives Supported
Support Actions that Maintain, Enhance, and Protect Ecosystem Functions to Promote Biodiversity and Increase Resilience to Climate Change	Statewide for high priority areas	forest health; wildlife habitat;	CALFIRE – CFIP, VMP, Urban Forestry NRCS – EQUIP, WHIP, PIER; USFS NIRDM	USFS; DFG; CALFIRE; NRCS; DPR; DWR; CEC; NGO's; Landowners	Federal & State Grants (USEPA; SWRCB; DWR)	Trends in forest health; species diversity; trends in invasive species	Climate Change

STRATEGIES FOR DATA LIMITATIONS

It is the intent of the State Legislature to provide for the assessment of California's forest resources in order to develop and implement forest resources policies for the state. Better use of forest resources can result where there is good information as to anticipated needs and constraints and the potentials for meeting such needs. The forest resources of California provide vitally important economic and environmental benefits to the people of California. Demands on forest resources in California are expected to increase significantly in the next decades. The necessary information is not now available and should be developed (excerpted from the California Forest and Rangeland Resources Assessment and Policies Act 1977).

GOALS: Improve the quality, access, and governance of data and analytical methodologies that support the underlying decisions on forest and range polices.

National Goal Supported: Enhance Public Benefits from Trees and Forests, Conserve Working Forest Landscapes, Protect Forests from Harm.

Montreal Process/BOF Policy Goal Supported:
To provide for the assessment of California's forest resources in order to develop and implement forest resources policies for the state.

State Assessment Theme:
Develop and maintain an effective system for the collection, analysis, and display of forest and rangeland data in forms that contribute to the achievement of sound forest policies in California.

Defined Landscape Areas

Priority Landscapes: Forest and Rangeland

Priority areas: Statewide, but with an emphasis on Sierra, Klamath/North Coast, Bay/Delta, Central Coast, South Coast, and Modoc bioregions

Strategy Overview

Purpose of Strategies
The purpose of this strategy is to improve the timeliness, quality, access, stewardship, and coordination of data and analytical methodologies that support the underlying decisions on forest and range polices in California. This can be accomplished through enhancing collaboration and by identifying and filling gaps in data availability, improving information management systems and methodologies, updating out-dated information and addressing deficiencies in data attribution, management, access, and analysis.

Statement of Need

Many agencies and stakeholders need and use data that is available for forest and rangeland. Data sets come from many sources, including governmental agencies, landowners, non-profits and others. Federal and state agencies play a vital role in the development and provision of data related to forest and rangelands. California has taken many steps to address challenges related to data and its delivery; some of which relate to information on forest and rangelands. Examples include the coordinating efforts of the Resources Agency (such as CERES) and the Environmental Protection Agency and their various departments. Various stakeholders have signed a Memorandum of Understanding recognizing the importance of vegetation data and the value of a collaborative approach. However, to date, funding has not been allocated to ensure that quality data are captured and maintained on a statewide basis.

Still, there many challenges; for example, a few are:

- Available data may not be at the desired scale or accuracy and may not have the attributes needed.
- Purposes of collection, methods of gathering data, and results may not be comparable
- The number of agencies involved in preparing and analyzing data is sufficiently large that it is hard to stay current
- Issues and questions may evolve or change that demand new data sets
- Gathering and compilation of data may be expensive and time consuming
- Interpretation and application of similar data to policy questions can vary.
- In many cases, existing funding sources are neither sufficient nor stable

In the context of the assessment, one illustration comes from complications associated with use of vegetation data. Vegetation data contributed to analyses in every assessment chapter. It was used to map and rank critical assets such as ecosystems, timber, range forage, biomass, carbon storage, forest meadows and riparian areas (for water analyses), urban tree cover, and green infrastructure. It also contributed to defining major threats such as wildfire, climate change, and urban heat potential. For the assessment, various vegetation data sources were utilized as the “best available” data. This often resulted in using data captured to different standards at various time periods, some captured as long as 20 years ago. Invariably, this had a negative impact on the quality of analyses. Also, mapping efforts within the state have typically focused on non-urban lands, and were inadequate for addressing urban forestry issues.

Cross-Cutting Issues

Table 1. Framework datasets used for multiple purposes in the assessment

Data Theme (# of chapters)	Uses	Quality issues
Vegetation (11)	Ecosystems, timber asset, range asset, wildfire threat, forest meadows, riparian cover, tree canopy (urban forestry), green infrastructure, vegetation types (reporting unit)	Outdated, inconsistent, inadequate for urban forestry
Development (8)	Undeveloped lands, housing asset, energy use	10 year census cycle inadequate to track/project development, too coarse in rural areas
Land ownership (7)	Developable lands, protected lands, recreation areas, federal/private (reporting unit)	Problems identifying protection status, missing Dept. of Defense and BIA lands
Fire perimeters (7)	Fire threat input, burn severity, condition class input	Missing perimeters, quality of severity data
Communities (6)	Reporting unit	Census data inadequate for unincorporated places, misses areas, outdated
Tree mortality (5)	Forest pest current damage/future threat	Unknown accuracy
Forest survey data (3)	Timber growth/inventory, carbon storage & sequestration, biomass potential, underperforming stands	10 year update cycle, concentration on timberland

Existing Supporting Plans and Programs

Federal Geographic Data Committee (FGDC), the National States Geographic Information Council (NSGIC), the California GIS council, the California Geographic Information Association (CGIA), the Office of the California Geographic Information Officer (OCIO-GIO).

Current Constraints

Lack of data, funding, training, modern hardware and software, current and applicable research and appropriate analytical techniques.

Key Stakeholders and Partners

Federal Geographic Data Committee (FGDC), the National States Geographic Information Council (NSGIC), the California GIS council, the California Geographic Information Association (CGIA), the Office of the California Geographic Information Officer (OCIO-GIO), California Environmental Protection Agency and the California Resources Agency and their member departments, and federal agencies such as USFS, BLM, NRCS, NMFS, USGS, and EPA.

Strategies and Supporting Actions

Strategy: DL.1. Develop and maintain effective policies and Information systems for the collection, analysis, and display of forest and rangeland data and trends in forms that contribute to the achievement of sound forest and range policies and regulations in California.

Action A – Encourage implementation of statewide spatial and non-spatial data infrastructures through effective strategic and business planning efforts.

Action B – Institute a data and analysis governance structure across agencies (??) to ensure that policies, procedures and standards are established and followed.

Action C – Support and improve access to, and use of appropriate data and tools for collecting, displaying, analyzing, and maintaining consistent data and information on forest and rangelands.

Action D – Support training for resource professionals and other interested stakeholders in collecting, analyzing, displaying and disseminating spatial and non-spatial information of forest and range extent, condition and trends.

Action E – Preserve institutional knowledge, efficiency and effectiveness through system automation and data management services.

Action F – Develop innovative funding mechanisms and incentives to support the development and maintenance of “framework” and other critical data and information systems for forest and rangelands.

Action G – Improve coordination between federal, state, local, tribal, private and international stakeholders in the collection, distribution, maintenance and analysis of key data describing the status and trends in forest and rangeland extent and condition.

Action H – Maintain support for existing local, state and federal programs that develop, maintain and analyze framework and other critical data sets describing the status and trends of forest and range resources in California.

Strategy: DL.2.Identify high-priority needs for developing the data and the analytical framework essential to improving the quality of future assessments that support effective forest and range policy development in California.

Action A – Continue to evaluate the accuracy and completeness of existing data and of the steps needed to improve the accuracy and completeness of data for future assessments and to guide forest and range policy development.

Action B – Invest in creating and maintaining current and consistent statewide vegetation data with appropriate spatial and categorical detail, including regular updating, that can be used for multiple purposes including forest assessment.

Action C – Augment current efforts to maintain and improve condition class data, in part through improved vegetation mapping, by capturing management activities such as timber harvest that can alter condition class, and better techniques for applying the condition class metric to aggregated areas reflecting natural fire regimes.

Action D – Support a systematic effort to map mountain meadows, ideally as part of a comprehensive vegetation mapping strategy.

Action E – Encourage completion of high resolution statewide soils maps (SSURGO), and develop a standard methodology to estimate soil organic carbon base data from soil maps through a collaborative effort between NRCS and USFS.

Action F – Track local ordinances that have been adopted in response to Fire Hazard Severity Zone (FHSZ) recommendations.

Action G – Systematically track and analyze spatial and non-spatial data related to disturbances (e.g. timber harvest, fire, development) in forest and rangelands.

Action H – Develop and maintain data for analyzing the threat from exotic invasive species.

Action I – Establish a statewide database of all forest and rangeland restoration projects in order to track restoration efforts and the success of projects.

Action J – Develop a comprehensive system for accessing current data related to fish and usable for prioritizing restoration and conservation of landscapes and habitats important for fish survival.

Action K – Assemble a comprehensive list of beneficial uses for water bodies, possibly through coordination with Regional Water Quality Control Boards.

Action L – Develop detailed GIS-based stream flow data to support estimating water supply.

Action M – Fund an effort to assemble a comprehensive riparian condition spatial dataset.

Action N – Develop alternative methods for mapping clusters of human settlement in unincorporated areas.

Action O – Support and enhance current efforts to capture and maintain parcel-based land ownership and protection status data.

Action P – Measure energy use at a finer scale than counties.

Action Q – Enhance collaborative efforts to annually update fire perimeters, and improve the completeness and quality of associated burn severity data.

Action R – Continue current efforts by the USFS to capture tree mortality and cause information, and develop a process for estimating data accuracy.

Action S – Continue and augment current forest inventory efforts, and consider enhancing and adapting survey frequency and methods as needed to meet near-term challenges related to disturbances, climate change, fire and other threats, and to better address urban forestry and rangeland issues.

Action T – Develop a more detailed statewide representation of groundwater basins depicting monitoring well locations, groundwater withdraws, recharge rates, and pollution levels.

Strategy: DL.3. Develop and improve current analytical methodologies, and conduct additional research to improve future assessments that support the development of sound forest and range policies in California.

Action A – Improve methods and data to project development through access to statewide standardized parcel data.

Action B – Develop a standard methodology for analyzing ecosystem health and its various threats through a collaborative effort of ecologists, fire scientists, pathologists, entomologists and other professionals and stakeholders.

Action C – Provide leadership for efforts to use and improve forest growth simulation models by identifying and prioritizing improvements to its components, and working in cooperation with other stakeholder agencies such as the USFS and NRCS.

Action D – Continue current efforts by California Department of Fish and Game to identify critical habitats for identifying protection priorities.

Action E – Develop a statewide water balance model through a collaborative process at a regional scale and incorporating climate change variables to significantly improve analysis of current and future water supply.

Action F – Develop standardized approaches to evaluate cumulative impacts to water quality from land management activities, including better tracking of management activities at the project level.

Action G – Research the interaction of fish populations and habitat, the limiting factors for fish survival, and the relative impact of the various threats on fish populations;

Action H – Develop appropriate analytical methods for identifying where and how policies, programs, and projects can improve the current status of fish populations.

California's population is overwhelmingly urban while most of its land base remains rural. The urban attitudes and metropolitan economies have substantially reshaped rural California. The economy of rural California is increasingly based on a mix of commodities, non-commodities and individuals that commute to metropolitan areas. There is an increasing public interest and demand for non-commodity environmental services that are produced on forest and range lands. As a result, governmental policies are more diverse and less focused on commodity production than they were a few decades earlier. There has been increased emphasis on many themes such as: watershed and fish and wildlife habitat restoration; acquisition and protection of habitat, vistas, and other unique elements of the forest and range landscape; improved air and water quality; controlling exotic species and forest pests; reducing the risk of wildfire; renewable energy and climate change impacts.

In turn, the public policies of investment, taxation and regulation are changing. New public policies often attempt to direct investment toward non-commodity values. Establishing priorities on investments for the natural resource themes listed above, is greatly influenced by ballot initiatives and bond measures. In addition, taxation policies are designed to encourage landowners to keep land in production and to support the improvement of wildlife habitat. Regulations provide more protection for fish and wildlife species listed as threatened or endangered and for air and water quality. This chapter describes a range of investment and taxation policies that are in place to help meet the demands for forest and range products and services.

INVESTMENT POLICIES

There is a long history of investing in natural resources on forest and range lands in California. This is true for the private, public, and non-profit sectors. In addition to market forces, public policies, such as regulation, taxation, incentives and research have strongly influenced the mix of investments, especially on private lands. To varying degrees and sometimes rather interrelated, public and private investments typically take five general forms: ongoing management, infrastructure, and related processing activities; restoration and enhancement; research, planning, assessment and monitoring; resource protection/fire management; and rural economic development (modified from Roques and McWilliams 1997). All of these investments and approaches are found on California's forests and rangelands.

Investment in Management Activities and Related Infrastructure

One form of investment is management for commodity production (such as timber, livestock forage, water production and hydroelectricity). Historically, this kind of investment has taken place on both private and publically owned land. In the case of the forest products and range industries there is no definitive study of the level of investment by private landowners in land management, infrastructure and facilities. Although regulatory costs are substantial, and the number of mills and biomass plants in

California has declined, some firms and landowners continue to make investments in new or refurbished facilities; examples include Collins Pine and Sierra Pacific Industries. In the case of public ownership, in recent years, less emphasis has been placed on traditional commodity production on federally-owned lands, with recent emphasis being placed on improved forest and range health and ecosystem services and restoration.

Investment in Restoration

Another form of investment, both public and private, is in restoration of forest and range ecosystems, including related riparian systems. These kinds of investments cover a wide variety of activities. Examples include: return of dead wood and large trees to the forest landscape; and restoration of streams, riparian areas and meadows to create favorable fish and amphibian habitat.

Efforts of this kind in California have had strong private and public support. In the recent decade or so, voters have supported bonds as a method for funding restoration projects. During this timeframe, investment in the restoration and enhancement of ecosystems (e.g., stream restoration, activities consistent with reserve strategies and habitat improvement) has increased. For example, in 1997 the legislature passed and the governor signed SB 271 (Thompson, Chapter 293, 1997), providing an additional $43 million over six years to specifically support watershed restoration efforts, including watershed assessments, the development of watershed action plans, the implementation of restoration projects and monitoring (CERES, 1998; Legislative Council of California, 1997). More recently, the passage of Proposition 84 (Water Quality, Safety and Supply, Flood Control, Natural Resource Protection, and Park Improvements) in 2006, provided $5.4 billion for natural resource based programs. This included substantial investment in restoration funds for the Bay-Delta estuary, supported stream and watershed restoration projects and provided additional funds for forest conservation. Propositions 13, 40 and 50 have also provided continued funding for conservation programs, stream restoration, fisheries restoration and watershed coordinators.

Investment in Research, Planning, Assessment, Monitoring, and Education/Technology and Information Transfer

These kinds of activities are another significant investment category. They are found primarily in the publically funded sector such as federal and state agencies, including the University of California and State University systems. Local agencies and groups such as Resource Conservation Districts, local communities, watershed groups, Firesafe Councils, and urban forestry groups also play a key role, especially in planning and information transfer. In addition, other non-profits and private landowners are involved in such activities.

In California and nationally during the last decade, increased funding and focus on research relevant to forest and range lands has arisen from concerns over renewable, efficient energy and climate change. One example is the role of the California Energy Commission (CEC). One of the Commission's programs is the Public Interest Energy Research Program (PIER). PIER's Environmental Area (PIER) was developed with a broad mandate to research the environmental effects of energy technology and energy

production, delivery, and use in California. PIER has funded climate change research in four areas including: climate monitoring, analysis and modeling; Greenhouse Gas (GHG) inventory methods; reduction of GHG emissions; and climate change impact and adaptation. CEC has also been involved in a national collaborative effort called WESTCARB. Established in the fall of 2003, WESTCARB is one of seven research partnerships co-funded by the U.S. Department of Energy to characterize regional carbon sequestration opportunities and conduct technology validation field tests. Some of this work has occurred on the LaTour Demonstration State Forest.

There has been a long history of planning and assessment, with particular emphasis on management of North Coast and Sierra forests. Examples on federal lands include Forest Ecosystem Management Assessment Team (FEMAT), Sierra Nevada Ecosystem Project (SNEP), Sierra Nevada Forest Plan Amendment (SNFPA), and Sierra Nevada Adaptive Management Program (SNAMP). An example of a California state funded program is the North Coast Watershed Assessment Program, which expended about $14 million from 2000 to 2003 for improved watershed information on California's North Coast. Expenditures for monitoring activities on California's forests and range lands are relatively limited. They are undertaken by federal land management agencies, some state agencies, and landowners. Two key examples for the state monitoring activities are the California Rangeland Water Quality Plan and the Board of Forestry Monitoring Study Group.

Investment in Natural Resource Protection

Resource protection activities involve expenditures for such things as control of exotic plant species, livestock disease prevention and response, and wildfire hazard reduction and control.

The largest expenditures relate to Federal, state, and local funding for control of wildfires. There are also substantial expenditures for wildfire hazard reduction in California. This is especially true since President Bush signed the Healthy Forests Restoration Act (HFRA) of 2003 (P.L. 108-148). HFRA is intended to reduce the risks of severe wildfire to people and the natural environment. Projects to reduce wildland fire hazards by treating fuels may be funded through a variety of sources. The National Fire Plan, Healthy Forests Initiative and other related federal initiatives have treated (prescribed fire and mechanical) between 200 and 310 thousand acres a year since 2004 in California; an average of 250,000 acres treated per year. Table 3.1 shows the acres treated by federal agencies in California for 2009. The U.S. Forest Service (USFS), Bureau of Land Management (BLM), the National Park Service (NPS), and other federal agencies listed have made substantial investments to reduce threats associated with high severity wildfires. State expenditures in vegetation treatments, including fuel reduction projects, are shown in table 3.2 for fiscal years 2004 - 2006. In addition, stand improvement projects are funded under California Forest Improvement Program (CFIP).

Firewise Communities, which represent community-based expenditures in resource protection, is a multi-agency program to engage communities in planning for wildfires through design, emergency response, and home design landscaping and maintenance.

Rural Fire Assistance (RFA) was a pilot effort from 2001-2005 to augment rural fire department firefighter safety and wildland fire protective capabilities. Currently, direct assistance to communities near DOI managed lands is delivered through firefighter training.

Table 3.1 – Acreage treated to reduce hazardous fuel loadings in California; National Fire Plan, 2009; Source: http://www.forestsandrangelands.gov/reports

Agency	Wildland Urban Interface			Other			
	Fire	Mechanical	Total	Fire	Mechanical	Total	Total
BIA	0	2,662	2,662	210	644	854	3,516
BLM	1,871	8,796	10,667	1,924	4,694	6,618	17,285
BOR	0	0	0	55	0	55	55
FWS	13,867	2,552	16,419	12,268	47,810	60,078	76,497
NPS	9,704	1,571	11,275	3,858	2,281	6,139	17,414
USFS	21,283	62,265	83,548	22,659	88,765	111,424	194,972
Total 2009	46,725	77,846	124,571	40,974	144,194	185,168	309,739
Average 2004 - 2009	40,238	76,687	116,925	47,903	85,748	133,651	250,576

Table 3.2 – Total acreage of Projects funded under Proposition 40 By Project Objective

County	Forest Health Protection	Forest Restoration	Fuel Reduction	Other	Shaded Fuel Break	Watershed Protection	Total
Alpine						30	30
Amador	37		66			639	742
Butte		109	372		44		525
Calaveras			287			317	604
El Dorado		169	487		1212	1123	2746
Fresno		42				208	250
Madera			144			433	577
Mariposa			246				246
Nevada			4528		47		4575
Placer			976		40		1016
Sacramento				100			100
Sierra			140				140
Tuolumne		143	226		55	645	1069
Yuba			522		40		562
Grand Total	37	463	7994	100	1438	3395	13427

The federal State Fire Assistance (SFA) program assists states and local fire departments in developing preparedness and response capabilities for wildland fire management. SFA had private-lands grant amounts of $2.3 million in 2007 and $3.2 million in 2008, with $23 million available in 2009. BLM Community Assistance grants had $3 million available in 2008 and $1.6 million in 2009. State funds were available from Proposition 40 for fuels reduction projects in the Sierra Nevada, but funding was suspended in 2009.

Investment in Rural Economic Development

Payments in lieu of taxes (PILT) are federal payments to local governments that help offset losses in property taxes because of federal ownership within their boundaries. This includes federal parks, forests and other lands. The formula for PILT incorporates population, receipt sharing payments and the amount of federal land within an affected county. Annual PILT amounts in California were about $19 million in 2003-2005, $21 million in 2006-2007, $33 million in 2008, and $34 million 2009.

In addition to PILT, the Secure Rural Schools and Community Self-Determination Act (SRS), which was authorized in 2000 and reauthorized in 2008, provides funding to counties with federal lands. Payments from SRS to 38 California counties were between $65 and $67 million from 2002 to 2005. Most of this funding was allocated to roads and schools (about $56 million) with the rest going to projects either supporting or on national forests. Fourteen resource advisory committees (RACs) have been established in California to assist with identifying funding priorities. The total SRS budget for California was $58 million in 2008 and $61 million for 2009. Funding is projected to decrease each year and be $40 million for California counties in 2011. The 2008 reauthorization changed some program structure including having RACs involved in project monitoring, use of funds for the Firewise Communities program, reimbursement for emergency services and development of community wildfire protection plans.

EXISTING PROGRAMS

Federal Investment

Federal investment in California ecosystems involves many agencies. Examples include the U.S. Environmental Protection Agency, DOI, U.S. Department of Agriculture, U.S. Department of Commerce, and U.S. Department of Defense. Within the Department of Interior (DOI) are the National Biological Survey, NPS, BLM, U.S. Bureau of Reclamation, and the U.S. Fish and Wildlife Service. Federal agencies receive funding from general appropriations and a variety of special accounts, trust funds, and receipt accounts financed from various fees, deposits, and receipts. Special accounts vary greatly in size and may require annual appropriation or are permanently appropriated. Each has its own purpose, requirements, and conditions. Special and other related accounts can represent significant sources of funding for federal agencies. In the 1990s, about 30 percent of total USFS funds each year were derived from these accounts (Gorte and Corn, 1995).The following provides a few examples of federal programs in California and is not intended to be comprehensive of all federal programs across the state.

Federal Programs

USFS – State and Private Forestry programs bring forest management assistance and expertise to a diversity of landowners, including small woodlot, tribal, state, and federal, through cost-effective, non-regulatory partnerships. The USFS in California are also developing policies and programs that will contribute to climate change strategies and strategies for forest biomass. In addition, through the National Fire Plan and Healthy Forests Initiative the USFS conducts fuel treatments that contribute to reducing the risk

of high severity wildfires. For additional information on the Forest Service Budget see: http://www.fs.fed.us/publications/budget-2011/fy-2011-usfs-budget-overview.pdf

NRCS – Natural Resources Conservation Service makes extensive investments in conservation and stewardship of forest and range lands across California. Additional information on the following programs is found on the NRCS website. http://www.ca.nrcs.usda.gov/programs/.

- Healthy Forests Reserve Program
- Conservation Stewardship Program
- Environmental Quality Incentives Program
- Wildlife Habitat Incentives Program
- Wetlands Reserve Program

BLM – BLM programs in California provide funds for vegetation treatments in forest and range lands. The healthy landscapes, renewable energy, and fire programs all have objectives that are consistent with the 2010 Forests and Rangelands Assessment and will likely contribute to implementation of strategies. For Additional Information see: BLM Budget http://www.blm.gov/wo/st/en/prog/more/division_of_budget.html

NPS – National Park Service in California manages 4.1 million acres of national parks in California. This includes approximately 1.2 million acres of forest land. NPS programs support a broad range of activities that represent extensive investment in preserving forests and other natural resources in California. In addition, NPS has an active fire management program that includes prescribed burning and other types of vegetation management. The Rivers, Trails, and Conservation Assistance (RTCA) Program is the community assistance arm of the National Park Service and represents an investment in green infrastructure and open space.

State Investment

California investment related to natural resources comes primarily from units within five agencies: the California Natural Resources Agency, the California Environmental Protection Agency (Cal/EPA), the California Business, Transportation and Housing Agency, the California Department of Food and Agriculture, and the University of California system. State expenditures for ecosystem management and resource infrastructure are largely vested in departments, boards, and commissions within the Natural Resources Agency and the Cal/EPA (Table 3.3). Both agencies derive most of their budget from the state General Fund and other Special Funds.

Table 3.3 – California Natural Resources Agency and California Environmental Protection Agency, 2002-2003 to 2009-2010 fiscal funding ($ in Millions). Data Source: California Department of Finance, Chart C-1; http://www.dof.ca.gov/budgeting/budget_faqs/information/#SummarySchedules

	Fiscal Year	General Fund	Selected Funds	Bond Funds	Budget Total	Federal Funds
California Resources Agency	2002-2003	1,147.2	1,078.7	1,113.5	3,339.4	108.6
	2003-2004	950.4	1,384.8	1,601.1	3,936.3	152.8
	2004-2005	1,031.2	1,533.6	1,006.1	3,570.9	107.4
	2005-2006	1,476.5	1,518.5	557.4	3,552.4	99.0
	2006-2007	1,971.0	1,607.9	604.1	4,183.0	98.8
	2007-2008	1,869.4	2,251.1	1,145.5	5,266.0	97.4
	2008-2009	1,773.1	1,989.2	955.9	4,718.2	122.5
	2009-2010	1,864.7	2,499.9	4,562.1	8,926.7	556.1
	2010-2011*	1,731.8	2,715.8	738.7	5,186.3	247.9
California Environmental Protection Agency	2002-2003	169.9	612.0	92.2	874.1	172.5
	2003-2004	81.4	677.1	190.8	949.3	100.2
	2004-2005	77.8	729.0	199.3	1,006.1	133.2
	2005-2006	70.0	911.5	151.4	1,132.9	106.0
	2006-2007	83.8	1,023.2	198.2	1,305.2	252.8
	2007-2008	90.9	1,053.2	739.3	1,883.4	183.1
	2008-2009	76.3	957.6	75.7	1,109.6	132.5
	2009-2010	69.5	1,000.5	660.8	1,730.8	196.3
	2010-2011*	68.3	1,106.8	294.6	1,469.7	199.4

* proposed funding for 2010 – 2011 fiscal year.

A review of state funding for natural resources conducted by the Public Policy Institute for California (PPIC) found that with the exception of 2001, the percentage of total California spending directed to natural resources had been dropping since 1979. In 1979, about four percent of total expenditures went to natural resource programs; by 2000, that number was 3.4 percent. Expenditures in FY 2001 rose because of increased spending under the state General Fund surplus. From 1979 to 2001, allocations from the state General Fund declined and were largely replaced by special funds earmarked for specific purposes. By 1995, revenues from fees and program-related assessments had grown to 50 percent. Resource spending financed by the General Fund received a significant influx of monies as part of the General Fund surpluses from 1999 to 2001. In more recent years state funding for natural resources has been approximately 5 percent (~ $7.1 billion) of the state budget in 2009-2010 and is projected to be comparable in the proposed budget for 2010-2011 (~ $6.6 billion), based on information from the Legislative Analysts Office (LAO, 2009). Funding for wildland fire protection (~ $1.2 billion in 2009-2010) and water resource management represent substantial investments in state funding.

Role of Conservancies

In order to promote the conservation of its land resources, the state has created a number of conservancies with regional conservation emphasis. Mainly supported through bond funds, state conservancies assist in acquiring land as a natural resource to be held as a public trust. In addition, they commonly provide funding to support restoration projects. For example, the Sierra Nevada Conservancy (SNC) represents 22 mountain counties throughout the Sierras. SNC received $54 million from proposition 84 to implement projects that support the following environmental program objectives:

- provide increased opportunity for tourism and recreation in the region;
- protect, conserve and restore the Region's physical, cultural, archaeological, historical and living resources;
- aid in the preservation of working landscapes;
- reduce the risk of natural disasters, such as wildfire;
- protect and improve water and air quality;
- assist the regional economy; and
- enhance public use and enjoyment of lands owned by the public.

Through both funding and technical assistance, SNC is well positioned to foster collaborative projects with State and Private Forestry programs and other state and federal programs.

State Forest and Range Programs

A variety of state and federal programs exist to assist forest and range landowners. These programs provide both technical and financial assistance to landowners and are offered through University extension, state and federal programs. In addition, Resource Conservation Districts (RCDs) are local non-governmental organizations that work between landowners and government programs, facilitating the delivery of technical assistance to landowners. This section's focus is on state forest and range programs, but significant overlap exists, particularly as the state delivers many of the USFS State and Private Forestry programs (Table 3.4).

Table 3.4 – Summary of State and Private Forestry Programs			
		FY Funding (thousands)	
Program	Description	2008	2009
Pest Management Program (CAL FIRE)	CAL FIRE's forest pest specialists (four statewide) help protect the state's forest resources from native and introduced pests, conduct surveys, provide technical assistance to private forest landowners, and promote forest health on all forest lands throughout the state.	$152 (state) $152 (federal)	$572 (state) $148 (federal)
Nursery and Seed Bank Program (CAL FIRE)	The program collects, processes and stores seed from seed zones and elevations statewide in order to be in a position to assist with the reforestation of areas burned in wildfires. The goal is to have a 10 year supply of seed in storage for all areas of the state, but the seed bank is inadequate at this time to accomplish this. The Magalia Nursery is capable of growing about 2 million seedlings yearly in anticipation of small landowner reforestation needs. The nursery is scheduled to close in phases between February 2010 and February 2011.	$293	NA
California Forest Improvement Program (CAL FIRE)	The goal of the program is to improve the timber productivity of non-industrial private forest lands while also improving other forest resources, such as fish and wildlife habitat and soil resources; the overall effect is to improve the total forest resource system.	$2,174 (state) $288 (federal)	$610 (state) $24 (federal)
Forest Stewardship Program (CAL FIRE)	The purpose of the FSP is to encourage the long-term stewardship of non-industrial private forest land. The primary emphasis of the program is technical assistance, forest landowner education and assisting in developing multi-resource planning documents such as a Forest Stewardship Plan.	$188 (state) $188 (federal)	$150 (state) $226 (federal)
Urban Forestry Program (CAL FIRE)	The mission of CAL FIRE’s Urban Forestry Program is to develop a regional and statewide cooperative effort to advance the development of sustainable urban and community forests.	$8,750 (state) $1,065 (federal)	$7,189 (state) $1,080 (federal)
Forest Legacy Program (CAL FIRE)	The objective of the Forest Legacy Program is to identify and protect environmentally important forestlands that are threatened by present or future conversion to non-forest uses by either purchasing the land or purchasing the development rights through deed restrictions such as a conservation easement.	$667 (state) $2,000 (federal)	$660 (state) $1,979 (federal)

State Fish and Wildlife Programs (California Department of Fish and Game)
The California Department of Fish and Game also has many programs that invest in conservation, restoration, and stewardship of forest and range lands. Table 3.5 is a summary of programs.

Table 3.5 - Summary of Department of Fish and Game Programs that support investment in natural resources.	
Fund Type	Fund Title
Dedicated Funds	Salmon Program
Dedicated Funds	Deer Program
Dedicated Funds	Migratory Waterfowl Habitat Program
Dedicated Funds	Private Lands Habitat Improvement
Dedicated Funds	Big Horn Sheep Program
Dedicated Funds	Streambed 1600 Program
Dedicated Funds	Threatened and Endangered Species and Plants Program
General Fund	Non-Game Fish/Wildlife/Habitat Programs
Bond	Resource Improvement Project Program
Special Fund	Non-Game Fish/Wildlife/Habitat Programs
Cost Recovery	Pollution Cleanup Expenses Program
Special Fund	Waterfowl / Habitat Program
Surtax Fund	Non-Game Fish/Wildlife/Habitat Programs
Special Fund	Environmental Enhancement Program
Bond	Fish and Wildlife Restoration Program
Bond	River / Coastal Watershed / Wetland Program
Bond	Waterway and Natural Resource Protection, Water Pollution, and Contamination Control, State & Local Park Improvements, Public Access, Water Conservation Efforts, Emergency Drinking Fund
Special Fund	Fish / Wildlife Protection Restoration

Bond Funding

Investments at the state level also come from a wide variety of sources. These include general appropriation, special funds, and a variety of other sources. Since 1988, a total of 55 propositions have passed that included some type of natural resource conservation or restoration measure (Table 3.6). Total funding through combined statewide, county, and local ballot measures is estimated at approximately $10.25 billion for the same time period. In addition, approximately $3 billion was generated through local taxes or fees. This substantial investment (average annual rate of ~ $600 million) represents a per capita spending of $358. This level of investment is much higher than most states, fifth overall in per capita spending compared to other states, and greatly influences the priorities for conservation of forest and range lands.

Table 3.6 – Summary of conservation bond funds approved in California (1988 – present). Includes statewide, county and city ballot measures. Source: The Trust for Public Land (2010).

Year	Total (dollars)
1988	776,000,000
1989	-
1990	65,430,000
1991	-
1992	-
1993	-
1994	-
1995	-
1996	207,600,000
1997	-
1998	171,450,000
1999	-
2000	1,705,000,000
2001	-
2002	3,850,000,000
2003	-
2004	100,000,000
2005	-
2006	2,955,500,000
2007	-
2008	410,000,000
Total	10,240,980,000

Ballot propositions passed by voters in recent years relating to park and habitat acquisition and water-related improvements have resulted in significant statewide investment in forest and range resources. In 1996, Proposition 204 (Safe, Clean, Reliable Water Supply Act) passed authorizing $995 million for activities relating to clean water, water recycling, ongoing programs in the Bay-Delta watersheds, and for the administrative expenses of the CALFED Bay-Delta Program studies and planning activities. In 2000, Proposition 12 (Safe Neighborhood Parks, Clean Water, Clean Air, and Coastal Protection Bond Act of 2000) and Proposition 13 (Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act) passed. Proposition 12 authorized $2.1 billion and Proposition 13 authorized $1.97 billion for specified purposes. In March 2002, voters passed Proposition 40 (the California Clean Water, Clear Air, Safe Neighborhood Parks and Coastal Protection Act of 2002) authorizing $2.6 billion for specified purposes. In total, these propositions represent an expenditure of over $7.5 billion. More recent investments include bond funding through Proposition 84 (Water Quality, Safety and Supply, Flood Control, Natural Resource Protection, and Park Improvements) that passed in 2006 and provides $5.4 billion for natural resource based programs. Under Proposition 84 forest conservation was allocated $450 million (8 percent) of the total bond funds (Table 3.7). Water related projects, some of which benefit forest and range lands, accounted for approximately 70 percent of the total bond funding.

Table 3.7. Allocation of bond funds under proposition 84 (2006). Source: California Strategic Growth Plan http://bondaccountability.resources.ca.gov/p84.aspx

Programs	Allocation	Committed	Balance
Safe Drinking Water and Water Quality Projects	$1,525,000	$817,139	$707,861
Flood Control	$800,000	$786,396	$13,604
Statewide Water Planning and Design	$65,000	$44,568	$20,432
Protection of Rivers, Lakes and Streams	$928,000	$777,996	$150,004
Forest and Wildlife Conservation	$450,000	$443,092	$6,908
Protection of Beaches, Bays and Coastal Waters	$540,000	$454,619	$85,381
Parks and Nature Education Facilities	$500,000	$406,773	$93,227
Sustainable Communities and Climate Change Reduction	$580,000	$237,727	$342,273
Totals:	$5,388,000	$4,156,890	$1,231,110

Investments by Non Governmental Organizations (NGOs)
Non-governmental organizations (NGOs) also play an important role in the long-term conservation and restoration of forests and rangeland ecosystems. In California there are hundreds of NGOs that manage lands for conservation, implement a broad range of watershed restoration projects, implement projects to reduce threats from severe wildfires, urban tree planting projects, and many other environmental stewardship projects. Typically, NGOs in California often work at a "grassroots" level and over time have developed extensive social networks that allow them to effectively implement projects. Continued collaboration with NGOs will be a crucial component for implementing many of the proposed strategies.

EMERGING FUNDING
Future Bond Initiatives - Water Bond (http://gov.ca.gov/issue/water-supply)
In 2009, the California state legislature passed a comprehensive water package. The plan consists of four policy bills and an $11.4 billion dollar bond. The package is intended to ensure reliable water supply, as well as restoring the Sacramento-San Joaquin Delta and other ecologically sensitive areas. The proposed bond initiative includes substantial funds ($1.785 billion) for conservation and watershed protection. Funding for watershed protection is intended to support a broad range of projects including forest restoration, salmonids habitat restoration, watershed climate change impacts and adaptation, and reduction of hazardous wildland fuels.

Carbon Markets
Carbon credits are generated when a project is developed and either greenhouse gas (GHG) emissions are reduced or carbon is sequestered. The value of the credits depends on market conditions and on the perceived quality of the credits. Project accounting usually follows published guidelines or protocols. Carbon registries are where the credits are serialized and tracked. Registries may also have protocols and oversee third party verifiers. Credits may be sold in a voluntary or compliance market. Voluntary markets are where the buyers voluntarily purchase credits to offset emissions, often for public relations or marketing purposes. Credits may also be purchased on the voluntary market to meet regulatory requirements, such as offsets for new power plants. Compliance markets are where credits are used to offset emissions under a regulatory program; usually considered under a cap and trade system but also possible under a GHG tax system.

Cap and trade is the currently favored system for mitigating anthropogenic climate change by capping emissions of GHGs and allowing a market to trade in emission credits. Cap and trade systems are being considered at the state, regional, national and international levels of governance. Currently, the state and regional levels are being actively developed under the auspices of the Global Warming Solutions Act of 2006 (AB 32) and the Western Climate Initiative (WCI), respectively. Under a cap and trade system emission allowances may be wholly or partially distributed by historic emissions or auctions. Offsets may be allowed to be sold to emitters when offsets are generated from outside the capped sectors. In addition to providing reductions in atmospheric

GHGs, offsets help to significantly reduce the cost of cap and trade. Offsets are limited to a certain percentage of the cap.

Future revenues that benefit forest and range landowners, and municipalities with respect to urban forestry offsets, may be derived from the production and sale of offsets or from auction revenues funding related programs. The AB 32 Scoping Plan, for example, identifies five forestry strategies for meeting the 2020 emissions goal for the state, with reforestation being one of the strategies. Auction revenues could be used to fund landowner assistance programs, such as CFIP, to reforest NIPF lands that would otherwise sequester substantially less carbon.

Discussion and Concluding Remarks

Funding through State and Private Forestry is important, but small relative to overall investments in forests and rangelands in California. As such, refining and articulating priority issues will be essential for coordinating funding efforts with other programs and maximizing program benefits. There are a broad range of existing state and federal programs in place that are likely sufficient to address the range of assessment issues. In many cases these programs lack adequate funding to fully implement the proposed strategies. Further, the number of programs that contribute to protecting and enhancing forests and rangelands is fragmented and continued efforts are needed to coordinate broader program objectives. In addition, the use of conservancies in California continues to play an important role in implementing projects and facilitating land conservation at a regional scale. NGO's and other non-profit groups will continue to play an important role in implementing restoration projects that tier to overarching strategies.

In lieu of new taxes or fee based programs, bond initiatives will continue to be a primary source of funding for restoration projects on forests and rangelands. As such, priorities are likely to be greatly influenced by future bond initiatives. As described above, the proposed water bond will likely provide a major source of state funding to support the implementation of proposed strategies. Bond initiatives are an important source of funding, but implementation of bond funded programs tend to lack long-term or comprehensive planning and may not always be well coordinated with assessment priorities or strategies.

Voluntary and proposed compliance markets under a possible cap and trade system could also bring an important source of funding. The funding provided through offset programs would provide landowners with incentives to manage lands to maximize carbon sequestration. Additional investment mechanisms are needed that would better align the cost of providing environmental services with communities that benefit from that service and reimbursing landowners that maintain and protect the resource.

Finally, with the recent economic crisis California, like other states, continues to struggle to support natural resource programs with declining and severely constrained budgets. This has also affected the sale of state bonds and the financing of bond funded programs.

Assembly Bill (AB) 32 Scoping Plan
The Assembly Bill 32 (Global Warming Solutions Act of 2006) Scoping Plan contains the main strategies California will use to reduce the greenhouse gases (GHG) that cause climate change. The scoping plan has a range of GHG reduction actions that include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade system.

Audubon Society
Audubon's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity. The national network of community-based nature centers and chapters, scientific and educational programs, and advocacy on behalf of areas sustaining important bird populations, engage millions of people of all ages and backgrounds in positive conservation experiences.

Bay Area Open Space Council
The Bay Area Open Space Council is a collaborative of over fifty-five member organizations actively involved in permanently protecting and stewarding important parks, trails and agricultural lands in the nine-county San Francisco Bay Area.

Bay-Delta Conservation Plan
The Bay-Delta Conservation Plan promotes the recovery of endangered, threatened, and sensitive fish and wildlife species and their habitats in the Sacramento-San Joaquin Delta. They promote recovery efforts in a way that will also protect and restore water supplies.

CALFED Bay-Delta Program
The Watershed Program was established in 1998 as an aid to achieving the overarching goal of the CALFED Bay-Delta Program to restore ecological health and improve water management by working with the community at a watershed level. The goals of the Watershed Program are to provide financial and technical assistance for watershed activities that help achieve the mission and objectives of CALFED, and to promote collaboration and integration among community based watershed efforts.

CalFlora
Calflora is a nonprofit organization dedicated to providing information about California plant biodiversity for use in education, research and conservation. CalFlora is structured as a digital library database and was conceived as a collaborative research project to collect and re-distribute information about California's wild plants, including habitat descriptions, photographs, observations, nomenclature, and distribution maps.

California Adaptation Strategy (CAS)
CAS is a first-of-its-kind multi-sector strategy to help guide California's efforts in adapting to climate change impacts. In cooperation and partnership with multiple state agencies, the 2009 California Climate Adaptation Strategy summarizes the best known science on climate change impacts in seven specific sectors and provides recommendations on how to manage against those threats.

California Association of Resource Conservation Districts (RCD)
Resource Conservation Districts (RCDs), once known as Soil Conservation Districts, are "special districts" of the state of California, set up under California law to be locally governed agencies with their own locally appointed, independent boards of directors. Although RCDs are established locally by the rules of a county's Local Agency Formation Committee (LAFCO), and they often have close ties to county government, they are not county government entities. One of the primary means RCDs utilize to organize representation at the state and national levels is through the California Association of Resource Conservation Districts (CARCD), a non-profit organization set up to serve the districts of California.

California Clean Air Act
The California Clean Air Act (CCAA) of 1988 requires nonattainment areas to achieve and maintain the state ambient air quality standards by the earliest practicable date. The CCAA required air districts must develop plans for attaining the state ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide standards.

California Desert Renewable Energy Conservation Plan (DRECP)
The plan is intended to provide a more predictable and streamlined regulatory compliance framework while completing a conservation plan that will balance renewable energy development with desert land use and natural resource conservation by identifying geographic areas designated for Renewable Portfolio Standard project development and identifying areas for conservation and species management and enhancement.

California Department of Forestry and Fire Protection (CAL FIRE)
The Department of Forestry and Fire Protection protects the people of California from fires, responds to emergencies, and protects and enhances forest, range, and watershed values providing social, economic, and environmental benefits to rural and urban citizens.

Board of Forestry: Anadromous Salmonid Protection Rules, 2009
The Anadromous Salmonid Protection (ASP) rules were approved by the State Board of Forestry and Fire Protection (Board) during their September 2009 meeting held in Sacramento. The ASP rules are intended to protect, maintain, and improve riparian habitats for state and federally listed anadromous salmonid species.

Board of Forestry: Hillslope Monitoring Program
The Hillslope Monitoring Program has been evaluating the implementation and effectiveness of California forest practices since 1996. The purpose of the Hillslope Monitoring Program is to determine if California's Forest Practice Rules are adequately protecting beneficial uses of water associated with commercial timber operations on nonfederal lands in California. Specific objectives of the Hillslope Monitoring Program are: 1) implementation monitoring to determine if the Forest Practice Rules (FPRs) related to water quality are properly implemented, and 2) effectiveness monitoring to determine if the FPRs affecting water quality are effective in meeting their intent when properly implemented.

Board of Forestry: Watersheds with Threatened or Impaired Values, 2009
As defined in the FPRs, T/I watersheds means planning watersheds with State or federally listed threatened, endangered or candidate populations of anadromous salmomids present or where they can be restored. The T/I rules expired December 31, 2009. The proposed regulatory amendments, entirely and solely involve changing the expiration date of the regulations to December 31, 2010.

CAL FIRE: Aviation Program
In support of its ground forces, CAL FIRE has an air fleet of airtankers, helicopters, and airtactical planes. From 13 air attack and nine helitack bases located statewide, aircraft can reach most fires within 20 minutes. The airtactical aircraft fly overhead directing the airtankers and helicopters to critical areas of the fire for retardant and water drops. While both airtankers and helicopters are equipped to carry fire retardant and water, the helicopters can also transport firefighters, equipment and injured personnel.

CAL FIRE: California Forest Improvement Program (CFIP)
The purpose of the California Forest Improvement Program (CFIP) program is to encourage private and public investment in, and improved management of, California forest lands and resources. This focus is to ensure adequate high quality timber supplies, related employment and other economic benefits, and the protection, maintenance, and enhancement of a productive and stable forest resource system for the benefit of present and future generations.

CAL FIRE: Civil Cost Recovery Program
Wildland fires cost California taxpayers millions of dollars every year. If the California Department of Forestry and Fire Protection's (CAL FIRE) investigation reveals a fire was caused by a violation of law or negligence, the person responsible can be charged criminally, civilly, or both.

CAL FIRE: Conservation Camp Program
CAL FIRE is currently authorized to operate 39 Conservation Camps statewide that house nearly 4,300 inmates and wards. These camps are operated in conjunction with the California Department of Corrections and Rehabilitation (CDCR). These crews are available to respond to all types of emergencies including wildfires, floods, search and rescue, and earthquakes. When not responding to emergencies, the crews are busy with conservation and community service work projects for state, federal, and local government agencies.

CAL FIRE: Cooperative Fire Protection Program
In a State as large and populated as California, no one emergency response agency can do it all. That is why cooperative efforts via contracts and agreements between state, federal and local agencies are essential in response to emergencies like wildland and structure fires, floods, earthquakes, hazardous material spills, and medical aids. CAL FIRE provides fire protection services to many California citizens through the administration of 146 cooperative fire protection agreements in 35 of the State's 58 counties, 28 cities, 30 fire districts and 23 other special districts and service areas.

CAL FIRE: California Forest Practices Rules
CAL FIRE enforces the laws that regulate logging on privately-owned and non federal public lands in California. These laws are found in the Forest Practice Act (2.7MB PDF) which was enacted in 1973 to ensure that forest management is done in a manner that will preserve and protect our fish, wildlife, forests and streams. Rules enacted by the Board of Forestry and Fire Protection are also enforced to protect these resources.

CAL FIRE: California Forest Stewardship Program
The California Forest Stewardship Program is designed to encourage good stewardship of private forestland. The program provides technical and financial assistance to influence positive changes to forestland management, assists communities in solving common watershed problems, and helps landowners.

CAL FIRE: Fire Prevention Planning
Planning incorporates concepts of the National Fire Plan, the California Fire Plan and individual CAL FIRE Unit Fire Plans, as well as Community Wildfire Protection Plans (CWPPs). Fire Plans outline the fire situation within each CAL FIRE Unit. CWPPs do the same for communities. Each identifies prevention measures to reduce risks, informs and involves the local community or communities in the area, and provides a framework to diminish the potential loss due to wildfire. Planning includes other state, federal and local government agencies as well as Fire Safe Councils. CAL FIRE staff access a variety of tools in the planning processes including California fire history statistics, fire weather, fire mapping, and Geographic Information Systems (GIS).

CAL FIRE: Fire and Resource Assessment Program (FRAP)
The California Department of Forestry and Fire Protection's Fire and Resource Assessment Program (FRAP) provides a variety of products including the Forest and Range Assessment, a detailed report on California's forests and rangelands. FRAP provides extensive technical and public information for statewide fire threat, fire hazard, watersheds, socio-economic conditions, environmental indicators, and forest-related climate change.

CAL FIRE: Forest Legacy Program
The purpose of the Forest Legacy Program (FLP) is to protect environmentally important forestland threatened with conversion to non-forest uses, such as subdivision for residential or commercial development. To help maintain the integrity and traditional uses of private

forestlands, the FLP promotes the use of permanent conservation easements. These easements provide an approach with which the federal government, in cooperation with state and local agencies, private organizations, and individuals can preserve the rich heritage of private forests.

CAL FIRE: Pest Management Program
Forest pests (insects and diseases) annually destroy 10 times the volume of timber lost due to forest fires. CAL FIRE's forest pest specialists help protect the state's forest resources from native and introduced pests, conduct surveys and provide technical assistance to private forest landowners, and promote forest health on all forest lands.

CAL FIRE: Resource Management Program
California is rich in natural resources. Of the 85 million acres classified as wildlands, nearly 17 million are commercial forest land, half privately-owned and half government-owned. This forest land grows 3.8 billion board feet yearly. Approximately 2 billion board feet of timber is harvested per year, with a value of over $1 billion. In addition to timber, the state's wildlands also provide valuable watershed, wildlife habitat, and recreation resources. Maintaining the sustainability of all these natural resources is the goal of the CAL FIRE Resource Management Program.

CAL FIRE: State Fire Marshal State Fire Training Program
The SFT Program is a collaborative effort of the California Fire Service that work together to design and deliver courses that provide fire service personnel at all levels with the knowledge and skills to do their jobs professionally and safely. Fire departments and individuals donate thousands of hours annually to support curriculum development, issuance of instructor credentials, and certification of personnel.

CAL FIRE: Strategic Fire Plan
Forms the basis for assessing California's complex and dynamic natural and man-made environment, and identifies a variety of actions to minimize the negative effects of wildland fire. The goal is to enhance the protection of lives, property and natural resources from wildland fire, as well as improve environmental resilience to wildland fire. Community protection includes promoting the safety of the public and emergency responders as well as protection of property and other improvements. In addition to the State fire plan, many counties have a specific fire plan to address the counties special concerns.

CAL FIRE: Unit Fire Plans
Individual CAL FIRE Unit Fire Management Plans document assessments of the fire situation within each of CAL FIRE's 21 Units and six contract counties. The plans include stakeholder contributions and priorities, and identify strategic areas for pre-fire planning and fuel treatment as defined by the people who live and work with the local fire problem.

CAL FIRE: Urban & Community Forestry Program (U&CF)
The mission of the California Department of Forestry and Fire Protection's Urban Forestry Program is to develop a regional and statewide cooperative effort to advance the development of sustainable urban and community forests. Trees provide energy conservation, reduction of storm-water runoff, extend the life of surface streets, improve local air, soil and water quality, reduce atmospheric carbon dioxide, provide wildlife habitat and increase property values.

CAL FIRE: Vegetation Management Program (VMP)
The Vegetation Management Program is a cost-sharing program that focuses on the use of prescribed fire, and mechanical means, for addressing wildland fire fuel hazards and other resource management issues on State Responsibility Area (SRA) lands. The use of prescribed fire mimics natural processes, restores fire to its historic role in wildland ecosystems, and provides significant fire hazard reduction benefits that enhance public and firefighter safety.

CAL FIRE: Volunteers In Prevention Program
The objective of the VIP Program is to involve and utilize citizens and public service groups in non-salaried positions to reduce man-caused fires. There are approximately 2500 VIP's statewide, in all 21 CAL FIRE Units, averaging over 60,000 hours of volunteer service to CAL FIRE.

CAL FIRE: Wildland Urban Interface Building Code Standards
The broad objective of the Wildland-Urban Interface Fire Area Building Standards is to establish minimum standards for materials and material assemblies and provide a reasonable level of exterior wildfire exposure protection for buildings in Wildland-Urban Interface Fire Areas. The use of ignition resistant materials and design to resist the intrusion of flame or burning embers projected by a vegetation fire (wildfire exposure) will prove to be the most prudent effort California has made to try and mitigate the losses resulting from our repeating cycle of interface fire disasters.

California Department of Fish and Game (DFG)
The Department of Fish and Game maintains native fish, wildlife, plant species and natural communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance in a sufficient amount and quality to ensure the survival of all species and natural communities. The department is also responsible for the diversified use of fish and wildlife including recreational, commercial, scientific and educational uses.

DFG: California Endangered Species Act (ESA)
The California Endangered Species Act (CESA) states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved. The Department will work with all interested persons, agencies and organizations to protect and preserve such sensitive resources and their habitats.

DFG: Habitat Conservation and Mitigation Banking
A conservation or mitigation bank is privately or publicly owned land managed for its natural resource values. In exchange for permanently protecting the land, the bank operator is allowed to sell habitat credits to developers who need to satisfy legal requirements for compensating environmental impacts of development projects.

DFG: Lake and Streambed Alteration Program
The Department of Fish and Game (DFG) is responsible for conserving, protecting, and managing California’s fish, wildlife, and native plant resources. To meet this responsibility, the Fish and Game Code (Section 1602) requires an entity to notify DFG of any proposed activity that may substantially modify a river, stream, or lake.

DFG: Natural Communities Conservation Planning (NCCP) Act
The primary objective of the NCCP program is to conserve natural communities at the ecosystem level while accommodating compatible land use. The program seeks to anticipate and prevent the controversies and gridlock caused by species' listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

California Department of Pesticide Regulation: Endangered Species Project
In California, DPR has been studying endangered species protection issues with federal funding since 1988. DPR activities include mapping sites occupied by federally listed species, evaluating pesticide exposure risks to inhabited sites, classifying risk and developing protection strategies to minimize risk as needed.

Department of Water Resources (DWR)
The State Water Resources Board works in coordination with the Regional Water Boards to preserve, protect, enhance, and restore water quality.

DWR: California Water Plan
The California Water Plan provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future.

California Environmental Protection Agency (CAL-EPA)
The California Environmental Protection Agency is charged with developing, implementing and enforcing the state's environmental protection laws that ensure clean air, clean water, clean soil, safe pesticides and waste recycling and reduction. Their departments are at the forefront of environmental science, using cutting-edge research to shape the state's environmental laws. There are five departments and several Regional Water Control Boards in CAL-EPA including Air Resource Board; Department of Pesticide Regulation; Department of Toxic Substances Control; Office of Environmental Health Hazard Assessment; State Water Resources Control Board; and nine Regional Water Control Boards.

CAL-EPA: Air Resources Board (CARB)
The California Air Resources Board is a part of the California Environmental Protection Agency. The Mission of the California Air Resources Board is to promote and protect public health, welfare and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state.

CAL EPA: State Water Resource Control Board (SWRCB)
The State Water Resources Control Board's mission is to preserve and enhance the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.

CAL EPA: State Water Resource Control Boards (SWRCB) Basin Plans
Tere are nine Regional Water Quality Control Boards (Regional Boards). Regional Boards develop "basin plans" for their hydrologic areas, govern requirements/issue waste discharge permits, take enforcement action against violators, and monitor water quality. The task of protecting and enforcing the many uses of water, including the needs of industry, agriculture, municipal districts, and the environment is an ongoing challenge for the Water Board and Regional Boards.

SWRCB: Surface Water Ambient Monitoring Program (SWAMP)
SWAMP is tasked with assessing water quality in all of California's surface waters. The program conducts monitoring directly and through collaborative partnerships; and provides numerous information products, all designed to support water resource management in California.

Total Maximum Daily Loads (TMDL) Plans
Section 303(d) of the federal Clean Water Act and 40 CFR §130.7 require states to identify waterbodies that do not meet water quality standards and are not supporting their beneficial uses. These waters are placed on the Section 303(d) List of Water Quality Limited Segments (List), also known as the 303(d) List of Impaired Waterbodies. The List identifies the pollutant or stressor causing impairment and establishes a schedule for developing a control plan to address the impairment. Placement on this list generally triggers development of a pollution control plan called a Total Maximum Daily Load (TMDL) for each waterbody and associated pollutant/stressor on the list. The Clean Water Act gives the State Water Resources Control Board and the US Environmental Protection Agency (EPA) the authority to establish TMDLs under Section 303(d).

California Department of Food and Agriculture (CDFA)
The California Department of Food and Agriculture protects and promotes California's agriculture. California's farmers and ranchers produce a safe, secure supply of food, fiber, and shelter. These

commodities are marketed fairly for all Californians and produced with responsible environmental stewardship.

CDFA: Border Protection Stations
Border Protection Stations are the first line of defense for protecting our environment and resources from invasive plants and exotic pests. The California Department of Food and Agriculture (CDFA) has 16 agricultural inspection stations along shared borders with Nevada, Oregon and Arizona. Each year, inspectors intercept thousands of lots of prohibited plant material that potentially threaten the food supply and the environment.

CDFA: Plant Health and Pest Prevention Services (PHPPS)
The Plant Health and Pest Prevention Services Division objective is to protect California's (1) Food supply from the devastating impact of exotic pests; (2) Environment and natural resources from direct pest impacts and increased pesticide use; (3) Public from pests that pose human health threats; (4) Position in the global economy.

California Emergency Management Agency (Cal EMA) California State Hazard Mitigation Plan Hazard mitigation is “any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards”. In California this definition has been expanded to include both natural and man-made hazards. This plan outlines California State Government's understanding and evaluation of the hazards the state faces and the strategies, goals, and activities it will pursue to address them.

California Emergency Management Agency: California Local Hazard Mitigation Planning
The local hazard mitigation planning process analyzes a community's risk from natural hazards, coordinates available resources, and implements actions to reduce or eliminate risks.

California Environmental Quality Act (CEQA)
CEQA, or the California Environmental Quality Act, is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.

California Fire Alliance
The California Fire Alliance is an interagency forum formed to support and encourage prefire suppression activities that enhance public safety, minimize wildfire costs and losses, and maintain or improve environmental quality. It seeks to achieve these ends through more effective coordination that will better integrate the member agency efforts.

California Inter-agency Noxious Weed Coordinating Committee (CINWCC)
The California Interagency Noxious Weed Coordinating Committee (CINWCC) was formed in 1995 when 14 federal, state, and county agencies came together under a Memorandum of Understanding to coordinate the management of noxious weeds. The committee’s mission is to facilitate, promote, and coordinate the establishment of an Integrated Pest Management partnership between public and private land managers toward the eradication and control of noxious weeds on federal and state lands and on private lands adjacent to public lands.

California Invasive Plants Council (CAL-IPC)
The purpose of the Council is to provide policy level direction and planning for mitigating harmful invasive species infestations throughout the state and for preventing the introduction of others that may be potentially harmful. The Council shall foster coordinated, streamlined approaches that support initiatives for the prevention and control of invasive species, avoiding program duplication by building upon the core competencies of member organizations.

California Native Plant Society – (CNPS)
The California Native Plant Society (CNPS) works to protect California's native plant heritage and preserve it for future generations. Urban and agricultural growth, the spread of nonnative weeds,

expanding knowledge regarding sustainable timber and grazing practices, and frequently inadequate land use planning all elevate the essential need to prevent the decline in California's native plant diversity.

California Natural Resources Agency (CNRA)
The Agency's mission is to restore, protect, and manage the state's natural, historical, and cultural resources for current and future generations using creative approaches and solutions based on science, collaboration, and respect for all the communities and interests involved. There are nine departments in the California Natural Resources Agency including CALFED Bay-Delta Program; California Conservation Corps; Department of Boating and Waterways; Department of Conservation; Department of Fish and Game; Department of Forestry and Fire Protection; Department of Parks and Recreation; Department of Resources Recycling; and Department of Water Resources.

California Noxious Weed Control Project Inventory
A combined government/private/non-profit effort to establish a database, accessible through the Internet, containing information on noxious weed control in California. This information will further the practice and science of noxious weed control and assist agencies and practitioners doing noxious weed control throughout the state.

California Outdoor Recreation Plan (CORP)
The California Outdoor Recreation Plan is the statewide master plan for parks, outdoor recreation, and open space for California. It provides policy guidance to all outdoor recreation providers, including federal, state, local, and special district agencies that provide outdoor recreational lands, facilities and services throughout California. The CORP is also the primary tool for prioritizing Land and Water Conservation Fund grant allocations to local governments.

California Partners in Flight Conservation Plan
The CalPIF mission is to promote the conservation of resident and migratory landbirds and their habitats in California through research, monitoring, education, and collaboration among public and private landowners and managers, government agencies, non-government organizations, and individuals and other bird conservation efforts. The California chapter of Partners in Flight (CalPIF) was established in 1992.

California Regional Invasive Species Information System Catalog (CRISISCat)
CRISISCat is a clearinghouse for information on invasive species in California, designed to provide access to a variety of resources such as organizations, people, projects and taxa-specific information. CRISISCat is a joint project of CAIN and the California Legacy Project.

California State Coastal Conservancy Strategic Plan
This plan is intended to protect, conserve, restore, and enhance environmental and human-based resources of the California coast and ocean for environmentally sustainable and prudent use by current and future generations under the policy direction of the California Coastal Act (1976). It includes policies pertaining to public access, recreation, marine resources, land resources, residential and industrial development, and port development. These policies are implemented primarily through Local Coastal Programs (LCPs) which offer planning tools for local governments to guide development in the coastal zone in partnership with the Coastal Commission.

California State parks Off-Highway Motor Vehicle Recreation Division Strategic Plan
This Strategic Plan provides guidance to the OHMVR Division to manage state vehicular recreation areas (SVRAs) through a statewide financial assistance program that provides off-highway vehicle-related activities including law enforcement, operations and management, education, environmental protection, and repair and restoration on local and federal lands.

California Tahoe Conservancy
The California Tahoe Conservancy is an independent State agency within the Natural Resources Agency of the State of California. It was established in its present form by State law in 1984 (Chapter 1239, Statutes of 1984). Its jurisdiction extends only to the California side of the Lake Tahoe Basin. The

Conservancy is not a regulatory agency. It was established to develop and implement programs through acquisitions and site improvements to improve water quality in Lake Tahoe, preserve the scenic beauty and recreational opportunities of the region, provide public access, preserve wildlife habitat areas, and manage and restore lands to protect the natural environment.

California Urban Forestry Advisory Committee (CUFAC)
The California Urban Forestry Advisory Committee was established to advise the Director of the CAL FIRE on the State's Urban Forestry Program.

California Wildlife Action Plan
California Wildlife: Conservation Challenge the state's wildlife action plan was developed and produced as a collaborative effort between the California Department of Fish and Game and the Wildlife Health Center at the University of California, Davis. The plan is directed at answering three primary questions: 1. What are the species and habitats of greatest conservation need? 2. What are the major stressors affecting California's native wildlife and habitats? 3. What are the actions needed to restore and conserve California's wildlife, thereby reducing the likelihood that more species will approach the condition of threatened or endangered?

California Wildlife Conservation Board
The Wildlife Conservation Board's three main functions are (1) land acquisition, (2) habitat restoration and enhancement of facilities, including conservation of inland wetlands, riparian habitat, oak woodlands and protection of rangeland, grazing land and grasslands, and (3) development of wildlife-oriented public access and recreational areas.

Chicago Climate Exchange (CCX)
Chicago Climate Exchange (CCX), launched in 2003, is an active voluntary, legally binding integrated trading system to reduce emissions of all six major greenhouse gases (GHGs), with offset projects worldwide. CCX is a cap and trade system whose Members make a legally binding emission reduction commitment. Members are allocated annual emission allowances in accordance with their emissions Baseline and the CCX Emission Reduction Schedule.

Climate Action Reserve (CAR)
The Climate Action Reserve is a national offsets program working to ensure integrity, transparency and financial value in the U.S. carbon market. It does this by establishing regulatory-quality standards for the development, quantification and verification of greenhouse gas (GHG) emissions reduction projects in North America; issuing carbon offset credits known as Climate Reserve Tonnes (CRT) generated from such projects; and tracking the transaction of credits over time in a transparent, publicly-accessible system.

County General Plans
General Plan is the overall planning made about an area, land, city, county etc where in the areas are generally established for different purposes, zones and activities.

Federal Emergency Management Agency (FEMA)
FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

Fire Safe Councils
Mobilize Californians to protect their homes, communities, and environments from wildfire. Since its formation in April 1993, the Council has united its diverse membership, including counties, to speak with one voice about fire safety. The Council has distributed fire prevention education materials to industry leaders and their constituents, evaluated legislation pertaining to fire safety and empowered grassroots organizations to spearhead fire safety programs.

Forest Tax Reform Act
This tax reform act made numerous revisions to the assessment and collection of taxes for timber and timberlands. Its primary features include: creation of the Timberland Production Zone (TPZ), where only timber production along with certain compatible uses are allowed, and a shift of tax collection of timber taxes by the State (Board of Equalization), based on regional (market area) timber values.

Greenbelt Alliance
Greenbelt Alliance protects open spaces and creates vibrant places throughout the San Francisco Bay Area. The Alliance works in partnership with diverse coalitions on public policy development, advocacy, and education.

Habitat Conservation Plan (HCP)
Habitat Conservation Plans under the Endangered Species Act provide a framework for people to complete projects while conserving at-risk species of plants and animals. Congress envisioned Habitat Conservation Plans as integrating development and land-use activities with conservation. HCPs are planning documents required as part of an application for an incidental take permit. They describe the anticipated effects of the proposed taking; how those impacts will be minimized, or mitigated; and how the HCP is to be funded.

Healthy Forests Restoration Act
The Healthy Forests Restoration Act of 2003 (P.L. 108-148) contains a variety of provisions to expedite hazardous-fuel reduction and forest-restoration projects on specific types of Federal land that are at risk of wildland fire or insect and disease epidemics. The act helps rural communities, States, Tribes, and landowners restore healthy forest and range land conditions on State, Tribal, and private lands.

Inland Wetlands Conservation Program
The Inland Wetlands Conservation Program (IWCP) was created to assist the Central Valley Joint Venture (CVJV) in its mission is to protect, restore, and enhance wetlands and associated habitats.

Invasive Species Council of California (ISCC)
The ISCC is an inter-agency council that helps to coordinate and ensure complementary, cost-efficient, environmentally sound and effective state activities regarding invasive species. The ISCC was established February 10, 2009.

Joint Fire Science Program
The Joint Fire Science Program (JFSP) was created by Congress in 1998 as an interagency research, development, and applications partnership between the U.S. Department of the Interior and the U.S. Department of Agriculture. Funding priorities and policies are set by the JFSP Governing Board, which includes representatives from the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, U.S. Geological Survey, and five representatives from the Forest Service.

Local Area Formation Commissions (LAFCs)
LAFCs are state-mandated quasi-judicial countywide Commissions, whose purview is to oversee boundary changes of cities and special districts, the formation of new agencies, including the incorporation of new cities and districts, and the consolidation or reorganization of special districts and or cities.

Metropolitan Planning Organization (MPO) Plans
Metropolitan Planning Organization (MPO) is a federally required transportation planning body comprised of elected and appointed officials representing local, state and federal governments or agencies having interest or responsibility in transportation planning and programming. An MPO is responsible for the development of a Long Range Transportation Plan (LRTP), the Transportation Improvement Program (TIP), and a Unified Planning Work Program (UPWP) for its metropolitan planning area. The adoption of these documents is a prerequisite for the receipt of both federal transit and federal highway funding.

Monitoring Study Group Strategic Plan
The MSG is an Advisory Committee to the Board of Forestry and Fire Protection (BOF) since January 2000. The MSG has, and continues, to: (1) develop a long-term program testing the effectiveness of California's Forest Practice Rules, and (2) provide guidance and oversight to the California Department of Forestry and Fire Protection (CAL FIRE) in implementing the program. CAL FIRE has funded monitoring efforts designed to ascertain if forest practice rules protecting beneficial uses of water are being implemented and are effective since 1990.

National Environmental Protection Act (NEPA)
The National Environmental Policy Act (NEPA) [42 U.S.C. 4321 et seq.] was signed into law on January 1, 1970. The Act establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and it provides a process for implementing these goals within the federal agencies. The Act also establishes the Council on Environmental Quality (CEQ).

National Fire Plan
The National Fire Plan (NFP) was developed in August 2000, following a landmark wildland fire season, with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The NFP addresses five key points: Firefighting, Rehabilitation, Hazardous Fuels Reduction, Community Assistance, and Accountability.

National Fish Habitat Action Plan
A coalition based effort intended to conserve fish and aquatic communities by focusing partnerships of state and federal agencies, conservation organizations, foundations and others on fish habitat issues.

The Nature Conservancy
The mission of the Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on earth by protecting the lands and water they need to survive.

Northern Sierra Partnership (NSP)
The Northern Sierra Partnership is a partnership of five organizations with experience completing significant land protection, restoration, policy development, and community enhancement projects in the northern Sierra. Together they target locally supported conservation and planning efforts. NSP's objective is to protect wetlands, lakes, and streams; connect and manage healthy forests that will reduce the risks of catastrophic wildfire; enhance the well-being of local communities and economies through sustainable land use programs; develop proactive, science-based approaches to adapt to climate change and to mitigate its expected impacts; and build an enduring culture of land and water conservation in the northern Sierra.

Oak Woodlands Conservation Program
The Oak Woodlands Conservation Program offers landowners, conservation organizations, cities and counties, an opportunity to obtain funding for projects designed to conserve and restore California's oak woodlands. The Program is designed to help local efforts achieve oak woodland protection. The program provides a mechanism to bring ranchers and conservationists together in a manner that allows both to achieve that which is so valued — sustainable ranch and farming operations and healthy oak woodlands.

Planning and Conservation League
The Planning and Conservation League (PCL) seeks to protect the California environment through state legislation, the administrative process, and through statewide ballot measures.

Proposition 40
Proposition 40, (the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002) – authorized $2.6 billion in bonds to be used for development, restoration, and acquisition of state and local parks, recreation areas and historical resources, and for land, air, and water conservation programs. The Urban and Community Forestry Program allocation was for $10 million over a four year period, which began in 2006.

Proposition 50
Proposition 50: Water Security, Clean drinking water, Coastal and Beach Protection Act of 2002 Authorized $3.4 billion in general obligation bonds, to be repaid from state's General Fund, to fund a variety of water projects including: specified CALFED Bay-Delta Program projects including urban and agricultural water use efficiency projects; grants and loans to reduce Colorado River water use; purchasing, protecting and restoring coastal wetlands near urban areas; competitive grants for water management and water quality improvement projects; development of river parkways; improved security for state, local and regional water systems; and grants for desalination and drinking water disinfecting projects.

Proposition 65
Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986, was enacted as a ballot initiative in November 1986. The Proposition was intended by its authors to protect California citizens and the State's drinking water sources from chemicals known to cause cancer, birth defects or other reproductive harm, and to inform citizens about exposures to such chemicals.

Proposition 84
Proposition 84, (the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006) –authorizes $5.388 billion in general obligation bonds to fund safe drinking water, water quality and supply, flood control, waterway and natural resource protection, water pollution and contamination control, state and local park improvements, public access to natural resources, and water conservation efforts. Bond expenditures also support urban forestry in the State based on guidance from the California Urban Forestry Act of 1978.

Proposition 117
Proposition 117 (The California Wildlife Protection Act of 1990) requires that California spend no less than $30 million a year on wildlife habitat protection and related purposes. The Habitat Conservation Fund is in charge of allocating these monies to local and state parks and conservancies to acquire or develop wildlife corridors and trails, provide for nature interpretation and other programs which bring urban residents into park and wildlife areas.

Regional Transportation Planning Organization (RTPO)
A Regional Transportation Planning Organization is formed through a voluntary association of local governments within a county or contiguous counties. RTPO members include cities, counties, tribes, ports, transportation service providers, private employers and others.

Sierra Club
The Sierra Club is the oldest and largest grassroots environmental organization in the United States. It was founded in 1892 in San Francisco, California by the well-known conservationist and preservationist John Muir, who became its first president. The Sierra Club has hundreds of thousands of members in chapters located throughout the US, and is affiliated with Sierra Club Canada.

Sierra Nevada Alliance
The organization is an Alliance of conservation groups that are based or work in the Sierra Nevada region. There are over eighty member groups that span the entire 400 mile mountain range. The Alliance mission is to protect and restore the natural resources of the Sierra Nevada for future generations while promoting sustainable communities.

Sierra Nevada Conservancy
The Sierra Nevada Conservancy (SNC) is a state agency created by bi-partisan legislation and signed into law by Governor Schwarzenegger in 2004. The SNC was created with the understanding that the environmental, economic and social well-being of the Sierra Nevada and its communities are closely linked and that the Region would benefit form an organization providing a strategic direction. The SNC Region, made up of all or part of 22 counties and over 25 million acres, is one of the most significant natural and biologically diverse regions in the world.

Smart Growth Initiative
The California Smart Growth Initiative, initiated in September 2000 by the Urban Land Institute, is designed to examine growth and development trends in California, determine the barriers to smart growth, and identify specific local, regional, and state solutions that advance a collaborative smart growth agenda.

Strategic Growth Council
The Strategic Growth Council was formed in September 2008. The Council is a cabinet level committee that is tasked with coordinating the activities of state agencies to improve air and water quality; protect natural resource and agriculture lands; increase the availability of affordable housing; improve infrastructure systems; promote public health; assist state and local entities in the planning of sustainable communities and meeting AB 32 goals.

Sustainable Agriculture Research and Education Program (SARE)
Since 1988, the Sustainable Agriculture Research and Education (SARE) program has helped advance farming systems that are profitable, environmentally sound, and good for communities through a nationwide research and education grants program.

University of California Cooperative Extension (UCCE)
The continuing education arm of the University of California provides innovative learning programs to adult learners in California, across the U.S. and throughout the world. By offering accessible and relevant courses, UC Extension provides knowledge and connections for people to achieve their personal and professional goals.

United States Department of Agriculture (USDA)
Federal Agency that provides leadership on food, agriculture, natural resources, and related issues based on sound public policy, the best available science, and efficient management.

USDA-FSA: Conservation Reserve Enhancement Program (CREP)
The Conservation Reserve Enhancement Program (CREP) is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water.

USDA-Conservation Stewardship program (CSP)
The Conservation Stewardship Program (CSP) is a voluntary conservation program that encourages producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities and improving, maintaining, and managing existing conservation activities.

USDA-NRCS: Emergency Watershed Protection (EWP)
The purpose of the Emergency Watershed Protection (EWP) program is to undertake emergency measures, including the purchase of flood plain easements, for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood or any other natural occurrence is causing or has caused a sudden impairment of the watershed.

USDA-NRCS: Environmental Quality Incentives Program (EQIP)
The Environmental Quality Incentives Program is a voluntary program that provides assistance to farmers and ranchers who face threats to soil, water, air, and related natural resources on their land. Through EQIP, the Natural Resources Conservation Service (NRCS) provides assistance to agricultural producers in a manner that will promote agricultural production and environmental quality as compatible goals, optimize environmental benefits, and help farmers and ranchers meet Federal, State, Tribal, and local environmental requirements.

USDA-NRCS: Healthy Forest Reserve Program (HFRP)
The purpose of the Healthy Forests Reserve Program (HFRP) is to assist landowners, on a voluntary basis, in restoring, enhancing and protecting forestland resources on private lands through easements, 30-year contracts and 10-year cost-share agreements. The objectives of the program are to promote the recovery of endangered and threatened species under the Endangered Species Act, improve plant and animal biodiversity and enhance carbon sequestration.

USDA-NRCS: Wetlands Reserve Program (WRP)
The Wetlands Reserve Program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

USDA-NRCS: Wildlife Habitat Incentives Program (WHIP)
The Wildlife Habitat Incentive Program (WHIP) is a voluntary program for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Indian land.

USDA-USFS: Forest Service Global Change Research Strategy, 2009 – 2019
The Forest Service Global Change Research Strategy helps identify best management practices for urban and rural forests, woodlands, and grasslands to sustain ecosystem health and a range of ecosystem services ("adaptation"), while also increasing carbon sequestration "mitigation")—all under changing climate conditions. The fundamental research focus of the forest Service Global Change Research Strategy is to increase understanding of forest, woodland, and grassland ecosystems so that they can be managed in a way that sustains and provides ecosystem services for future generations.

USDA-USFS: National Urban and Community Forestry Program (UCF)
Urban and Community Forestry (UCF) is a cooperative program of the US Forest Service that focuses on the stewardship of urban natural resources. With 80 percent of the nation's population in urban areas, there are strong environmental, social, and economic cases to be made for the conservation of green spaces to guide growth and revitalize city centers and older suburbs.

USDA-USFS: Northwest Forest Plan (NFP)
The Northwest Forest Plan is an integrated, comprehensive design for ecosystem management, intergovernmental and public collaboration, and rural community economic assistance for federal forests in western Oregon, Washington, and northern California.

USDA-USFS: Region V Best Management Practices (BMP) Evaluation Program
Effectiveness monitoring is completed through annual BMP monitoring of randomly selected, recently completed projects and concurrent monitoring in which sites are selected based on management interest in specific ongoing projects. Effectiveness monitoring is designed to evaluate how well the Forest and Region implement BMPs and how effectively the BMPs control water pollution from National Forest lands.

USDA-USFS Forest Health Protection (FHP) – This program has specialists in forest entomology and pathology, invasive plants, pesticide use, survey and monitoring, suppression and control, technology development and other forest health-related services that assist with protecting and improving the health of rural, wildland and urban forests.

Voluntary Carbon Standard (VCS) Program
The VCS Program provides a robust, global standard and program for approval of credible voluntary offsets. VCS offsets must be real (have happened), additional (beyond business-as-usual activities),

measurable, permanent (not temporarily displace emissions), independently verified and unique (not used more than once to offset emissions).

U.S. Department of the Interior
The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

DOI-BLM: Resource Management Plans (RMPs)
Resource Management Plans are Bureau of Land Management land use planning tools that include issues on outdoor recreation activities, threatened and endangered species habitat, geothermal development, wilderness conservation, fire protection and land access. There are specific California Desert Conservation Area Plans (CDCA) that are RMPs. These plans aim to allow use of public land while not diminishing environmental, cultural and aesthetic value of the desert and to give management direction to conflict resolution.

DOI-USFWS: Endangered Species Program
The FWS Recovery Program works with partners to take measures to prevent the extinction of species, and prepares, coordinates, and implements recovery plans. Recovery plans provide a roadmap with detailed site-specific management actions for private, Federal, and State cooperation in conserving listed species and their ecosystems. A recovery plan is a non-regulatory document. It may apply to one species or an ecosystem. The FWS also offers Safe Harbor Agreements for private landowners through the Endangered Species Program which provides opportunities for private landowners to participate in conserving and recovering imperiled species.

The FWS annually offers millions of dollars in grants for endangered species conservation and recovery. Cooperative Endangered Species Conservation Fund grants are offered to States and Territories for an array of conservation projects for species that are listed, proposed, or candidates for listing.

DOI-USFWS: Partners for Fish and Wildlife Service Program
The Partners for fish and Wildlife Service Program objective is to efficiently achieve voluntary habitat restoration on private lands, through financial and technical assistance, for the benefit of Federal Trust Species. The 2008 Farm Bill established a tax deduction for expenditures paid or incurred for the purpose of achieving site-specific management actions recommended in recovery plans for species listed as threatened or endangered under the Endangered Species Act (ESA).

DOI-NPS: Land and Water Conservation Fund (LWCF)
The Land and Water Conservation Fund was established in 1965 by Congress and provides federal funding for state and local outdoor recreation projects. Since its inception, LWCF has helped state agencies and local communities acquire nearly seven million acres of land and underwritten the development of more than 37,000 state and local park and recreation projects.

DOI-NPS: Federal Lands to Parks Program
This program helps communities create new parks and recreation areas by transferring surplus Federal land to state and local governments. This program helps ensure public access to properties and stewardship of the properties' natural, cultural and recreational resources.

DOI-NPS: The Rivers, Trails, and Conservation Assistance Program
A community assistance program that helps communities conserve rivers, preserve open space, and develop trails and greenways.

Wildlife Conservation and Restoration Program
Federal grant programs that provide financial aid to States, Commonwealths and territories under the Pittman-Robertson Wildlife Restoration Act to plan and implement projects for benefit of a diverse array of wildlife and associated habitats, including species that are not hunted or fished; and to fulfill unmet needs

of wildlife within the States, Commonwealths and territories, including wildlife education and recreation activities.

Williamson Act Program

The California Land Conservation Act of 1965--commonly referred to as the Williamson Act--enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive property tax assessments that are much lower than normal because they are based upon farming and open space uses as opposed to full market value. Local governments receive an annual subvention of forgone property tax revenues from the state via the Open Space Subvention Act of 1971. The Williamson Act was suspended in 2009 due to budget cuts.

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