

APPENDIX

10 March 2019

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Robert R. Williams
Forestry Consultant, Pine Creek Forestry LLC

Dear Bob:

You asked for my thoughts on fire and the Pinelands. I'm attaching the essay I wrote several years ago, which is no longer as current as it was then, but still provides a useful historical survey and sketches the themes that continue to resonate.

As far back as records exist, the Pinelands have burned. Their smoke was smelled by explorers such as Giovanni da Verrazzano before they saw the Jersey shore, and they spied plumes before they saw land. Overwhelmingly these fires have been set by people. That does not mean they are an alien presence outside the evolutionary experience of the Pinelands' principle species. Rather humanity's burning has added and amplified fire's presence; the keystone species like the pitch pine show adaptations as profound as those found in longleaf and lodgepole pine. It is a fire species and a fire landscape. It always has been.

The burning shifted during European settlement. Combined with the axe and markets it intensified and broadened. Many fires now passed into abusive burns. At the end of the 19th century, when Gifford Pinchot and Henry Graves, both destined to become chiefs of the U.S. Forest Service, wanted to investigate the American fire scene, they visited the pine barrens. The New Jersey Forest Fire Service was created primarily to deal with the Pinelands. Some of the earliest scientific inquiries into fire ecology were conducted by Yale foresters and later Forest Service researchers on the Lebanon Experimental Forest - testimony to the fire-hardiness of the landscape and the fascinating character of its peculiar ecology. Throughout it all the pitch pine survived.


The creation of the Pinelands Preserve began an extraordinary experiment in protecting land against mindless sprawl - one that deserves to be more widely known and emulated. As a model for restricting development, the project has largely succeeded. As a template for managing the protected lands, it is fast approaching a decision point. Unsurprisingly, the issue revolves around fire - potential bad fires that might blast out of the preserve, and the good fires that the preserve needs.

The potential for a horrific fire is latent in the land. From time to time it demonstrates its power - the 1963 fires are the last in long chronicle. Given the experience of the fire services, it is unlikely that a single ignition or two would exceed their capacities. But the conditions for bad fires seem to be worsening, and a day of multiple ignitions could overwhelm their capabilities. The best solution to prevent such an explosion is to keep the land in good order, to reduce its proneness to conflagrations, and the best way to do that is to substitute routine good fire.

This is an art and a science the Pinelands have long excelled in. The evidence suggests the practice will have to scale up and that perhaps other preparations will be needed to allow for the right kinds of burning. Among those preparations are policies, political jurisdictions, liability law, and legislation to promote good fires.

So long as the Pinelands exist, they will burn. The issue is how and under whose control.

Sincerely,

A handwritten signature in black ink that reads "Steve Pyne". The signature is written in a cursive, slightly slanted style.

Stephen J. Pyne

From Bob Williams

TO THE LAST SMOKE

Lake
Oswego



The Northeast A Fire Survey

Stephen J. Pyne

OUT April - 2019

24

2018 STRATEGIC FIRE PLAN FOR CALIFORNIA

A vision for a natural environment that is more fire resilient; buildings and infrastructure that are more fire resistant; and a society that is more aware of and responsive to the benefits and threats of wildland fire; all achieved through local, state, federal, tribal, and private partnerships.



**STATE BOARD OF FORESTRY AND FIRE
PROTECTION**

**CALIFORNIA DEPARTMENT OF FORESTRY AND
FIRE PROTECTION (CAL FIRE)**

August 22, 2018

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EXECUTIVE SUMMARY

The Strategic Fire Plan is one of the Board of Forestry and Fire Protection's (Board) preeminent policies.¹ The Board has adopted these Plans since the 1930s and periodically updates them to reflect current and anticipated needs. Over time, as the environmental, social, and economic landscape of California's wildlands has changed, the Board has evolved the Strategic Fire Plan to better respond to these changes and to provide the Department of Forestry and Fire Protection (CAL FIRE) with appropriate guidance "...for adequate statewide fire protection of state responsibility areas." (PRC § 4130)

Earlier iterations of this plan were exhaustive and provided fine-grained detail on vegetation types, placement of suppression personnel and equipment, budgetary considerations, and assets at risk. During preparation of the 2010 Strategic Fire Plan (2010 Plan), the Board changed the previous Plan structure to provide broad, strategic direction to CAL FIRE. The 2010 Plan also required CAL FIRE—a decentralized agency with 21 administrative field units, along with 6 contract counties, implementing multiple fire prevention, natural resource management, and fire suppression programs—to annually report back to the Board on their Unit Fire Plans and accomplishments.

The 2010 Plan approach has proven successful. CAL FIRE's annual updates to the Board, coupled with its Unit Fire Plans, have demonstrated CAL FIRE's ability to meet the 2010 Plan's goals and objectives. The structure and flexibility built into the 2010 Plan provided clear guidance to CAL FIRE and its partners, and CAL FIRE has continued successful implementation at all levels. The policy direction provided by the 2010 Plan also has helped to support CAL FIRE budget requests for additional resources required to attain the provided goals and objectives. Given the success of the new approach, the Board continued this format for the 2018 Strategic Fire Plan (2018 Plan) and incorporated updated goals and objectives to reflect lessons learned, new priorities, and changed conditions.

Since the 2010 Plan, California has experienced environmental changes, and CAL FIRE has made significant organizational changes. The effects of climate change, overly dense forests, and prolonged drought have resulted in unprecedented tree mortality in the state's forests, as well as an increase in the number, area, and severity of wildland fires. Loss of life and structures as a direct or proximate result of wildland fires is at an all-time high. In turn, CAL FIRE has set its focus upon increasing the pace and scale of fire prevention activities while simultaneously fielding a growing year-round wildland fire suppression force. The 2018 Plan anticipates that these trends will continue.

This 2018 Plan reflects CAL FIRE's focus on (1) fire prevention and suppression activities to protect lives, property, and ecosystem services, and (2) natural resource management to maintain the state's forests as a resilient carbon sink to meet California's climate change goals and to serve as important habitat for adaptation and mitigation. Additionally, the continued inclusive collaboration among local, state, federal, tribal, and private

¹ The Board develops and adopts the Strategic Fire Plan pursuant to broad direction provided under Public Resources Code (PRC) §§ 4114 and 4130.

partners remains paramount to effectively manage towards a more fire resilient wildland-urban interface and natural environment. The Plan construes “collaboration” very broadly, from working together to implement a single fuel break, working together to develop a Community Wildfire Protection Plan, to developing and administering the statewide, multi-agency California Fire Management Agreement.

The elements of the 2018 Plan are all consistent with the findings and direction provided in recent assessments, policy reports, and high-level collaborative strategies referenced herein. This scope includes Governor Brown’s Executive Order B-52-18 and establishment of the California Forest Management Task Force.

Implementation of the 2010 Plan demonstrated to the Board and to CAL FIRE that its goals and objectives are not discrete and separate elements, but rather are highly inter-related parts of a holistic strategy. The seven goals in the 2010 Plan have been expanded to eight goals, with a new goal focusing on a wide range of fire prevention activities throughout the state.

New technology allows more rapid and expansive data collection and analysis across the state in pre-, during-, and post-fire environments. Over time, detailed analysis of these data will further assist CAL FIRE in focused efforts to meet the goals and objectives of the 2018 Plan. This is most readily apparent in the ability of CAL FIRE to analyze and share data within and across Departmental programs and Units, as well as with other public and private partners. Moving forward requires melding of knowledge that is informed through emerging science, improved data, and integrated analysis of a variety of factors (e.g., environmental conditions, prevention activities, suppression tactics, land use planning, forest health initiatives, and the effects of wildland fire on the built environment). The Board, CAL FIRE, and our partners can build on this emerging science and data to achieve higher levels of success in the implementation of this 2018 Plan.

This Strategic Fire Plan is focused and concise, ensuring it will be efficient guidance for CAL FIRE and the many stakeholders who share similar missions, responsibilities, and common interests. It was developed through collaboration among the members of the Fire Plan Steering Committee, which included representatives of federal, state, and local governments, as well as labor.² This Committee of subject matter experts worked for over a year preparing this document, and the 2018 Plan went through a Board-led public review and comment process to incorporate additional input. This process included two public workshops, which were held in Santa Rosa and Ventura in May 2018.

The Board expects Unit Fire Plans will continue to implement current efforts, and where necessary, establish new programs and projects to meet the 2018 Plan goals and objectives. As a monitoring mechanism, CAL FIRE will report to the Board annually on progress toward meeting the 2018 Plan’s goals, provide an aggregation of the Unit Fire Plans, and identify opportunities for adaptive management. The ability of the Board and CAL FIRE to meet the 2018 Plan’s goals and objectives will evolve over time as statewide initiatives are implemented and as funds, resources, staffing, and collaborative opportunities become available.

² See p.ii for a full listing of Steering Committee members.

The Board looks forward to working with CAL FIRE and our many partners toward successful implementation of this 2018 Strategic Fire Plan. This success will not be possible without strong collaboration and dedicated funding that targets fire prevention, natural resource management, and fire suppression activities across the state. For Californians to live sustainably in conjunction with fire over the long term, the State must deploy a multi-faceted and balanced approach to all elements of fire management including fire prevention, natural resource management, planning, and fire suppression and recognize both the inevitability and the necessity of fire in healthy wildland ecosystems.

Vision

A vision for a natural environment that is more fire resilient; buildings and infrastructure that are more fire resistant; and a society that is more aware of and responsive to the benefits and threats of wildland fire; all achieved through local, state, federal, tribal, and private partnerships.

Goals as Summarized

The goals that are critical to achieving the 2018 Strategic Fire Plan's (2018 Plan) vision revolve around fire prevention, natural resource management, and fire suppression efforts, as broadly construed. Major components are:

- Improve the availability and use of consistent, shared information on hazard and risk assessment;
- Promote the role of local planning processes, including general plans, new development, and existing developments, and recognize individual landowner/homeowner responsibilities;
- Foster a shared vision among communities and the multiple fire protection jurisdictions, including county-based plans and community-based plans such as Community Wildfire Protection Plans (CWPP);
- Increase awareness and actions to improve fire resistance of man-made assets at risk and fire resilience of wildland environments through natural resource management;
- Integrate implementation of fire and vegetative fuels management practices consistent with the priorities of landowners or managers;
- Determine and seek the needed level of resources for fire prevention, natural resource management, fire suppression, and related services; and
- Implement needed assessments and actions for post-fire protection and recovery.

STATE BOARD OF FORESTRY AND FIRE PROTECTION

The Board of Forestry and Fire Protection (Board) is a Governor-appointed body, whose members are appointed based on their professional and educational qualifications and their general knowledge or interest in watershed management, forest management, fish and wildlife, range improvement, forest economics or land use policy. Of the Board's nine members, five are representatives from the general public, three are from the forest products industry, and one member is from the range-livestock industry.



State Board of Forestry and Fire Protection.

The mission of the Board is to lead California in developing policies and programs that serve the public interest in environmentally, economically, and socially sustainable forest and rangeland management; and a fire protection system that protects and serves the people of the state. Its statutory responsibilities are to:

1. Establish and administer forest and rangeland policy for the State of California;
2. Protect and represent the state's interest in all forestry and rangeland matters;
3. Provide direction and guidance to CAL FIRE on fire protection and natural resource management;
4. Accomplish a comprehensive regulatory program for forestry and fire protection;
5. Conduct its duties to inform and respond to the people of the State of California; and
6. Address minimum fire safety standards for developments in the State Responsibility and fire hazard planning in General Plan Safety Elements.

In concert with the mission of the Board, the mission of the California Department of Forestry and Fire Protection (CAL FIRE) is to serve and safeguard the people and protect the property and resources of California.

The Board is responsible for developing the general forest policy of the state, setting CAL FIRE guiding policies, and representing the state's interest in federal land management. Central among these are the Board-promulgated Forest Practice Rules, which set standards and best management practices for commercial management of nonfederal forests in the state, including measures for reducing wildland fire risks and improving forest resilience.

CAL FIRE implements and enforces the Board's policies and regulations. The Board is within CAL FIRE and, together, they work to carry out the mandates of the Governor and the Legislature to protect and enhance the state's unique forest, wildland, and watershed resources.

To carry out these responsibilities, the Board engages in a strategic planning process which defines and communicates the Board's guiding values and priorities and directs resources to the most important issues. It also defines both the Board's and CAL FIRE's vision, and how to measure and report performance.

The development of the Strategic Fire Plan is a critical element of this planning process. The Strategic Fire Plan forms the basis for assessing California's complex and dynamic natural and built environments, and it identifies a variety of actions to minimize the negative effects and enhance the positive effects of fire.

The Public Resources Code authorizes the Board to establish a fire plan which, among other things, establishes the levels of statewide fire protection services for State Responsibility Area (SRA) lands. CAL FIRE and other federal and local fire protection resources collectively provide regional and statewide emergency response services. In addition, California's integrated mutual aid fire protection system provides statewide fire protection services through automatic and mutual aid agreements for wildland fire and other emergency incidents.

16x

SETTING THE STAGE

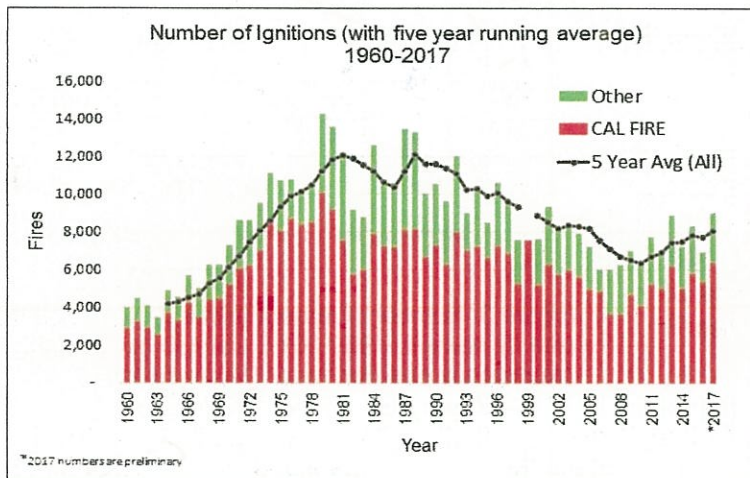
Fire is a primary driving force that has shaped California’s ecosystems for millennia, recurring at varying intervals in virtually all vegetation types. It is estimated that between 4.5 and 12 million acres burned annually prior to Euro-American settlement, although there was significant variability in pre-settlement fire regimes across vegetation types and regions. Wildland fire activity always has been closely connected to climate and continues to be an endemic part of natural systems of much of the state. Our continuing quest to manage these systems in the face of fire’s inevitability requires both looking backward for patterns and successes and looking forward for new innovations and strategies.



*Extensive Drought Mortality within the Central Sierra
Photo courtesy of CAL FIRE*

Wildland Fire Trends

The modern era has seen a marked change in natural fire regimes due to land management practices and fire suppression. The disruption of fire regimes within ecosystems has created conditions across California that, in concert with climate change and expanding development, are manifesting themselves in the form of increased wildland fire impacts, with ecological, economic and human consequences.



*Figure 1. Number of ignitions (with five year running average)
Data Source: CAL FIRE Historical Wildfire Statistics, 1960- 2017
(A data gap exists for “other” wildland fire ignitions in 1999, which disallows calculation of a 5-year rolling average for 1999)*

Recent trends have shown an increase in the number of ignitions, area burned, and impacts to ecosystems. Ignitions, which are correlated to increased workload, have been on the rise since 2007 (Figure 1) after decades of reductions. While this increase in ignitions is indicative of a increased fire suppression workload for CAL FIRE, it also highlights the continued need for a robust fire prevention program.

The burn area, whether looked at in aggregate or by vegetation type, shows an increasing trend that mirrors signatures of climate change, such as rising mean temperature and increasing length of fire seasons.

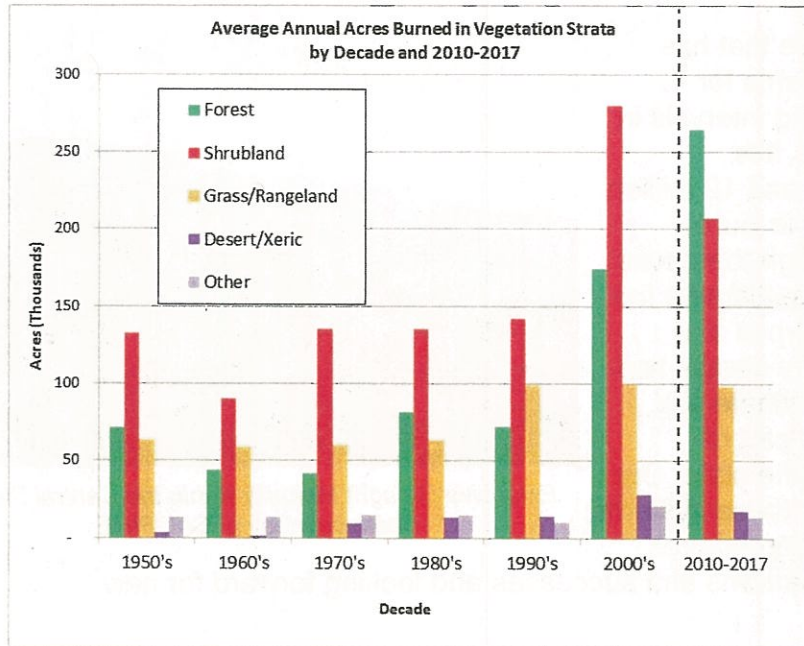


Figure 2 shows annual average rates of burning (acres/year) by vegetation type and decade. Annually since 2000, the average annual acres burned in California has more than doubled the average of the 1960s (FRAP 2018, forthcoming). By decade, this annual average rose steadily through the 1990s to a peak in the first decade of the 2000s and beyond. Average annual area burned within the state since 2000 has maintained at a rate of approximately 700,000 acres each year.

Figure 2: Average annual area burned (acres) by decade and vegetation strata, 1960- 2017. Data source: CAL FIRE California Interagency Fire Perimeter Database 2017.

Of particular note, Figure 2 shows that there has been a steady increase in burn area in forest fuel types. The amount of forest area burned has increased each decade since the 1990s, and, since 2010, more forest area has burned than any other vegetation type.

The increasing prevalence of very large fires (>100,000 acres) across the West, as well as large scale tree mortality events, has led many experts to posit that the US has entered into an era of “mega-fires” or “mega-disturbances.”³ During this decade, although the number of large annual fires has

decreased compared to the 2000s, the average fire size has increased (Figure 3). Fourteen of the twenty largest wildland fires of the modern era have occurred since 2000, including the 2017 Thomas Fire, which burned over 280,000 acres. In fact, 2017 had the

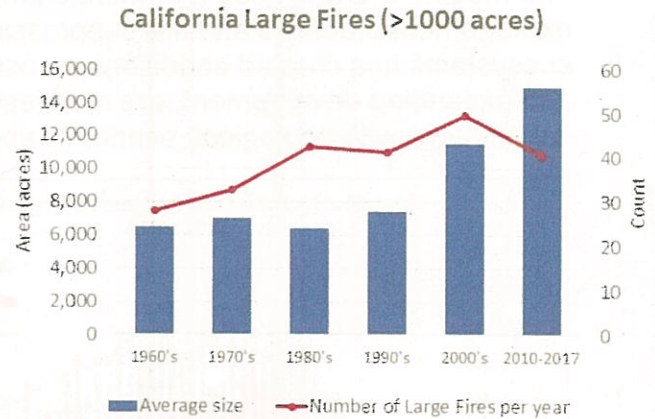
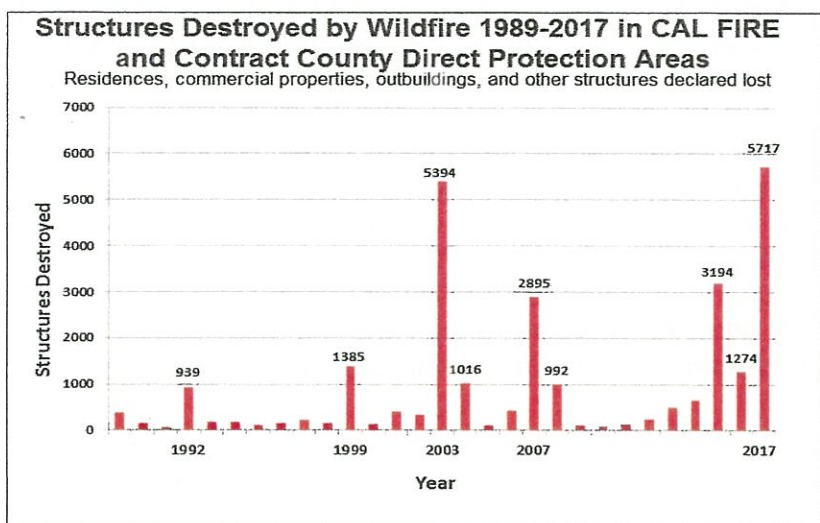


Figure 3: Number of large wildfires (>1000 acres) and average size by decade, 1960-2017. Data source: CAL FIRE California Interagency Fire Perimeter Database 2017.

³ Temperate and boreal forest mega-fires: characteristics and challenges. *Frontiers in Ecology and the Environment*, 12(2), pp.115-122.

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most structures destroyed by wildland fire within the last three decades, totaling 5,717 structures within Direct Protection Areas (DPA). More than 10,000 structures were lost in



the DPA and Local Response Areas combined. Since the turn of the century there has been a steep increase in structures lost compared to the 1990s, which is correlated to the average fire size increasing (Figure 4).

Figure 4: Number of structures destroyed by wildfire between the years 1989-2017 in CAL FIRE and contract county direct protection areas

Climate change and wildland fire now drive forest and watershed policy and management. Forests sequester and store significant amounts of atmospheric carbon, thereby helping to check greenhouse

gas impacts such as rising mean temperatures. However, both the increasing number and nature of wildland fires cause massive losses in stored carbon and significant reductions in carbon sequestration. As such, carbon stability now plays a central role in forest policy (cf. AB1504 Forest Carbon Inventory, California Forest Carbon Plan, Little Hoover Commission Report, Forestry Note 121, Executive Order B-52-18, and the Governor’s Forest Management Task Force). Policies are designed to greatly increase the pace and scale of actions to improve forest health and resiliency and to promote long-term carbon stability, uptake, and storage by promoting larger healthy trees.

These trees are more resistant to fire and other disturbances that can lead to loss of forest cover and ultimately result in lower carbon density ecosystems. Similar plans directed at other land types are also being developed (e.g., Natural and Working Lands Carbon Plan). Collectively, these plans promote policies to get the right kind of fire on the right kind of landscape at the right time, thereby enhancing the long-term carbon trends and ecosystem health across the state.



Prescribed Fire in the forested setting Photo courtesy of CAL FIRE

Managing wildland fire in the face of complex and sometimes competing interests is a major challenge. As land managers continue to increase the use of proactive fuel treatments, greater funding and collaboration are increasingly necessary to address fire and vegetative fuels at landscape scales.

Examples of existing collaborative approaches include the Sierra Nevada Watershed Improvement Program, Western Klamath Restoration Partnership, Prescribed Fire MOU, Good Neighbor Authority agreements between CAL FIRE and USFS Region 5, and the California Fire Management Agreement. In addition, the California Forest Carbon Plan and the Forest Management Task Force emphasize the importance of landscape-level collaboration to ensure the achievement of its forest health and resiliency goals. Critical funding sources (such as the California Climate Investment Forest Health Grant Program at CAL FIRE and State bond act support for grant programs at multiple State agencies) are also necessary to support these collaborative efforts. The Fiscal Year (FY) 2018 Federal Omnibus Spending Bill provides new wildfire funding and forest management authorities to the Forest Service. These new resources will offer significant support to the Forest Service in achieving its goals for healthier forests and the benefits they deliver to the public, including through collaborative efforts with the State of California and other partners.

Population

Demographic pressures continue to put more people, homes, and infrastructure in harm's way from wildland fire. The most recent assessment of California's Wildland-Urban Interface shows that as of 2010, there were about 3 million housing units in Fire Hazard Severity Zones (FHSZ) that are potentially at risk from wildland fire. Figure 5 shows how these housing units are distributed among California counties. The figure shows that a large proportion of the houses within FHSZ are in the southern portion of the state. The top five counties for FHSZ housing units, all in southern California, contain about half of all statewide housing units in FHSZ. However, this is a statewide problem, with 37 counties have at least 10,000 housing units in FHSZ.

Further, since the frequency of extreme weather events is projected to increase, urban areas both immediately adjacent to and near wildlands will be at risk. The 2017 October Fire Siege clearly showed that the damage from wildland fires can occur in areas previously thought to be at low risk. Recent wildland fires also have demonstrated that post-fire events can cause substantial loss of life and damage to property and natural resources. CAL FIRE is continuing to explore new data, science, and tools to revise its Fire Hazard Severity Zone maps to account for localized extreme wind events. In addition to improving mapping, expanded policies and incentives will help existing communities to proactively improve their resistance to wildland fire damage. The end goal is to limit structure and infrastructure impacts and minimize urban conflagrations, where the majority of damage occurs.

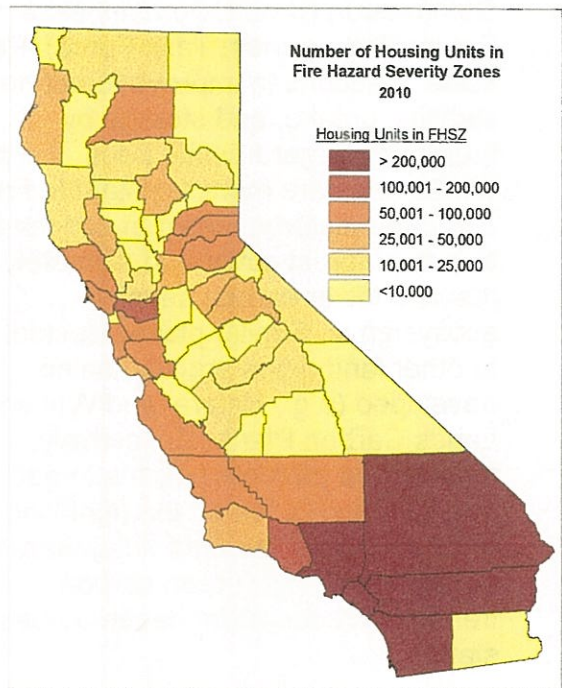


Figure 5: Census Housing Units in Fire Hazard Severity Zones, 2010.
Data Sources: Fire Hazard Severity Zones, FRAP, v11; Census block data, U.S. Census Bureau, 2010.

Fire Protection

Climate change has rendered the term “fire season” obsolete, as wildfires now burn on a year-round basis across the State. Coupled with the ever-increasing number of people and structures exposed to wildland fire risks, it is not surprising that the state’s largest and most destructive fires have occurred in just the past three years. It is impossible to ignore the reality that wildland fires are having a greater impact than ever before.

State, local, federal and tribal agencies each have wildland fire protection responsibilities that are essential to address this difficult situation. Current circumstances require a strong combination of fire protection efforts that marry the strengths of fire suppression with aggressive and robust fire prevention activities. While neither of these efforts can be completely successful on its own, there is growing evidence of success when both efforts are applied in concert.

Fire suppression in California relies on integrated, inter-agency efforts to maximize the use of firefighting resources. This integration is essential to allow the most appropriate resource to respond to an emergency incident, regardless of jurisdiction, and avoids duplication of resources. Existing statutes allow and interagency agreements guide the state’s emergency and non-emergency response to local and/or federal agencies, and vice versa.

While each agency has its own primary mission and responsibilities, wildland fires do not recognize jurisdictional boundaries. Because of varying missions, ownership responsibilities, and land management objectives, applying fire management policies can be complicated. A one-size-fits-all approach to wildland fire suppression does not work in



*Fire Suppression Efforts on Thomas Fire, Dec. 2017.
Photo courtesy of USFS Region V.*

California; hence the need for differing suppression, prevention, and mitigation strategies must be recognized.

This integrated fire suppression model has been tested by the growing wildland fire extent and severity. Despite California’s highly effective wildland fire protection system, some fires escape control efforts. Under extreme weather and fuel conditions or when resource availability is limited due to significant fire activity, a small percentage of wildland fires become large and damaging.

These events have become more frequent and destructive, straining suppression efforts and requiring the best training, resources, technological advancements, and interagency collaboration.

Since the 2010 Plan was approved, fire prevention efforts have improved dramatically. Relying on fire suppression resources alone will never be enough to combat the growing wildland fire impacts. A proactive approach incorporating many layers of prevention activities is now vital to wildfire mitigation strategies. CAL FIRE must continue to seek out and utilize the latest and most effective technologies, data, and research efforts to enhance fire protection efforts across the state. Pre- and post-fire smart device technology, coupled with more robust geographic information systems providing real-time data, provides around the clock feedback both on the ground and in the air.

The State Responsibility Area Fire Prevention Fee (now wholly replaced with the California Climate Initiatives funding) was essential to the successful introduction and implementation of many fire prevention programs. It is critical that these programs continue to move forward, incorporating efforts to create an environment that is more resilient and resistant to wildland fire impacts, continue to develop new policies and procedures to promote public and firefighter safety, and educate the public that wildfire is a natural and inevitable part of California's landscape. As more data are gathered in both pre- and post-fire environments, research will provide insight on how to further improve these efforts.

Individual landowners, homeowners, and communities share wildland fire protection and prevention responsibilities with federal, state, tribal, and local fire protection agencies. Homeowners have a primary responsibility to create and maintain defensible space around their structures and to utilize ignition resistant building materials and



Private Landowner working to clear defensible space around a habitable structure

construction methods. These efforts, combined with a long-term maintenance plan for the built environment, can help create structure resistance to embers, which are now known to be the leading cause of structure ignitions during many wildland fires. Homeowners and landowners in a community must work together to plan and implement fire prevention measures, such as education programs and fuel treatment projects, and incorporate new strategies and technological innovations as they are developed. None of these efforts will be

successful on its own. It is the holistic combination of all these actions that will reduce the impacts of wildland fires.

Integration of fire prevention and fire suppression activities will provide a successful path forward to respond to California's growing wildland fire impacts. This integration requires a shift in the way California's fire service moves forward. Historically, fire prevention and fire suppression have been treated as two separate and distinct functions within the fire service and by the general public. Moving forward, this can no longer be the case.

The artificial separation between prevention and suppression activities has now been dissolved. Suppression resources, when available, are committed year-round in performing fire prevention activities. As we expand fuel reduction treatments across the landscape, they will play an increasing role during fire suppression. Inspections and public education programs continue to help further fire preparedness efforts by embedding fire service personnel as important members of the local fire planning community. Thorough research, data collection, and analysis informs all aspects of prevention and suppression. As CAL FIRE becomes even more adept at integrating these efforts, fire protection and mitigation will be more successful. Creating a single integrated fire protection model composed of both fire prevention, natural resource management, and fire suppression strategies is a primary intent of this 2018 Strategic Fire Plan.

Preventing Wildland Fire Threats to Ecosystem Health

While historically wildfire has been a key component in ecosystem dynamics, a number of factors have disrupted the natural fire regime occurring in many of California's ecosystems. There are many cases where the type of wildland fire and the pattern of its occurrence, when compared to historical conditions, are creating adverse impacts on ecosystem composition, structure, and function. Factors such as fire suppression, land use, exotic invasive species, and climate change all place stresses in the manner in which fire interacts with ecosystem health, function (such as biodiversity) and sustainability.

While these issues are reasonably well defined, an analytical approach using these concepts to define priority treatment areas across the state is needed to frame a strategic response to these impending risks. One example of the evolution of these strategies is the Fire MOU, which was signed in 2015 by multiple parties, including CAL FIRE, the USDA Forest Service, the National Park Service, and multiple conservation organizations.

The California Forest Carbon Plan also identifies the expanded use of prescribed fire and other fuels treatments to enhance forest ecological resilience. CAL FIRE's Vegetation Treatment Program Programmatic EIR, when finalized, will also be an important tool to reduce fuels on SRA lands.



Mechanized management of vegetative fuels Photo courtesy of CAL FIRE

CAL FIRE Staffing and Capacity

Since Board approval of the 2010 Strategic Fire Plan, CAL FIRE has been successful in several budget augmentations. The goals and objectives of the 2010 Plan provided CAL FIRE program managers with a strong basis to justify budget augmentations to increase the pace and scale of fire prevention, natural resource management, administration, and fire suppression activities statewide. This process has ultimately resulted in CAL FIRE moving forward into the era of the combined fire protection disciplines. Examples of the most significant efforts in strengthening CAL FIRE and its implementation of the 2010 Plan goals and objectives through budgetary augmentation can be reviewed in Appendix A.

While not all budgetary matters over the life of the 2010 Plan have been covered in Appendix A, the budget augmentations have increased the pace and scale of fire prevention, natural resource management, and fire suppression resources. The interconnectedness of the 2010 Fire Plan goals allowed CAL FIRE program managers to successfully justify the bolstered staff and other resources to continue to conduct the critical work for the state. The Board intends that the modified goals and objectives of this 2018 Strategic Fire Plan will result in supporting the continued efforts of CAL FIRE as the agency moves toward further development of fire prevention, natural resource management, and fire suppression strategies.

MOVING FORWARD WHILE CHECKING BACK

Adaptive Management

Consistent with the principle of adaptive management, this 2018 Strategic Fire Plan is designed to be flexible and allow for changing internal and external conditions. Objectives may be reevaluated by the Board and their relational importance may change. Decisions made because of these reevaluations need to rely on analysis and interpretation of vast amounts of data. Advances in science and technology will allow CAL FIRE to continue in these analytical efforts. For the lifespan of this 2018 Plan, the state must continue to take full advantage of improvements to gather more and increasingly accurate data for study and research. Findings will result in a better understanding of how climate issues continue to affect forest health and other natural resources, and how the built environment can become more resistant and resilient to the effects of wildfire. As improvements continue to be made in data collection and analysis, the results can be used to improve forest health initiatives, wildfire prevention goals, and strive toward a future that improves safety and resilience and resistance to increasing wildfire impacts. The Board's Effectiveness Monitoring Committee can contribute to 2018 Plan-related adaptation through the evaluation of the fire prevention and resource management effectiveness of the Forest Practice Rules.

Goals and Objectives

The foundation of this dynamic 2018 Plan is the eight goals and their associated objectives. Collectively, these goals and objectives provide a framework to address the protection of lives, property and natural resources from wildland fire.

Priorities

The 2018 Plan and its associated goals and objectives frame the programs of fire prevention, natural resource management, and fire suppression work for CAL FIRE over the life of the 2018 Plan. Program priorities, funding levels and measures of success are dynamic and subject to change.

The Board and CAL FIRE will remain diligent in attempting to secure the appropriate level of resources through direct funding requests, grant opportunities, or agreements with collaborative partners. CAL FIRE will prioritize the goals and objectives to make the most effective use of existing staff and funding. CAL FIRE, to the extent feasible, will maximize the ability to meet the stated goals and objectives with the level of resources available.

During the first two years of this 2018 Plan, each CAL FIRE Unit, and contract county, will revise its individual Unit Fire Plan to identify its priorities for the implementation of the identified goals and objectives. Throughout the remaining life of this 2018 Plan, the priorities will be periodically reviewed and updated as necessary.

Timelines

CAL FIRE will report to the Board annually on its accomplishments of the goals and objectives of this 2018 Plan. The next comprehensive update to the 2018 Plan will take place in 2026, or as necessary based upon changing environmental or social needs.

Monitoring Wildland Vegetation Changes and Using Risk Assessment Models

In addition to Board monitoring of 2018 Plan implementation, the state should engage in comprehensive monitoring of key features of the wildland and wildland-urban interface (WUI) landscape through which wildland fires move. The state needs robust risk assessment models to predict fire behavior and effects across these landscapes, including those that address forest resilience and carbon-sequestration. Further needs include evaluation of how vegetative treatments affect wildland fire behavior and outcomes where the two interact. To meet the goals and objective of this of this 2018 Plan, the Board recommends:

- Expanded, frequently refreshed data about forest, shrubland, and watershed areas, including WUI;
- Tools that support integrated risk modeling that couples spatially explicit stochastic fire modeling with fire-behavior-specific value change curves;
- Watershed-based analytical frameworks based on or similar to the Sierra Nevada Watershed Improvement Program that couple local land owner/land manager, agency, and stakeholder involvement with spatial data risk tools;
- A statewide, multi-partner forest health monitoring program, leveraging Demonstration State Forests for CAL FIRE contributions. This program will go a

long way to providing quantitative measures of ecosystem structure and function, and form the backbone of trend analysis to inform policy change. Maintain long-term permanent monitoring plots designed to describe forest changes in response to climate change, disturbance, and treatment activities;

- Programmatic monitoring of post-treatment results (vegetation and fuels, effects on soils, water, habitat, and other resources) and effectiveness where treatment areas are burned in wildland fires;
- Development and dedicated support for a Prescribed Fire Working Group, Vegetation Treatment Program, California Forest Improvement Program, Forest Health Grant Program, Fire Prevention Grant Program, Forest Practice Program, and other relevant programs. All programs should report vegetation treatment activities into a common spatial database for evaluation and summarization; and
- Support for a coordinated research program, including but not limited to: Research on Demonstration State Forests; funding for research through the California Climate Investment Forest Health Program and other state grant funds; and collaborative efforts with the Forest Service Pacific Southwest and Pacific Northwest Research Stations, that supports broad land management goals and specific treatment objectives across all CAL FIRE natural resource management programs.

VISION

A vision for a natural environment that is more fire resilient; buildings and infrastructure that are more fire resistant; and a society that is more aware of and responsive to the benefits and threats of wildland fire; all achieved through local, state, federal, tribal, and private partnerships.

GOALS AND OBJECTIVES

Goals

Through government and community collaboration, the following goals will 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. Each goal listed here is meant to build upon the previous one (e.g., Goal 3 builds upon the accomplishments in Goals 1 and 2). Although full attainment of a goal is ultimately dependent upon the success of previous goals, any of the goals can be worked on at any given time based on available funding and other opportunities.

1. Identify and evaluate wildland fire hazards and recognize life, property and natural resource assets at risk, including watershed, habitat, social and other values of functioning ecosystems. Facilitate the collaborative development and sharing of all analyses and data collection across all ownerships for consistency in type and kind.
2. Promote and support local land use planning processes as they relate to:
(a) protection of life, property, and natural resources from risks associated with wildland fire, and (b) individual landowner objectives and responsibilities.
3. Support and participate in the collaborative development and implementation of local, county and regional plans that address fire protection and landowner objectives.
4. Increase fire prevention awareness, knowledge and actions implemented by individuals and communities to reduce human loss, property damage and impacts to natural resources from wildland fires.
5. Integrate fire and fuels management practices with landowner/land manager priorities across jurisdictions.
6. Determine the level of resources necessary to effectively identify, plan and implement fire prevention using adaptive management strategies.
7. Determine the level of fire suppression resources necessary to protect the values and assets at risk identified during planning processes.

8. Implement post-fire assessments and programs for the protection of life, property, and natural resource recovery.

Objectives

For each of the identified goals, this 2018 Plan lays out a number of objectives to be accomplished. The identified objectives are not meant to be all-inclusive. There may be additional objectives that the Board, CAL FIRE or other cooperative partners identify and could utilize in reaching the primary goals.

- Goal 1: Identify and evaluate wildland fire hazards and recognize life, property and natural resource assets at risk, including watershed, habitat, social and other values of functioning ecosystems. Facilitate the collaborative development and sharing of all analyses and data collection across all ownerships for consistency in type and kind.

Objectives:

- a) Continue to identify, develop and provide automated tools to facilitate the timely collection, analysis and consistent presentation of datasets.
- b) Update and maintain consistent, detailed vegetation and fuels maps across all ownerships in an efficient and cost-effective manner.
- c) Provide regular updates to the CAL FIRE's Fire Hazard Severity Zone maps.
- d) Develop and validate weather and climatology information for use in predicting fire behavior.
- e) Update fire history information and re-evaluate existing fire prediction models to obtain composite fire threat across all ownerships.
- f) Collaborate with other agencies to update existing data for values and assets at risk utilizing geographic information systems (GIS) data layers and other mapping solutions, including fire behavior-specific effects.



*California Fire Hazard Severity Zone Map.
Source: CAL FIRE, Fire and Range
Assessment Program*

- g) 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 buildup of hazardous fuel conditions and resulting fire behavior.
- h) Engage and participate with local stakeholder groups (e.g., fire safe councils and others) to validate and prioritize the assets at risk.

Goal 2: Promote and support local land use planning processes as they relate to: (a) protection of life, property, and natural resources from risks associated with wildland fire, and (b) individual landowner objectives and responsibilities.

Objectives:

- a) Provide expertise to appropriate governmental bodies in the development and/or revision of a comprehensive set of wildland and wildland urban interface (WUI) protection policies for inclusion in each county general plan and/or other appropriate local land use planning documents.
- b) Identify key elements necessary to achieve a fire safe community, and incorporate these elements into land use planning, CWPPs and regional, county, and Unit Fire Plans.
- c) Engage in the development, review, and adoption of local land use plans to ensure compliance with fire safe regulations and current building standards and protection of natural resources.
- d) Collaborate with other agencies to assemble and distribute required and other supporting data for local land use planning.

Goal 3: Support and participate in the collaborative development and implementation of local, county, and regional plans that address fire protection and landowner objectives.

Objectives:

- a) Coordinate Unit Fire Plans with regional and county fire plans or Community Wildfire Protection Plans to encourage and support one consistent approach.
- b) Create and support venues in which individual community members can be actively involved in local fire safe councils, community emergency response teams, FIREWISE, collaboratives, and other community-based efforts to develop readiness plans and educate landowners to mitigate the risks and effects of wildland fire.
- c) Collaborate with federal, tribal and local governments, other state agencies, fire service, and other organizations, to maintain and improve emergency response plans.
- d) Ensure planning efforts are consistent with the Cohesive Strategy, Healthy Forest Restoration Act, the Statewide Hazard Mitigation Plan, federal land management plans, as well as local hazard mitigation plans and other relevant statewide or regional strategic planning documents.
- e) Maximize available resources to strengthen planning and increase implementation efforts through the development of public/private partnerships.
- f) Develop and utilize available fire risk mitigation treatment decision support tools to assist in project planning, design, implementation, and validation.



*Interagency coordination and planning.
Photo courtesy of USFS Region 5*

Goal 4: Increase fire prevention awareness, knowledge and actions implemented by individuals and communities to reduce human loss, property damage, and impacts to natural resources from wildland fires.

Objectives:

a) Educate landowners, residents, and business owners about the risks and their incumbent responsibilities of living in the wildlands, including applicable regulations, impacts to natural resources, and prevention measures and preplanning activities.

b) Educate landowners, residents, fire safe councils, and business owners to understand that fire prevention is more than defensible space, including why structures ignite, the role embers play in such ignitions, and the importance of fire safe building materials, designs, and retrofits.



Home surrounded by wildland that survived a fire due to good defensible space.

c) Facilitate activities with individuals and organizations, as appropriate, to assist individual property owners in complying with fire safe regulations, including utilizing social media and emerging technologies.

d) Continue to improve regulatory effectiveness, compliance monitoring and reporting pursuant to Public Resources Code (PRC) §4290 and §4291.

e) Continue to increase the number and effectiveness of defensible space inspections and promote an increasing level of compliance with defensible space laws and regulations through the use of CAL FIRE staffing as available, public and private organizations, and alternative inspection methods.

f) Promote the coordination 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.

- g) Continue to evaluate new, ignition-resistant construction technologies and materials and promote the strengthening of California building standards.
- h) Seek out authority and funding incentives to promote the retrofit of existing structures to meet ignition-resistant building codes.
- i) Actively enforce and seek updates as necessary to fire prevention codes, regulations, and statutes that address fire ignition.
- j) Actively investigate all wildland fires. For those resulting from negligent acts, pursue appropriate civil and/or criminal actions, including cost recovery.
- k) Identify fire prevention performance measures and metrics for documenting and evaluating progress, measuring future performance, and communicating results to the Board and the public.
- l) Analyze trends in fire cause, and focus prevention and education efforts to modify human behavior and reduce ignitions.

Goal 5: Integrate fire and fuels management practices with landowner/land manager priorities across all ownerships and jurisdictions.

Objectives:

- a) Promote efforts to restore the ecological role of prescribed and managed fire in areas and upon jurisdictions where doing so is consistent with local land management objectives and does not present an unacceptable risk to human health and safety or security of adjacent ownerships.
- b) Increase support of landowner-initiated fuels reduction by using all available authorities and programs.
- c) Work to streamline or remove regulatory or policy barriers that limit fuels reduction activities.
- d) Promote and develop programmatic documents to increase the pace and scale of fuels treatment activities
- e) Assist collaborative partners by educating, increasing grant funding and administration capacity, providing technical assistance, and other means that achieve fuels reduction work on the landscape.
- f) Promote forest and rangeland health and resilience through fuels reduction, and sustainable commercial forest management. Improve markets for and utilization of all forest products, including dead trees, waste, and biomass.
- g) Increase public education and awareness in support of ecologically sensitive and economically efficient vegetation management activities, including prescribed fire, grazing, forest thinning, and other fuels treatment projects.
- h) Expand the development of collaborative multi-agency/landowner fuels reduction policies, plans and activities at the watershed and fireshed level.
- i) Support the availability and utilization of CAL FIRE hand crews and other CAL FIRE resources, as well as local, state, federal, tribal, and private resources, for fuels management activities, including ongoing maintenance.



CAL FIRE inmate crew working on a fuel reduction chipping project.

Goal 6: Determine the level of resources necessary to effectively identify, plan and implement fire prevention using adaptive management strategies.

Objectives:

- a) Seek additional staffing for implementing enhanced fire prevention activities, including related natural resource management programs.
- b) Initiate and maintain agreements with local, state, federal, tribal, and private partners that value the importance of integrated and cooperative fire prevention activities to implement efficient and cost effective programs and projects beneficial to all stakeholders.
- c) Develop a process and criteria for determining prevention resource levels and allocation based on goals and on current projected needs.
- d) Evaluate and develop the use of science, data and innovative technology to implement fire prevention activities in a more collaborative and efficient manner.
- e) Review data, conduct analysis and implement adaptive management related to fire prevention activities.
- f) Increase opportunities to enable all personnel's engagement in the practice, benefits, and understanding of fire prevention activities.

Goal 7: Determine the level of fire suppression resources necessary to protect the values and assets at risk identified during planning processes.

Objectives:

- a) Maintain an aggressive wildland fire initial attack policy that places a priority on protecting lives, property and natural resources. At the same time, consider suppression strategies that incorporate values and assets at risk, as well as cost factors wherever possible.
- b) Maintain current criteria and develop new criteria utilizing emerging technology for determining suppression resource allocation based on elements such as identified values and assets at risk, ignition density, fire history, vegetation type and condition, as well as local weather and topography.
- c) Continue to analyze appropriate staffing levels and equipment needs commensurate with the current and projected emergency response environment.
- d) Seek to increase the number of CAL FIRE hand crews for use in wildland fire suppression and other emergency response activities.
- e) Establish, periodically evaluate, and maintain cooperative fire protection agreements with local, state, tribal, and federal partners that support an integrated, cooperative, fire protection system and deliver efficient and cost effective emergency response capabilities beneficial to all stakeholders.
- f) Improve policies and strategies to minimize injuries or loss of life to the public and emergency responders during emergency response activities throughout the state.
- g) Ensure all firefighters are provided appropriate training, equipment, facilities, and other infrastructure necessary to successfully and safely



Backfire suppression tactics on a wildland fire.

meet the increasingly complicated and challenging emergency response environment.

- h) Continue to evaluate and implement new technologies to improve firefighter safety, situational awareness and emergency response effectiveness.
- i) Provide for succession planning and employee professional development at all levels within CAL FIRE to maintain leadership, emergency response capabilities, administrative management skills, and critical areas of expertise.
- j) Effectively engage and train all CAL FIRE employees across all disciplines to address both planning and emergency response.

Goal 8: Implement post-fire assessments and programs for the protection of life, property, and natural resource recovery.

Objectives:

- a) Encourage rapid post-fire assessment, when and where appropriate, to determine values at risk within and downstream of the fire perimeter from flooding, debris flows, and excessive surface erosion. Provide preliminary emergency protection measures that can be implemented in a timely manner, and help coordinate project implementation with appropriate agencies.
- 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.
- c) Effectively utilize available resources, including CAL FIRE hand crews, grants, and assistance programs to accomplish restoration and protection activities.
- d) Assess the effects of pre- and post-fire treatments to refine best management practices.
- e) Assist landowners and local government in the evaluation of the need to retain and utilize features (e.g., roads, firelines, and water sources) developed during a fire suppression effort, taking into consideration those features identified in previous planning efforts.
- f) Aid landowners in recently burned areas in developing and implementing vegetation treatment plans to manage the re-growth of vegetation and to maintain reduced fuels conditions.
- g) Promote native species seed bank and seedling production capacity to provide the availability of appropriate species for reforestation and restoration across the state's diverse forestlands.



Shaded fuelbreak in the forested setting

- h) Use after-action reports to evaluate and implement new technologies and practices to improve post-fire assessment and rehabilitation.
- i) Encourage the development of necessary interagency agreements, procedures, funding, and training to ensure that watershed emergency response teams can be assembled and deployed in a timely basis where needed.

APPENDIX A: Summary of CAL FIRE Budget Augmentation Supported By Implementation of the 2010 Strategic Fire Plan

- In Fiscal Year (FY) 2010-11, CAL FIRE received permanent funding for day-to-day fire suppression operating costs, including the Aviation Management Unit operations, San Diego Helitack staffing, funding to support a contract for a Very Large Air Tanker, two engines for the Tahoe Basin, and dedicated Defensible Space inspection staff.
- In FY 2011-12, CAL FIRE received permanent funding to further support Aviation Management Services, permanent staff for two single-engine stations within the Tahoe Basin, staffing for two contracted firefighting helicopters, and dedicated State Responsibility Area (SRA) Fee funding to support the enhancement of CAL FIRE wildland fire prevention programs.
- In FY 2013-14, Fire Severity, Treatment, Education, Prevention and Planning programs were provided permanent SRA Fee funding and significant staffing to implement the provisions of SB 1241 that focused on meeting the demand for vegetative fuel treatment and to educating homeowners on ways to prevent the ignition and spread of unwanted human-caused fires by hiring seasonal Defensible Space Inspectors and to build a Land Use Planning Program to work with local jurisdictions. Limited-term positions were provided for grant administration and technical oversight for CAL FIRE's Cooperative Forestry Assistance programs. Funding was authorized that facilitated collaboration between CAL FIRE and California Department of Corrections and Rehabilitation to maintain inmate camps to support suppression activities, and, lastly, additional funding was authorized to facilitate collaboration between CAL FIRE and the California Conservation Corps (CCC) on wildland fire prevention and suppression activities.
- In FY 2014-15, CAL FIRE was granted significant Greenhouse Gas Reduction Funds (GGRF) and position authority that presented CAL FIRE the opportunity to greatly bolster forest health programs and reduce fuel loads in light of climate change. This legislative action also allowed for a renewed focus on fire prevention and fire risk mitigation. This was accomplished through collaboration with State and Local Fire Safe Councils, local governments, fire and community service districts, and homeowners associations. Additionally, GGRF funding was allocated to support many other natural resource management opportunities, including addressing reforestation needs for burned areas, reduction in the rate of spread of forest diseases and removal of dead and dying trees. CAL FIRE was also the recipient of funding and staff positions to provide fire prevention and suppression in the San Bernardino Mountains, the San Jacinto Mountains, and the Lake Tahoe Basin as a means of addressing drought conditions within the State's forests. This funding effort also facilitated further collaboration with local governments, nonprofits, and local conservation corps to assist in both prevention and suppression activities within this portion of the State.

- In FY 2015-16, CAL FIRE received fiscal and staff support to address heightened fire conditions brought on by the extended drought. A fiscal allocation was also approved for to allow for the replacement of a Large Air Tanker that was lost to an aviation accident. In a cooperative effort with the CCC, CAL FIRE reopened the Butte Fire Center. CAL FIRE and CCC crews will provide fire suppression forces, as well as, support for other emergency incidents. CAL FIRE and CCC crews will work cooperatively on wildland fire prevention projects in the form of vegetative fuels reduction work from the re-opened fire center. SRA Funds were provided to CAL FIRE for a public education campaign centered on the prevention of and preparedness for wildland fires throughout California, targeting homeowners, residents, and visitors to the 31 million acres of the SRA.
- In FY 2016-17, CAL FIRE was granted staffing and support for firefighter surge capacity that included staffing 23 additional engines previously scheduled for replacement. This support also addressed required fireline support positions, including relief coverage and, retention of seasonal firefighters on engines and at air attack and Helitack bases beyond the budgeted fire season, to provide additional defensible space inspectors, and to enhance air attack capabilities. Several existing CAL FIRE programs were also allocated fiscal support to address technology needs. This support included funding for upgrades to Information Technology, Situation Command Awareness Data Acquisition, Automated Vehicle Location and Mobile Data Computer devices. A one-time funding allocation was provided to CAL FIRE to mitigate the public health and safety threats posed by the massive tree mortality in the central and southern Sierra Nevada. Funding for two new helicopter airframes, along with supporting staff was also provided. CAL FIRE was also granted a one-time allocation of 200 million from the Green House Gas Reduction Fund that was focused on implementation of projects that increase long-terms rates of carbon sequestration within the state.
- In FY 2017-18, CAL FIRE received funding through December 31, 2017 that includes retaining seasonal firefighters on engines beyond the budgeted fire season, firefighter surge, required fireline support positions, dedicated sawyers for the California National Guard crews, and additional defensible space inspectors; CCC fire suppression crews at the Placer Residential Center; increased vehicle maintenance, and contract funds for leasing one Exclusive Use Large Air Tanker. Support for natural resource management, such as continued tree mortality removal and disposal and updating and re-opening of the Louis A. Moran Reforestation Center also was allocated. Approximately 268 positions and an additional 42 year-round engines were funded to assist in suppression efforts, but are also expected to assist in tree removal and drought related environmental issues when wildland fire suppression is not underway. Lastly, the Legislature added additional funding for SRA Fire Prevention Fund Grants, Tree Mortality Grants to local agencies in 10 counties subject to the tree mortality highest rates of tree mortality, which can be used to leverage an additional \$2 million General Fund. A large sum, \$200 million of California Climate Investments funds, was allocated to CAL FIRE for Forest Health and fire prevention grants.

APPENDIX B: Glossary

Built Environment - Human-made surroundings that provide the setting for human activity, ranging in scale from buildings to parks, including the human-made space in which people live, work, and recreate on a day-to-day basis.

Climate Change – Any long-term significant change in the “average weather” that a given region experiences. Average weather may include average temperature, precipitation, and wind patterns.

(<http://frap.cdf.ca.gov/assessment2010/definitions.html>)

Community Wildfire Protection Plan (CWPP) – A community-based collaborative plan developed by local stakeholders that identifies and prioritizes areas for hazardous fuel reduction treatments to protect communities and infrastructure from wildfire. Stakeholders, applicable local government, local fire departments, state forestry, and federal land management agencies agree to the plans.

Cooperative Fire Protection Agreements – Agreements established between federal, state, tribal and local government entities to provide long-term fire and emergency service protection. These agreements include the California Fire Management Agreement (CFMA) and the California Fire Assistance Agreement (CFAA).

CFMA: <https://gacc.nifc.gov/oscc/cwgcg/cfma.php>

CFAA: http://www.caloes.ca.gov/FireRescueSite/Documents/CalOES-2015_CFAA_Agreement_with%20Signatures.pdf

Defensible Space – The area within the perimeter of a parcel, development, neighborhood, or community where basic wildland fire protection practices and measures are implemented, providing the key point of defense from an approaching wildfire or defense against encroaching wildfires or escaping structure fires.

(http://cdfdata.fire.ca.gov/fire_er/fpp_engineering_view?guide_id=8)

Direct Protection Areas (DPA) - Intermingled and adjacent lands delineated by boundaries regardless of jurisdictional agency. Wildfire protection in these areas are negotiated, created and agreed to by the administrative units of either the Federal Agencies or the State.

Effectiveness Monitoring Committee – This Board-appointed committee is responsible for supporting, through review and funding, research and monitoring efforts to evaluate the effectiveness of the Forest Practice Rules and associated regulations in maintaining and enhancing water quality and aquatic and terrestrial wildlife habitats.

(http://bofdata.fire.ca.gov/board_committees/effectiveness_monitoring_committee/)

Fire Hazard – A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.

(<http://www.nwccg.gov/pms/pubs/glossary>)

Fire MOU - Memorandum of Understanding for the Purpose of Increasing the Use of Fire to Meet Ecological and Other Management Objectives, Forest Service Agreement No. 16-MU-11052012-148.

Fire Prevention – Activities such as public education, community outreach, building code enforcement, engineering (construction standards), and reduction of fuel hazard that is intended to reduce the incidence of unwanted human-caused wildfires and the risks they pose to life, property, or resources. (<http://www.nwcg.gov/pms/pubs/glossary>)

Fire Protection - The study and practice of mitigating the unwanted effects of potentially destructive fires.

Fire Resilient – The ability of a vegetation type, ecosystem, or community to respond positively to or recover quickly from the effects of a wildfire burning within, across or adjacent to them.

Fire Resistant – The condition of an asset that resists ignition and damage from wildfire. Structures are built using ignition resistant materials such as stucco, tile roofs, and boxed eaves with the likelihood that they will withstand most wildland fires or at least reduce damage caused by them.

Fire Risk – The chance of fire starting, as determined by the presence and activity of causative agents; a causative agent or a number related to the potential number of firebrands (embers) to which a given area will be exposed during the day. (<http://www.nwcg.gov/pms/pubs/glossary>)

Fire Safe Building Standards – Various laws and codes that apply accepted fire safety practices (as determined by scientific research panels and associations, with replicated results) into construction of assets. Examples of laws and codes include; California Fire Code Chapter 49, California Building Code Chapter 7A, Public Resource Code, §4290 and Fire Safe Regulations, §1270.

Fire Safe Councils (FSC) – A group of concerned citizens organized to educate groups on fire safe programs, projects and planning. The Councils work closely with the local fire agencies to develop and implement priorities. (<http://www.firesafecouncil.org>)

Fireshed – A contiguous area displaying similar fire history and problem fire characteristics (e.g., intensity, resistance to control) and requiring similar suppression response strategies.

Fire Suppression Resources – State, federal, tribal, local and private equipment and resources gathered to extinguish and mitigate wildland fires.

FIREWISE – A national program designed to reach beyond the fire service by involving homeowners, community leaders, planners, developers, and others in the effort to protect people, property, and natural resources from the risk of wildland fire before a fire starts. The Firewise program is community driven.

and facilities and to render services to each and every other party of the agreement to prevent and combat any type of disaster or emergency.

Native Species Seed Bank – A storage area for seed that is collected from a species which is a part of the original vegetation of the area in question.

Prescribed Fire – A planned wildland fire designed to meet specific management objectives.

Private Partners – This includes, but is not limited to, businesses, large landowners, small landowners, non-governmental organizations, and utilities.

Reforestation – The establishment of forests on land that had recent (less than 10 years) tree cover. (<http://frap.cdf.ca.gov/assessment2010/definitions.html>)

Salvage – The harvesting of dead, dying, and damaged trees to recover their economic values that would otherwise be lost to deterioration.

Situational Awareness – The application of the human senses to current and predicted weather, fire, or other emergency conditions to plan and execute actions that provide for the safety of all personnel and equipment engaged in an emergency; this includes development of alternative strategies of fire suppression and the net effect of each.

Suppression Strategy - The general plan or direction selected to accomplish incident objectives.

Unit Fire Plan – Plans developed by individual CAL FIRE Units or contract counties to address wildfire protection areas, initial attack success, assets and infrastructure at risk, pre-fire management strategies, and accountability within their geographical boundaries. http://cdfdata.fire.ca.gov/fire_er/fpp_planning_plans

Values and Assets at Risk – Accepted principles or standards and any constructed or landscape attribute that has value and contributes to community or individual well-being and quality of life. Examples include property, structures, physical improvements, natural and cultural resources, community infrastructure, commercial standing timber, ecosystem health, and production of water.

Wildfire – An unplanned ignition; unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.

Wildland – Those unincorporated areas covered wholly or in part by trees, brush, grass, or other flammable vegetation.

Wildland Fire – Fire that occurs in the wildland as the result of an unplanned ignition.

Wildland Urban Interface (WUI) –The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. (<http://www.nwccg.gov/pms/pubs/glossary>)

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From Stephen Lee, IV

Community Wildfire Prevention & Mitigation Report

In response to
Executive Order
N-05-19

Nas



Prepared by:
California Department of Forestry and Fire Protection

With Assistance From:



Governor's Office of Emergency Services



California National Guard



California Government Operations Agency



Governor's Office of Planning and Research

Department of Finance



California Natural Resources Agency

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Contributors

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Strategic Growth Council	California Environmental Justice Alliance
Office of State Fire Marshal	Morongo Fire District
California Air Resources Board	The Nature Conservancy
California Department of State Parks	Resources Legacy Fund
California Department of Fish and Wildlife	Pacific Forest Trust
California Department of Public Health	California League of Cities
California Energy Commission	California Fire Safe Council
California Public Utilities Commission	The Red Cross
California Department of Transportation	California Licensed Foresters Association
California Department of Industrial Relations	Sierra Forest Legacy
Sierra Nevada Conservancy	Trinity County Fire Safe Council
University of California Berkeley	Lower Mattole Fire Safe Council and
University of California Cooperative Extension (UCANR)	Mattole Restoration Council
Humboldt State University	Watershed Research and Training Center
California Forest Management Task Force	ForEverGreen Forestry
US Forest Service PSW Research Station	The Fire Restoration Group
Natural Resources Conservation Service	Mendocino/Humboldt Redwood
North Coast Regional Water Quality Control Board	Company
Central Valley Regional Water Quality Control Board	Green Diamond Resource Company
Lahontan Regional Water Quality Control Board	Sierra Pacific Industries
	California Cattlemen's Association
	Town of Portola Valley

Executive Summary

California experienced the deadliest and most destructive wildfires in its history in 2017 and 2018. Fueled by drought, an unprecedented buildup of dry vegetation and extreme winds, the size and intensity of these wildfires caused the loss of more than 100 lives, destroyed thousands of homes and exposed millions of urban and rural Californians to unhealthy air.

Climate change, an epidemic of dead and dying trees, and the proliferation of new homes in the wildland urban interface (WUI) magnify the threat and place substantially more people and property at risk than in preceding decades. More than 25 million acres of California wildlands are classified as under very high or extreme fire threat, extending that risk over half the state.

Certain populations in our state are particularly vulnerable to wildfire threats. These Californians live in communities that face near-term public safety threats given their location. Certain residents are further vulnerable given factors such as age and lack of mobility. The tragic loss of life and property in the town of Paradise during the recent Camp Fire demonstrates such vulnerability.

Recognizing the need for urgent action, Governor Gavin Newsom issued Executive Order N-05-19 on January 9, 2019. The Executive Order directs the California Department of Forestry and Fire Protection (CAL FIRE), in consultation with other state agencies and departments, to recommend immediate, medium and long-term actions to help prevent destructive wildfires.

With an emphasis on taking necessary actions to protect vulnerable populations, and recognizing a backlog in fuels management work combined with finite resources, the Governor placed an emphasis on pursuing a strategic approach where necessary actions are focused on California's most vulnerable communities as a prescriptive and deliberative endeavor to realize the greatest returns on reducing risk to life and property.

Using locally developed and vetted fire plans prepared by CAL FIRE Units as a starting point, CAL FIRE identified priority fuel reduction projects that can be implemented almost immediately to protect communities vulnerable to wildfire. It then considered socioeconomic characteristics of the communities that would be protected, including data on poverty levels, residents with disabilities, language barriers, residents over 65 or under five years of age, and households without a car.

In total, CAL FIRE identified 35 priority projects that can be implemented immediately to help reduce public safety risk for over 200 communities. Project examples include removal of hazardous dead trees, vegetation clearing,

creation of fuel breaks and community defensible spaces, and creation of ingress and egress corridors. These projects can be implemented immediately if recommendations in this report are taken to enable the work. Details on the projects and CAL FIRE's analysis can be found online at http://calfire.ca.gov/fire_prevention/downloads/FuelReductionProjectList.pdf , which will remain updated in the coming months. The list of projects is attached to this report as Appendix C.

CAL FIRE has also worked with over 40 entities including government and non-government stakeholders to identify administrative, regulatory and policy actions that can be taken in the next 12 months to begin systematically addressing community vulnerability and wildfire fuel buildup through rapid deployment of resources. Implementing several of these recommended actions is necessary to execute the priority fuel reduction projects referenced above. Other recommendations are intended to put the state on a path toward long-term community protection, wildfire prevention, and forest health.

The recommendations in this report, while significant, are only part of the solution. Additional efforts around protecting lives and property through home hardening and other measures must be vigorously pursued by government and stakeholders at all levels concurrently with the pursuit of the recommendations in this report. California must adopt an "all of the above" approach to protecting public safety and maintaining the health of our forest ecosystems.

It is important to note that California faces a massive backlog of forest management work. Millions of acres are in need of treatment, and this work—once completed—must be repeated over the years. Also, while fuels treatment such as forest thinning and creation of fire breaks can help reduce fire severity, wind-driven wildfire events that destroy lives and property will very likely still occur.

This report's recommendations on priority fuel reduction projects and administrative, regulatory, and policy changes can protect our most vulnerable communities in the short term and place California on a trajectory away from increasingly destructive fires and toward more a moderate and manageable fire regime.

Current Setting

While wildfires are a natural part of California's landscape, the fire season in California and across the West is starting earlier and ending later each year. Climate change is considered a key driver of this trend¹. Warmer spring and summer temperatures, reduced snowpack, and earlier spring snowmelt create longer and more intense dry seasons that increase moisture stress on vegetation and make forests more susceptible to severe wildfire². The length of fire season is estimated to have increased by 75 days across the Sierras and seems to correspond with an increase in the extent of forest fires across the state³.

Climate change is acting as a force-multiplier that will increasingly exacerbate wildland fire issues over the coming decades⁴. The state can expect to experience longer fire seasons, increased frequency and severity of drought, greater acreage burned and related impacts such as widespread tree mortality and bark beetle infestation⁵. Decades of fire suppression have disrupted natural fire cycles and added to the problem.

California's forest management efforts have not kept pace with these growing threats. Despite good forest management work completed by the state and federal government and private landowners each year, our collective forest management work each year is currently inadequate to improve the health of millions of acres of forests and wildlands that require it. It is estimated that as many as 15 million acres of California forests need some form of restoration⁶.

As wildfire threats have worsened over the last two years, wildfire response, preemptive fire prevention, and vegetation management to reduce fire severity and contain erratic wildfire have been intensified. Further action is imperative. While restoring forest health and resilience will take decades to achieve, the immediate actions recommended in this report can immediately begin to protect our most vulnerable communities.

¹ (Flannigan et al 2000; Westerling, 2016)

² (Mote, 2005; Westerling, 2016)

³ (Westerling, 2016)

⁴ Simulations for California's Fourth Climate Change Assessment: Projecting Changes in Extreme Wildfire Events with a Warming Climate.

http://www.climateassessment.ca.gov/techreports/docs/20180827-Projections_CCCA4-CEC-2018-014.pdf

⁵ California Tree Mortality Task Force: Synthesis of Research into the Long-Term Outlook for Sierra Nevada Forests following the Current Bark Beetle Epidemic

http://www.fire.ca.gov/treetaskforce/downloads/WorkingGroup/White_paper_on_recovery_06-12-18.pdf

⁶ Forest Carbon Plan 2018

While it is not possible to eliminate wildfire risks in California, focused and deliberate action can protect communities and improve forest and fuels conditions to enable a more moderate and healthy wildfire cycle that can coexist with Californians.

Significant barriers to this work exist. Forest thinning and fuels reduction are expensive, and funding limitations constrain what can be achieved. Given this reality, it is critically important to focus funding and efforts on protecting vulnerable communities in high fire risk areas, utilizing no-cost and low-cost solutions where possible. For example, mobilizing the private sector by providing incentives to incorporate fuels reduction in commercial forest management on private lands can be an important part of this effort.

Recommendations

Most urgently, this report identifies priority projects that can be implemented immediately to help protect our state's most vulnerable communities. While some communities are vulnerable to fire due to their location next to forests and wildlands, that vulnerability can be magnified by socioeconomic factors such as population age, car ownership, and lack of ingress or egress corridors.

To identify these priority projects, CAL FIRE developed a methodology to characterize communities' relative vulnerability. This methodology incorporates physical wildfire risks around communities and socioeconomic characteristics of these communities to understand the relative vulnerability of each community. This methodology integrates three primary analyses:

1. Identification of vulnerable communities based on the socioeconomic characteristics of communities that indicate vulnerability to wildfire;
2. Identification of priority fuel reduction projects based on existing CAL FIRE Unit Plans. Each of these Unit Plans has identified priority projects based on the place-specific expertise of CAL FIRE Unit personnel working in each region of the state; and
3. Evaluation of wildfire risk within the proposed project area.

A detailed explanation of this methodology is found in Appendix A.

In addition to recommending priority projects for immediate implementation, this report recommends broader solutions for state government to consider in the immediate, near, and longer terms to ensure the work continues in a systematic way. Recommended short-term actions in this report encompass actions that can be taken immediately. Proposed mid-term actions are targeted for completion between July and December of this year. Long-term recommendations may be initiated quickly but will require more than a year to implement.

In developing these recommendations for action, CAL FIRE considered:

1. Actions needed to advance work before the peak of fire season later this year;
2. Work already underway in other venues; and
3. Actions that will prevent and mitigate wildfires to the greatest extent possible with an emphasis on environmental sustainability and protection of public health.

These efforts are meant to complement efforts already underway:

- a. The Governor's Forest Management Task Force was created in June 2018 to coordinate actions needed across government. It is anticipated the Forest Management Task Force will continue to be a centralized hub of organizing and coordinating actions recommended under this report.
- b. The Commission on Catastrophic Wildfire Cost and Recovery was established pursuant to SB 901 (Dodd, Chapter 626, Statutes of 2018). The Commission is tasked with making recommendations by July 2019 related to the costs of catastrophic wildfire, how these costs should be socialized in an equitable manner, and the potential to establish a fund to address the costs associated with catastrophic wildfires.
- c. The California Public Utilities Commission's (CPUC) Wildfire Proceeding was initiated in 2018. Among other things, in coordination with CAL FIRE the CPUC's process will formalize enhanced wildfire mitigation plans currently under development by the electrical utilities pursuant to SB 901.
- d. The 2018 Strategic Fire Plan is California's current plan for reducing community wildfire risk. The California Board of Forestry, the policy-setting body within CAL FIRE, recently updated California's Strategic Fire Plan⁷. That plan identifies priorities for CAL FIRE including evaluation of wildfire risk, working with property owners and local governments to plan for and mitigate those risks, and determining resource needs to response to fire outbreaks.
- e. The 2018 State Hazard Mitigation Plan was developed by the California Office of Emergency Services (OES). CAL FIRE contributed to the recent update to California's Hazard Mitigation Plan⁸, which contains specific information on hazard risk assessment, and tracks progress on various mitigation efforts developed in recent years.
- f. The California Forest Carbon Plan released in 2018 summarized current and projected forest conditions and directed actions to achieve healthy and resilient wildland and urban forests and maintain forests as a carbon sink.

⁷ State Board of Forestry and Fire Protection, 2018 Strategic Fire Plan (August 22, 2018), available online at <http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fpppdf1614.pdf>.

⁸ California State Hazard Mitigation Plan (September 2018), Chapter 8 "Fire Hazards: Risks and Mitigation," available online at https://www.caloes.ca.gov/HazardMitigationSite/Documents/011-2018%20SHMP_FINAL_Ch%208.pdf.

SUMMARY TABLE OF RECOMMENDATIONS

	Recommendation	Priority	Lead	Type
1	Direct CAL FIRE Units to complete priority fuel reduction projects.	I	CAL FIRE	Administrative
2	Authorize incident response to implement rapid treatment of fuels.	I	CAL FIRE	Administrative
3	Increase housing availability for fuel crew staff.	I	OES	Administrative
4	Suspend regulatory requirements as needed to complete fuels reduction projects in 2019.	I	All regulatory agencies	Regulations
5	Assess funding and personnel capacity within CAL FIRE and other departments and determine areas for additional investment and administrative actions to maximize effectiveness of current workforce.	I	CAL FIRE / CCC / DPR / CAL HR	Administrative
6	Align community education campaigns across all state and local entities.	I	Forest Management Task Force	Policy
7	Execute State Agency MOU for fuels reduction.	M	All relevant agencies	Policy
8	Identify options for retrofitting homes to new wildland urban interface standards.	M	CAL FIRE	Policy
9	Create incentives for fuels reduction on private lands.	M	All regulatory agencies	Regulations
10	Continue developing methodology to assess communities at risk.	M	CAL FIRE	Administrative
11	Jumpstart workforce development for forestry and fuels work.	M	CAL FIRE / CARB	Administrative
12	<u>Develop mobile data collection tool for project reporting.</u>	M	CAL FIRE	Administrative
13	Coordinate with air quality regulators to enable increased use of prescribed fire.	M	CAL FIRE / CARB	Administrative
14	Develop technology tools to enable real time prescribed fire information sharing.	M	Forest Management Task Force	Policy
15	Certify the California Vegetation Treatment Program Environmental Impact Report.	L	Board of Forestry and Fire Protection	Administrative
16	Develop scientific research plan regarding management and mitigation with funding recommendations.	L	Forest Management Task Force	Policy
17	Provide technical assistance to local governments to enhance or enable fire hazard planning.	L	Forest Management Task Force	Policy
18	Update codes governing defensible space and forest and rangeland protection.	L	CAL FIRE	Regulations
19	Request the Board of Forestry and Fire Protection review the Forest Practice Act and Rules and make recommendations on changes needed to restore forest health.	L	Board of Forestry and Fire Protection	Regulations

Key: Priorities are identified as follows: I = immediate term, M = medium term, L = long term

Immediate Actions: These recommended actions would begin immediately to protect vulnerable communities before the height of the coming fire season.

1. Direct CAL FIRE Units to complete priority fuel reduction projects to protect public safety.

CAL FIRE has identified priority fuels reduction projects that can be initiated almost immediately to protect the lives, health, property, and natural resources using the community vulnerability methodology described above and in Appendix A. CAL FIRE shall work, to the extent feasible, with other public agencies, landowners, and the communities themselves to implement these projects.

The list of priority projects impacting vulnerable communities will be maintained on CAL FIRE's website and updated regularly so the status of each project is reported publicly. The list is attached at Appendix C.

2. Authorize incident response to implement rapid treatment of fuels.

Deploy emergency responders to complete fuels reduction projects to protect vulnerable communities. CAL FIRE and the National Guard will establish incident bases in proximity to vulnerable community centers and coordinate fuels treatment operations from those bases utilizing the Incident Command System. The Incident Command System provides a complete, functional command organization that CAL FIRE and the National Guard will use to ensure the effectiveness of command and crew safety.

3. Increase housing availability for fuel crew staff.

Provide additional state housing for seasonal state employees working on forest management and fuels reduction. These entry level employees are not highly compensated, and often have challenges finding affordable housing in areas where they work. OES should coordinate identifying additional housing for staff both in the short-term for work in 2019 and then a long-term plan for temporary housing.

4. Suspend regulatory requirements as necessary to protect public safety through the priority fuels reduction projects identified by CAL FIRE in this report.

Numerous laws and regulations govern fuels reduction projects, and implementation often requires coordination with, and approval from,

various state and local agencies. Typical environmental compliance, permitting requirements, licensing requirements, and state contracting laws and regulations, should be streamlined where possible to facilitate project implementation.

5. Assess funding and personnel capacity within CAL FIRE and other departments and determine areas for additional investment and administrative actions to maximize effectiveness of current workforce.

Expanding the state's work to reduce public safety risks from wildfires and manage forests depends on adequately resourcing this work and providing the tools required to optimize state agency performance of this work.

CAL FIRE should identify whether staffing levels are sufficient, and current staffing locations remain appropriate to efficiently mitigate wildfires early, and effectively contribute to the state's goal of treating 500,000 acres annually, as set forth in the Forest Carbon Plan.

This task should also include:

- a. Recommendations on how the additional resources requested in the Governor's January Budget should be deployed if approved by the Legislature.
 - b. Reviewing reimbursement rates and cost share agreements for CDCR and CCC project work. Identify where additional resources are needed.
 - c. Reviewing classifications, work week and levels of administrative support for CAL FIRE staff.
 - d. Identifying and working with other land management agencies who may need additional fuels management staff (for example, State Parks).
 - e. Review of purchasing for items such as vehicles with associated changes to purchasing policies.
 - f. Restarting work on CAL FIRE's firefighter classification consolidation proposal with California Department of Human Resources (CalHR).
6. Align community education campaigns across all state and local entities.

The Forest Management Task Force should work on coordinated messaging for all entities providing direct funding or grants for public education campaigns. This should include coordinated messaging for Cal Volunteer and OES grants pursuant to AB 72 (Committee on Budget,

Chapter 1, Statutes of 2019) as well as all other state agencies, including CAL FIRE. Education campaigns should be rolled out consistently throughout the state.

Mid-Term Actions: The recommended actions are designed to be completed by the end of this year.

7. Execute State Agency MOU for fuels reduction.

Direct all relevant state agencies and departments to develop and sign a memorandum of understanding (MOU) committing the capabilities of each agency towards the common goals of fuel reduction and protection of vulnerable populations, and environmental sustainability.

Direct the MOU agencies to utilize social media channels and other avenues to communicate the value of defensible space and other actions homeowners can take to protect against wildfire prior to the peak of wildfire season in 2019.

8. Identify options for retrofitting homes to new Wildland Urban Interface standards.

- a. CAL FIRE should identify options for incentivizing home hardening to create fire resistant structures within the WUI and with a focus on vulnerable communities.
- b. The Forest Management Task Force should immediately begin work to identify actions for retrofitting homes in the WUI with a focus on vulnerable communities. The Forest Management Task Force should also develop a comprehensive plan to bring existing housing stock up to new building code standards for the Wildland Urban Interface with a priority on vulnerable communities. The Forest Management Task Force should work with the Department of Insurance to seek input from the insurance industry on potential rebates or incentives for homeowners.
- c. Additionally, as provided in Assembly Bill 2911 (Friedman, Chapter 641, Statutes of 2018), CAL FIRE, and the Director of Housing and Community Development, should develop a list of low-cost retrofits that provide comprehensive fire risk reduction to protect structures from fires spreading from adjacent structures or vegetation and to prevent vegetation from spreading fires to adjacent structures.

9. Create incentives for fuels reduction on private lands.

Direct the Board of Forestry and Fire Protection to create or modify regulations to incentivize private landowners to engage in fuels reduction projects. This may include allowing removal of sufficient medium and large size trees or reducing after-harvest leave tree requirements sufficiently. These should be pursued through the emergency rule making process whenever possible.

Non-industrial private landowners often do not have the resources to actively manage their forests, and may often be the same vulnerable populations needing protection from wildfire. Small non-industrial private landowners make up approximately 25 percent of California's forest land owners and managers, almost twice as much as private industrial forest lands.

10. Continue developing methodology to assess communities at risk.

The methodology used to identify priority projects provides a robust assessment of near-term projects that can be implemented before the 2019 fire season. However, long-term planning and decision-making efforts to reduce wildfire risk require consideration of additional factors. Therefore, this methodology should serve as the basis for ongoing assessment methods to evaluate short and long-term wildfire risk reduction strategies across the state, with specific attention to identifying vulnerable communities.

The Forest Management Task Force should establish an interagency team with experience in spatial analysis, technology support, environmental management, public health, climate change, and social vulnerability to develop the methodology enhancements needed to inform the long-term planning needs of both state and local agencies.

11. Jumpstart workforce development for forestry and fuels work.

- a. Identify specific opportunities to develop and incentivize workforce training programs for implementation by the end of 2019. The goal is to increase the number of properly trained personnel available to do fuels reduction and forest management and restoration work in the private sector.

12. Develop mobile data collection tool for project reporting.

Procure a mobile fuel reduction data collection application to be used by all land management departments and agencies to increase accuracy and ease of data collection in the field.

13. Coordinate with air quality regulators to enable increased use of prescribed fire.

Uncontrolled wildfires can cause far more harmful air quality and public health impacts than prescribed burns because they often burn much more vegetation and last longer than prescribed burns. However, prescribed burns must still be managed to minimize emissions. To increase the scale of prescribed burns while protecting air quality:

- a. CAL FIRE should coordinate with the CARB to explore updates to state air quality regulations to facilitate prescribed burns. Examples could include changes in how prescribed burns are accounted for in air quality calculations and allocating burn permits on a project, rather than parcel or landowner, basis.
- b. In addition to examining state regulations, CAL FIRE and CARB should also coordinate with the U.S. Environmental Protection Agency to identify changes in federal air quality regulations that would facilitate prescribed burns.
- c. CAL FIRE should coordinate with local and regional air districts to develop multi-year smoke management plans and burn permits for public purpose burning to help reduce costs and complexity for burners.

14. Develop technology tools to enable real time prescribed fire information sharing.

The Prescribed Fire Information Reporting System (PFIRS) should be officially recognized as the state's reporting tool to underscore the need for a common reporting and permitting tool across all agencies and private burners involved with prescribed fire. PFIRS should be funded and developed as the tool to support, facilitate and track prescribed fire efforts statewide. All state agencies and departments should be directed to use prescribed fire to obtain permitting and report through PFIRS, and federal land managers should be encouraged to use it for reporting. The reporting system is currently used by CARB, CAL FIRE, and the U.S. Forest Service.

Longer-term Actions: These actions are designed to begin quickly, but likely require more than a year to complete.

15. Certify the California Vegetation Treatment Program Environmental Impact Report.

Beyond the priority fuels treatment projects that CAL FIRE will implement in 2019, CAL FIRE and other land managers must increase the pace and scale of vegetation treatment throughout California. To that end, CAL FIRE and the Board of Forestry are preparing the California Vegetation Treatment Program Environmental Impact Report (CalVTP EIR) to identify and minimize environmental impacts associated with vegetation treatment. Once completed, CAL FIRE and other agencies will be able to rely on that document to streamline the environmental review process for future treatment projects.

To maximize the streamlining value of the CalVTP EIR, other agencies with regulatory authority over vegetation treatment activities should be directed to engage in its development. CAL FIRE and the Board of Forestry should invite agencies within the California Natural Resources Agency and California Environmental Protection Agency to:

- a. In the immediate term, identify subsequent permitting processes that may apply to vegetation treatment projects.
- b. In the mid-term, develop streamlined permitting recommendations if it is determined that environmental compliance not covered by the CalVTP EIR will preclude projects from timely completion.

16. Develop a scientific research plan for wildfire management and mitigation, with funding recommendations.

The Forest Management Task Force should develop a research plan with funding prioritization. Topics that should be considered include:

- a. Leverage the Governor's Request for Innovative Ideas (RFI2).
- b. Best management practices in the face of a changing climate and our understanding of forest health and resilience.
- c. Use of LiDAR, satellite and other imagery and elevation data collection, processing and analysis for incorporation into state management plans and emergency response.
- d. Funding for collaborative research to address the full range of wildfire related topics. Important research investments could include both

basic and applied research as well as social science to better understand social vulnerability, human behavior, land use, and policies that support resilience in communities that coexist with fire and mitigate impacts on life and property.

- e. Research and development on new WUI building test standards in future research programs including the use of damage inspection reports from recent fires.

17. Provide technical assistance to local governments to enhance or enable fire hazard planning.

With the expansion of urban development into wildland areas, firefighting becomes more dangerous and costly, and the consequences of wildfires to lives and property become more severe. Local governments control land use decisions that can minimize those dangers. CAL FIRE and other state agencies have information and expertise that can support local governments in making safer choices. To enable land use planning that minimizes fire risks:

- a. Assist the Governor's Office of Planning and Research in identifying specific land use strategies to reduce fire risk to buildings, infrastructure, and communities and in updating the "Fire Hazard Planning, General Plan Technical Advice Series," as provided in Assembly Bill 2911 (Friedman, Chapter 641, Statutes of 2018).
- b. Work with Cal OES and the Standardized Emergency Management System Advisory Committee to develop robust local evacuation planning models for high or very high Fire Hazard Severity Zones based upon best practices from within California.
- c. Provide technical assistance to support land use planning efforts to limit development in high fire hazard areas, as well as technical assistance to support mitigation activities that minimize risk to existing communities, with specific attention to vulnerable communities.

18. CAL FIRE should update codes governing defensible space and forest and rangeland protection.

- a. Review the penalty for non-compliance with defensible space code, establishing a fixed compliance date in lieu of three-inspection process. Include vacant land provisions.
- b. Review enforcement the full 100 feet of defensible space around a structure when the structure is closer than 100 feet from the parcel line.

- c. Consider the home and the first 0-5 feet as the most critical and hardened aspect of home hardening and defensible space. Consider requiring ignition resistant building material, only allow bark and hardscape, not trees or shrubs in this area.
 - d. Consider science-based regulation of wood piles and wood fences.
19. Request the Board of Forestry and Fire Protection review the Forest Practice Act and Rules and make recommendations on changes needed to protect public safety and restore forest health.

The Forest Practice Act, and regulations that implement it, currently contain rules that limit fuel hazard reduction activities. The rules could be updated to facilitate non-commercial fuel reduction projects. The Board should consider where existing exemptions could be expanded further to prevent and mitigate wildfires with an emphasis on environmental sustainability and protection of public health.

Appendix A – Methodology to assess vulnerable communities

Summary

The 2018 Strategic Fire Plan for California⁹, and the National Cohesive Wildland Fire Management Strategy¹⁰ provide a set of goals and strategies that includes: fire adapted communities, safe and effective wildfire response, and resilient landscapes. Despite recent accelerated investment and resources, the vast amount of work and time required to achieve strategic goals necessitates an approach that best protects lives and property in the **near-term**, while simultaneously working over the **long-term** to create more resilient communities and landscapes that will allow Californians to live sustainably in the State's fire-prone landscapes. **Near-term needs include increasing the pace of fuel reduction in and near communities at risk, improving compliance with defensible space requirements, and improving fire resistance of both existing and new structures in the WUI.** In the longer term, a landscape-scale approach that marries forest health treatments with targeted community protection activities will be needed to fully address the scope of fire management issues in California.

Living sustainably in the fire-prone landscapes of California will require broad recognition of the inevitability of fire, which will in turn necessitate enhanced investment in and novel approaches to risk evaluation, fuel management, forest health, land use planning and community adaptation. As we move headlong through the 21st century, fire managers and landowners in California are challenged to effectively utilize available resources and tools to create resilient landscapes, reduce loss of life and property, and stem rising management costs, while enhancing our compatibility with the fire environment in which we live. Applying limited resources necessitates identification of the most vulnerable communities in which to begin this work.

Methods for assessing vulnerable communities

The following section provides a general description of the methods used to incorporate both wildfire risk and socioeconomic conditions of the communities that fuel reduction projects are designed to reduce

The overall goal of the analysis was to construct a framework that provides an assessment of wildfire risk and populations at risk from wildfire impacts. The

⁹ 2018 Strategic Fire Plan for California.

http://cdfdata.fire.ca.gov/fire_er/fpp_planning_cafireplan

¹⁰ National Cohesive Wildland Fire Management Strategy.

<https://www.forestsandrangelands.gov/strategy/thestrategy.shtml>

methodology consists of three main steps: a) identification of priority fuel reduction projects; b) evaluation of wildfire risk within the proposed project area; and c) evaluation of the socioeconomic characteristics of communities that projects are intended to protect.

For the initial step, CAL FIRE Units were asked to identify priority fuel reduction projects for their Units that would reduce wildfire risk to nearby communities. Project boundaries were incorporated into a GIS database for analysis.

Socioeconomic Analysis

Socioeconomic factors were based on evaluating conditions that are associated with populations at risk to wildfire. Some populations may experience greater risk to wildfire based on socioeconomic factors that lead to adverse health outcomes and their ability to respond to a wildfire. The factors chosen for this analysis were previously identified in CAL FIRE's Forest and Range Assessment and through a study conducted by Headwater's Economics (Table 1). Data for each socioeconomic variable was from the U.S. Census Bureau's American Community Survey (ACS) and organized by census tract.

Table 1. Socioeconomic variables considered to represent populations at risk to wildfire impacts

Socioeconomic Variables	Description
Families in poverty	Percentage of families in the census tract living below the poverty line
People with disabilities	Percentage of people in census tract estimated to have a disability; based on self-reporting
People that have difficulty speaking English	Percentage of people in the census tract estimated to have difficulty speaking English
People over 65	Percentage of people in the census tract over the age of 65
People under 5	Percentage of people in the census tract under the age of 5
Households without a car	Percentage of families in the census tract without a car

Data Sources: American Community Survey (ACS); California Building Resilience Against Climate Effects (CalBRACE) Project (2016).

For each project, the number of nearby communities was identified, represented by communities that were within a 5-mile buffer of each project boundary. For each community within the buffer, census track data was averaged for each of the socioeconomic variables. This resulted in a table that

provides a description of the socioeconomic characteristics of each community that is associated each proposed project. In addition, a composite socioeconomic index was generated that represented the average across all socioeconomic variables. The socioeconomic index ranges from 0 to 100.

Wildfire Risk Analysis for Proposed Projects

Wildfire risk was then characterized by intersecting the Unit proposed fuel reduction projects with the following spatial data layers:

- SRA – State Responsibility Areas
- WUI – Wildland Urban Interface (WUI Interface, WUI Intermix, and WUI Influence Zone)
- CAL FIRE Priority Landscape for Reducing Wildfire Risk to Ecosystems
- CAL FIRE Priority Landscape for Reducing Wildfire Threat to Communities

Each of these data layers is described in greater detail below.

An overlay of project boundaries was done to determine the percentage of the project area in State Responsibility Area (SRA) and within WUI. WUI was represented by varying degrees of housing density that are associated with WUI Interface, WUI Intermix, and WUI Influence zones.

The proposed project boundaries were then intersected with CAL FIRE's Priority Landscape for Reducing Wildfire Risk to Ecosystems ("Ecosystems PL"). The Ecosystems PL combines resource assets (water supply, carbon storage, standing timber, site quality, and large trees) with a set of threats (fire threat – fuel hazard and fire probability and Fire Return Interval Departure). This PL prioritizes watersheds for potential treatment to reduce wildfire risk based on threats and assets to forested lands. The ranking varies from 1 (least risk) to 5 (greatest risk). Lands such as conifer woodlands (e.g. juniper and pinyon-juniper), oak woodlands (blue oak woodland, valley oak woodland, coastal oak woodland, etc.), shrublands, grasslands, were not included. In addition, only forested lands with a fire return interval departure (FRID) of class 2 or greater were included. This ensures that the areas most in need of treatment to restore natural fire regimes and improve ecological functions are prioritized. For this analysis, only ranks 3, 4, and 5 were used to designate high priority areas for reducing wildfire risk to ecosystems. Each proposed project was overlaid with the Ecosystems PL to determine the percent of each project area that was associated with high wildfire risk to ecosystem services.

Next the proposed projects were intersected with CAL FIRE's Priority Landscape for Reducing Wildfire Risk to Communities ("Communities PL"). The Communities PL identifies where communities (people and associated infrastructure) are at

greatest risk from wildfire. Housing density within the Wildland Urban Interface is used to represent community assets. Areas with lower housing density receive a lower value and areas of higher housing density receive a higher value. The threat to communities is derived from CAL FIRE's Fire Hazard Severity Zones. Combining asset and threat rankings produces a priority landscape where areas with higher housing density and higher fire hazard receive the highest score. For this analysis, only ranks 3, 4, and 5 were used to designate high priority areas for reducing wildfire risk to communities. Each proposed project was overlaid with the Communities PL to determine the percent of each project area that was associated with high wildfire threat to communities.

A composite Wildfire Risk Index was also generated that represented the average across all wildfire risk variables (WUI, Ecosystems PL, and Communities PL). The wildfire risk index ranges from 0 to 100. Results characterizing wildfire risk for each proposed project are described on the CAL FIRE website.

Detailed Data Layer Information for Methodology to Assess Communities at Risk

This appendix provides detailed information on the sources, selection and construction of each of the data layers used in this analysis.

State Responsibility Area

CAL FIRE has a legal responsibility to provide fire protection on all State Responsibility Area (SRA) lands, which are defined based on land ownership, population density and land use. For example, CAL FIRE does not have responsibility for densely populated areas, incorporated cities, agricultural lands, or lands administered by the federal government.

Wildland Urban Interface (WUI)

Wildland Urban Interface (WUI) –The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels¹¹.

CAL FIRE Priority Landscape for Reducing Wildfire Threat to Communities

This Priority Landscape (PL) prioritizes lands where communities (people and associated infrastructure) are at risk from wildfire to direct efforts at reducing wildfire risk in these areas.

¹¹ <http://www.nwccg.gov/pms/pubs/glossary>

Ranking

The ranking varies from 1 (least risk) to 5 (greatest risk). Housing density derived from FRAP's WUI layer is used to rank assets. Threat is determined using California Fire Hazard Severity Zones.

Assets

The asset to be protected in this PL is communities, which are defined by housing densities. Less dense areas receive lower value and higher densities receive higher value. The classes of density are:

- 0 = No houses
- 1 = 0 - 0.05 housing unit per acre
- 2 = 0.051 - 0.200 housing unit per acre
- 3 = 0.201 - 1 housing unit per acre
- 4 = greater than 1 housing unit per acres

Threats

The threat to the communities is Fire Hazard Severity, derived from CAL FIRE's Fire Hazard Severity Zones. The zone ranking is:

- 1 = moderate severity
- 3 = high severity
- 5 = very high severity

Final Ranking:

The ranked asset and ranked threat were combined to derive the final ranked priority landscape. The results were ranked from the lowest risk of 1 to the highest risk of 5.

CAL FIRE Priority Landscape for Reducing Wildfire Risk to Forest Ecosystem Services

This Priority Landscape (PL) prioritizes watersheds for potential treatment to reduce wildfire risk based on threats and assets to forested lands.

Ranking

The ranking varies from 1 (least risk) to 5 (greatest risk). Lands such as conifer woodlands (e.g. juniper and pinyon-juniper), oak woodlands (blue oak woodland, valley oak woodland, coastal oak woodland, etc.), shrublands, grasslands, were not included. In addition, only forested lands with a fire return interval departure (FRID) of class 2 or greater were included. This ensures that the areas most in need of treatment to restore natural fire regimes and improve ecological functions are prioritized.

Assets

Surface water value: Watersheds (HUC12s) were ranked based on surface drinking water value from the USDA Forest Service's Forests to Faucet data, https://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml

Carbon storage: Estimated amount of carbon in the forest that is in living trees above the ground was spatially imputed into a GIS layer from Forest Service FIA data by Wilson et al. (2013) using a gradient nearest neighbor (GNN) technique. See Wilson, B.T., C.W. Woodall, and D.M. Griffith, *Imputing forest carbon stock estimates from inventory plots to a nationally continuous coverage*. Carbon Balance and Management, 2013. 8(1): p. 15.

Standing timber: Shows the estimated commercial timber volume on lands available for harvesting. Standing Timber was primarily derived from LEMMA Structure Maps (<https://lemma.forestry.oregonstate.edu/data/structure-maps>) that also used Forest Service FIA data and a GNN methodology (2012 vintage). LEMMA commercial timber volume was reduced for areas of high fire severity burns through 2017 (from FRAP), BAER imagery for areas of high severity wildfires that have occurred in 2018 from:

<https://fsapps.nwccg.gov/afm/baer/download.php>), and Aerial Detection Survey data of areas of high tree mortality (also subsequent to 2012). Lands not available for timber harvest were removed, including southern California and South Central Coast counties with no viable timber processing facilities.

Site quality: This shows the productivity of timberland, based upon potential volume of wood (i.e. cubic feet) that can be produced per acre in a year. Site Class GIS data was produced by Wilson from Forest Service FIA data (using the same methods as for the Carbon storage layer), based upon FIA attribute SITECLCD – site productivity class code. It shows the potential timber volume produced at culmination of mean annual increment, in the standard classes used by the USFS.

Large trees: Derived from FRAP vegetation layer FVEG15 (WHRSIZE), which in turn (for this attribute) came from CALVEG data of the USFS. Tree size class scores were 1 = (6-11" DBH); 3 = (11-24" DBH); and 5 = (over 24" DBH).

Threats

Fire Threat: FRAP fire threat data (fthrt18_1) was derived from a combination of FRAP surface fuels data and large fire probability from the Fire Simulation (FSim) system developed by the US Forest Service Missoula, Montana Fire Sciences Laboratory.

Fire Return Interval Departure (FRID): FRID shows the deviation from historic averages of fire occurrence. FRID from USFS Region 5 was used to prioritize areas most in need of treatment. FRID scores of 2, 3, and 4 were assigned scores of 1, 3, and 5 respectively.

Composite Ranks

All assets were combined and the result ranked from 1 to 5 to derive a composite asset. Likewise, all threats were combined the results ranked from 1 to 5 to create a composite threat. The composite asset layer and composite threat ranks were then combined and classified to a final priority landscape rank for each 30m pixel.

Appendix B – Maps

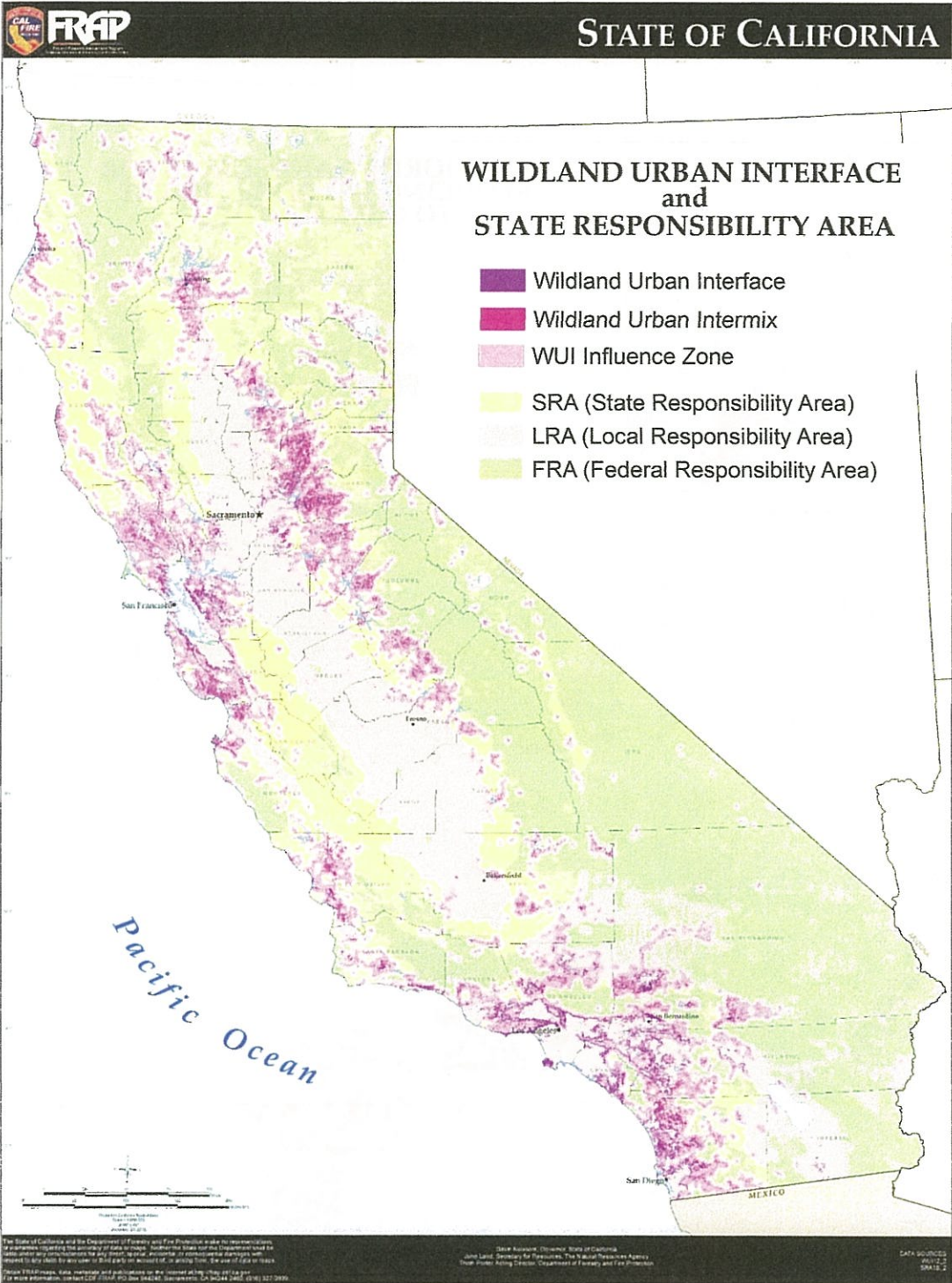


Figure 1: California's Wildland Urban Interface.

71x

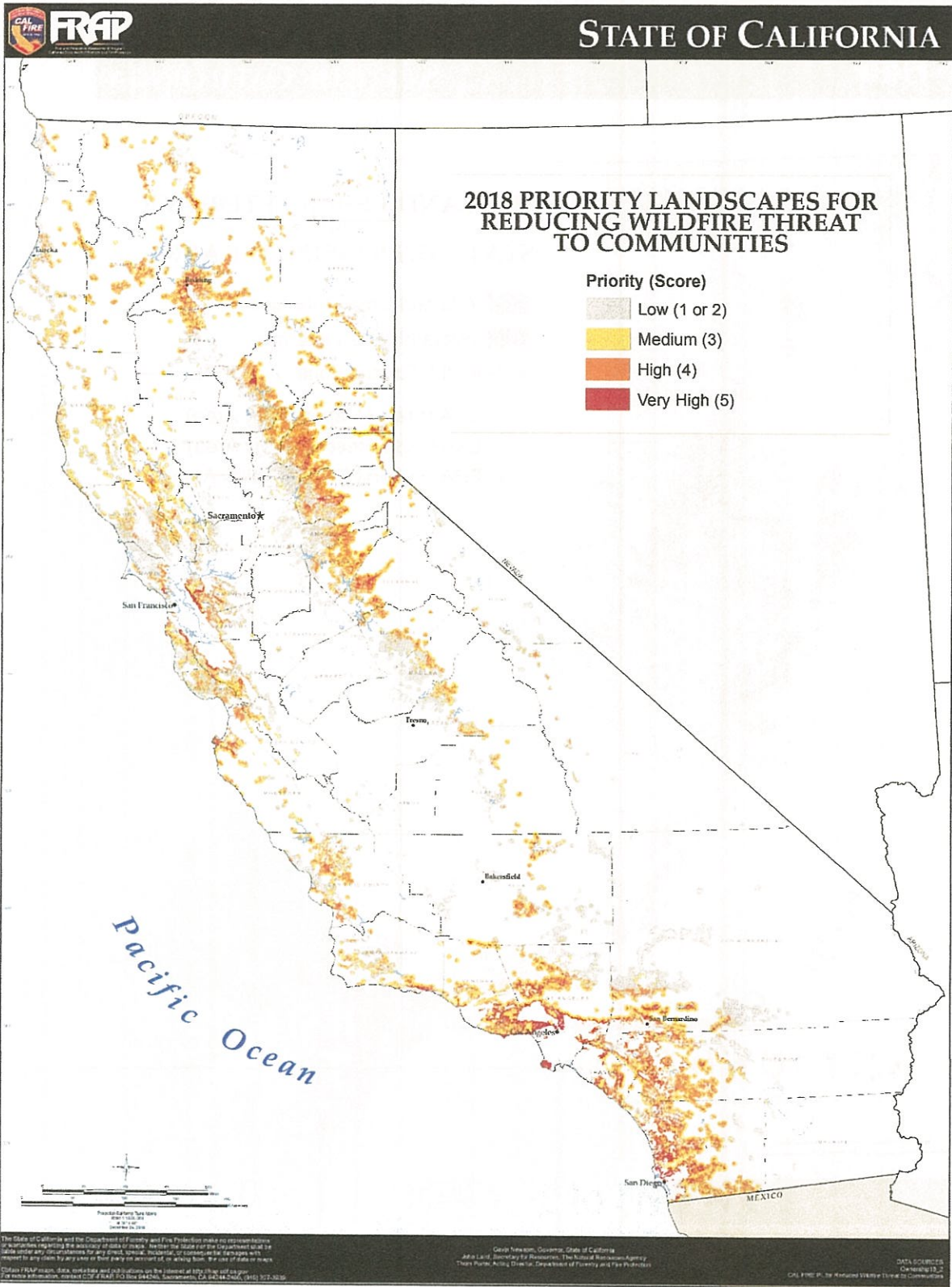


Figure 2: Priority Landscapes for Reducing Wildfire Threat to Communities.

72x

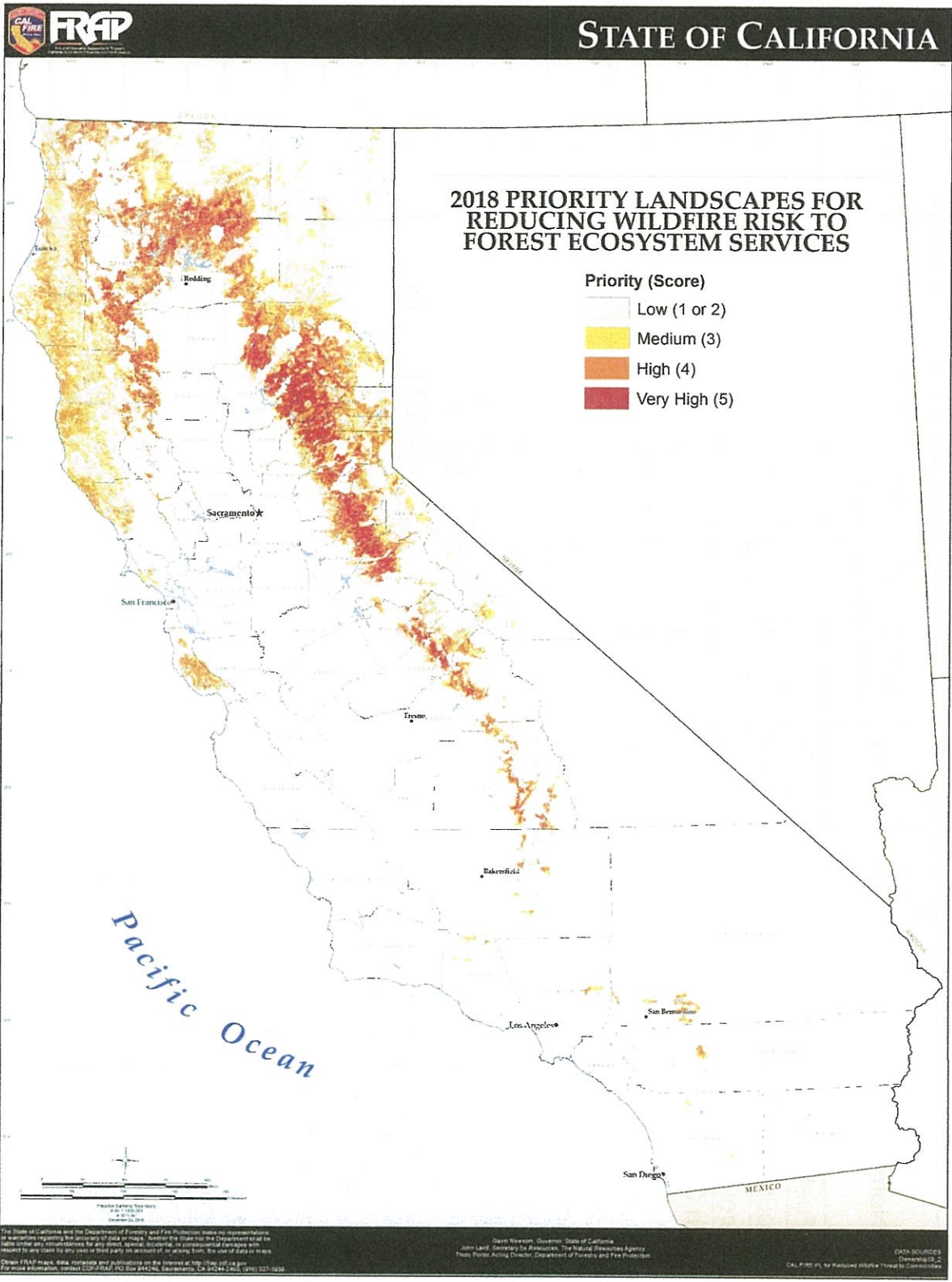


Figure 3: Priority Landscapes for Reducing Wildfire Threat to Communities.

73x

Appendix C – CAL FIRE Priority Fuel Reduction Project List

#	Project Name	CAL FIRE UNIT	Acres	Number of Communities	Affected Population	Socio-economic Score (SES)	Fire Risk Score (FRS)	Final Summary Score
1	Hwy 44 Fuel Break	SHU	1,124	3	8,833	90	86	88
2	Kings Mountain Roadside	CZU	467	18	271,096	88	84	86
3	Rush Creek	FKU	181	1	2,973	71	99	85
4	San Juan Canyon Fuel Reduction	BEU	2,277	4	54,067	116	53	85
5	Martin Ranch Fuel Break	LMU	57	4	3,957	69	98	83
6	Santa Barbara Foothill Community Defensible Space	SBC	1,960	5	127,516	98	64	81
7	Musick Fuel Break	FKU	393	5	12,677	62	95	79
8	Bridgeville FR	HUU	18	1	4,143	66	87	76
9	North Orinda Fuel Break	SCU	1,760	30	561,223	96	56	76
10	West Redding Fuels Reduction	SHU	3,091	7	114,607	84	67	75
11	Guatay Community Fuel Break	MVU	128	15	221,282	85	66	75
12	China Gulch Fuel Break	SHU	530	8	88,610	84	66	75
13	Forbestown Ridge	BTU	1,673	8	14,950	92	58	75
14	North Fork American River Fuelbreak	NEU	4,373	13	77,319	65	84	74
15	Shaver Springs	FKU	78	4	12,677	62	86	74
16	El Granada Quarry Park Fuel Break	CZU	250	10	100,433	85	62	73
17	Blue Rush Fuel Break	FKU	82	1	2,973	71	75	73
18	State Route 17 Fuel Break	SCU	454	8	72,462	58	88	73

74x

#	Project Name	UNIT	Acres	Number of Communities	Affected Population	Socio-economic Score (SES)	Fire Risk Score (FRS)	Final Summary Score
19	Painted Cave Community Defensible Space	SBC	1,742	7	84,232	79	66	73
20	Willits Fuels Reduction	MEU	11,965	3	13,120	88	55	72
21	San Marcos Pass	SBC	3,096	7	84,342	79	62	70
22	Grist Fuel Break	MMU	102	3	13,097	79	60	69
23	Crest Community Fuel Break	MVU	60	3	5,278	71	66	68
24	Beal Fuel Break	FKU	728	6	12,677	62	74	68
25	Aptos, Buzzard, Hinkley Ridgeway and Roadside	CZU	1,036	16	112,505	73	58	66
26	Ukiah Fuels Reduction	MEU	26,541	10	39,195	95	34	65
27	Lake Shastina Fuels Treatment	SKU	759	3	7,231	87	36	62
28	Ponderosa West Grass Valley Defense Zone	NEU	1,238	9	54,776	67	56	61
29	Big Rock Prescribed Burn	LAC	431	8	44,440	52	66	59
30	Metcalf Gap	MMU	44	4	10,131	79	37	58
31	Palo Colorado Fire Access Roads	BEU	6,843	4	9,556	77	37	57
32	Laurel Springs-Hennicksons Ridge	BEU	4,368	1	5,933	64	48	56
33	Elk Creek Fuel Break	TGU	953	2	4,868	98	3	50
34	Palo Corona Fuel Reduction	BEU	10,428	9	59,585	82	11	46
35	Highway 41 Vegetation Management Plan	MMU	4,621	7	28,737	84	4	44

75

From Stephen Lee, IV

EXECUTIVE DEPARTMENT
STATE OF CALIFORNIA

EXECUTIVE ORDER N-05-19

WHEREAS, California experienced the most destructive wildfire season in State history in 2018, enduring over 7,600 wildfires that burned 1,846,445 acres in total;

WHEREAS, the 2018 Camp Fire was both the deadliest fire in State history, claiming the lives of 86 people, as well as the most destructive, destroying 18,804 structures – a tragedy from which impacted communities will take years to recover;

WHEREAS, six of the top ten most destructive fires in State history have occurred in just the past two years, including the Camp, Tubbs, Woolsey, Carr, Nuns, and Thomas Fires;

WHEREAS, the reality of climate change – persistent drought, warmer temperatures, and more severe winds – has created conditions that will lead to more frequent and destructive wildfires;

WHEREAS, historically, fires lit by Native Americans and lightning strikes cleared the forest of surface fuels on a regular cycle to manage vegetation;

WHEREAS, California arrived at our present emergency condition through the combined factors of fire exclusion, forest management policies that created overgrown and overcrowded forests, a rapidly changing climate, and a historic drought with accompanying bark beetle epidemics;

WHEREAS, fuels reduction, which encompasses a range of forest management activities, including thinning, treating surface fuels with prescribed fire, mechanical methods, manual methods, and grazing, can reduce potential fire intensity;

WHEREAS, the State has invested significant resources into proactive forestland health maintenance through a number of programs, including direct land management by the California Department of Forestry & Fire Protection (CAL FIRE) and California Conservation Corps crews, and through grants to landowners and other private entities that perform management projects on their own property or on sections of forestland in their communities;

WHEREAS, a significant infusion of funding from the Greenhouse Gas Reduction Fund will make available \$1 billion over the next five years, beginning this year, for the purpose of active forestland management;

WHEREAS, in addition to the aforementioned \$1 billion in forestland management funding, the Governor's proposed 2019-2020 budget will also include significant enhancements for more year-round fire crews, as well as investments in greater use of technology and equipment for the purpose of preventing and fighting wildfires;

WHEREAS, to maximize the efficacy of these historic investments, the State endeavors to implement management strategies more rapidly and in a manner that is environmentally sustainable, and to prevent or contain to the greatest extent possible future destructive fires such as those that ravaged California in 2018;

WHEREAS, in order to prioritize the most at-risk communities, the State must consider two coequally important factors of vulnerability: scientific and social. California must access the best available science about dangerous fuel conditions, wind patterns, fire behavior, and other scientific indicators. But of equal importance are social vulnerability factors including social isolation, poverty, language barriers, and other access and functional needs challenges. Communities with high preponderance of physical fire danger and high indicators of social vulnerability deserve the State's highest attention; and

WHEREAS, the people of the State of California expect that their government will take all possible actions to protect life, property, and forests from deadly megafires, and will do so with an urgency that matches the scope of the threat.

NOW, THEREFORE, I, GAVIN NEWSOM, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this Order and direct as follows:

1. Within 45 days of the issuance of this Executive Order, CAL FIRE, in consultation with other State agencies and departments, shall provide a written report to the Governor with recommendations of the most impactful administrative, regulatory, and policy changes or waivers the Governor can initiate that are necessary to prevent and mitigate wildfires to the greatest extent possible, with an emphasis on environmental sustainability and protection of public health.
2. CAL FIRE shall be the lead department in the convening of state agencies and in the production of this report. Other agencies and departments shall cooperate and support CAL FIRE in the researching and writing of this report, including but not limited to the Governor's Office of Emergency Services, the California National Guard, the California Government Operations Agency, the Office of Planning and Research, and the Department of Finance.
3. CAL FIRE shall lead stakeholder engagement to inform the report, including consultations with local fire chiefs, local elected officials, Fire Safe Councils, and other impacted stakeholders, as necessary.
4. In preparing the report, CAL FIRE shall include recommendations to the Governor for immediate, medium-term, and long-term recommended actions that will have the greatest impact in preventing the impact of destructive, deadly wildfires. These recommendations should include, but not be limited to:
 - a. Methods to most quickly deploy personnel and resources onto the landscape for the purpose of performing fuels management.
 - b. Policy changes, including but not limited to procurement or permitting waivers that will allow for more rapid and effective

fuels management treatments, especially for projects accomplishable before the peak of fire season later this year.

c. Methodology to assess which communities are at greatest risk from wildfire and the projects within/nearby areas that would reduce the threat of a catastrophic wildfire if completed. In this context, CAL FIRE shall consider not only the best available science when identifying high-hazard communities, but also socioeconomic factors and vulnerable populations that exacerbate the human toll of wildfires. This scoping shall be done in consultation with local impacted stakeholders, experts, and academics.

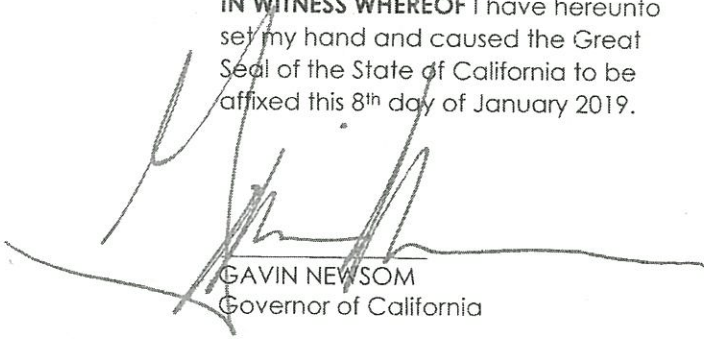
5. As CAL FIRE identifies communities at greatest risk from wildfire, per directive 4c herein, CAL FIRE shall share this assessment to guide the Governor's Office of Emergency Services as they scope and execute the "California for All" community resiliency public education and preparedness campaign proposed in the Governor's 2019-2020 budget. This effort will include local grants and will focus on community engagement and public education in high-risk areas with an emphasis on public health and safety.

IT IS FURTHER ORDERED that State Agencies shall cooperate in the implementation of this Order. Other entities of State government not under my direct executive authority, including the University of California and California State University, are requested to assist in its implementation.

This Order is not intended to, and does not, create any rights or benefits, substantive or a procedural, enforceable at law or in equity, against the State of California, its departments, agencies, or other entities, its officers or employees, or any other person.

IT IS FURTHER ORDERED that soon as hereafter possible, this Order shall be filed with the Office of the Secretary of State and that widespread publicity and notice shall be given to this Order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 8th day of January 2019.

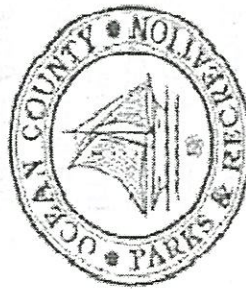


GAVIN NEWSOM
Governor of California

ATTEST:

ALEX PADILLA
Secretary of State

WILDFIRE
HAZARD &
HISTORY IN
OCEAN
COUNTY



Virginia E. Haines- Freeholder
Director, Chairwoman Parks

Michael T. Mangum- Director

732-506-9090

www.oceancountyparks.org



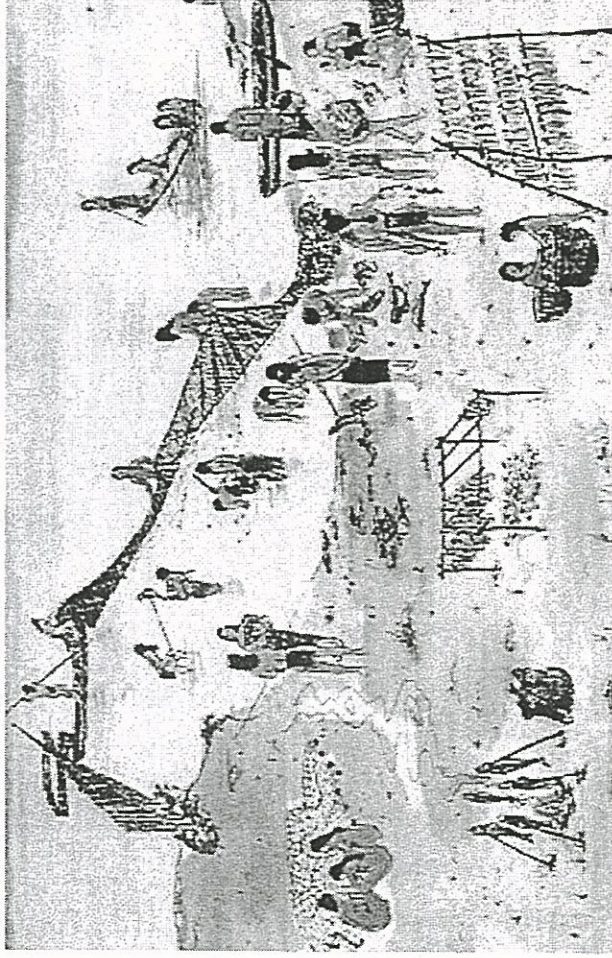
History of Fire in South Jersey

- When the first Europeans arrived they found an open park like forest throughout most of the Pinelands.
- "The trees grow generally not thick, but in some places 10, in some 15, in some 25 or 30 upon an acre,"
Gawen Lawrie 1684
- Native Americans helped shape the post glacial forest through the use of fire.
- The NJ Pinelands are a fire dependent forest.
- The forest used to have frequent low intensity fires that kept fuel loads low and maintained a healthy forest.



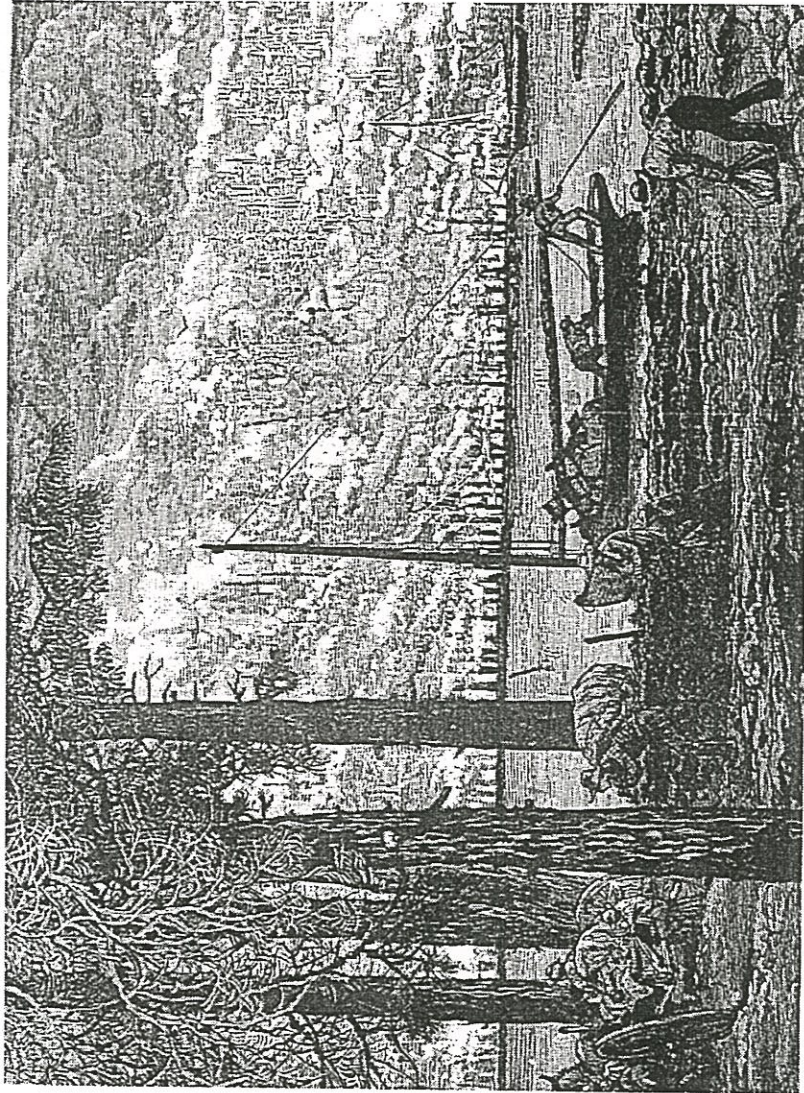
History of Prescribed Fire

- For thousands of years Native Americans burned the forests in the Northeast and specifically in New Jersey.
- They burned to benefit game species.
- Improve forest access.
- Facilitate agriculture



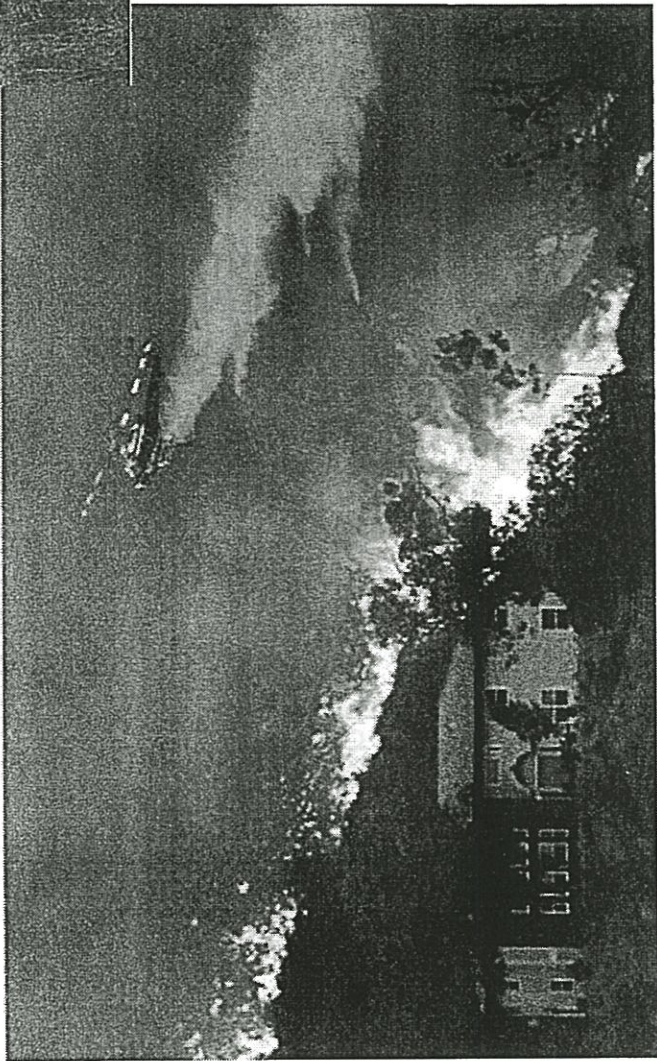
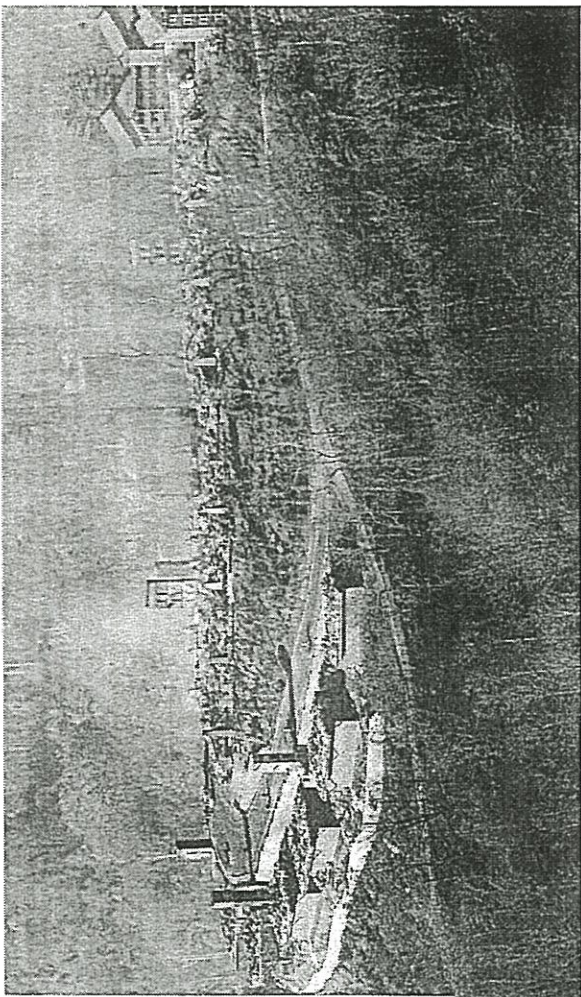
Ocean County has a long History of Disastrous Wildfires

- "In Ocean County fires did little damage this year (1895). This is due mainly to the fact, the severe fires of 1894...left little combustible material" State Geologist
- 1963- 193,000 acres 186 homes lost 7 killed
- 1971-Manahawkin 21,000 acres burned in 7 hours
- 1977- Bass River 2,300 acres, 4 firefighters killed
- 1992-5,000 acres burned across G.S. Parkway into Oyster Creek Nuclear Power Plant.
- 1995-Greenwood 19,225 acres
- 1997- Barnegat Fire (Manchester)- 17,000 acres
- 2002- Jakes Branch 1277 acres, burned across G.S. Parkway 3 homes lost & 15 out buildings
- 2007- Warren Grove 15,550 acres



FOREST FIRE, OYSTER CREEK. From *Frank Leslie's Illustrated Newspaper*, May 29, 1890. Destructive fires periodically ravaged the cedar and pine forests along the New Jersey coast. This scene, made at Oyster Creek, shows residents fleeing from the flames by cart and by boat.

California & Tennessee
can happen here "Again"



- It has happened here. The population was a small fraction of today

CPAW

- Recently a team of internationally recognized experts working on a grant from the US Forest Service, for the Township of Ocean, analyzed and quantified the wildfire hazard and risk for the entire County.



2018

Final Recommendations for Township of Ocean, NJ



Prepared by:
Wildfire Planning International, LLC
Wildland Professional Solutions, Inc.
11/20/2018

Wildfire Hazard

- Their determination, using the best science, showed a fact we already knew that Ocean County had a, continued, high to very high risk of large dangerous wildfires.

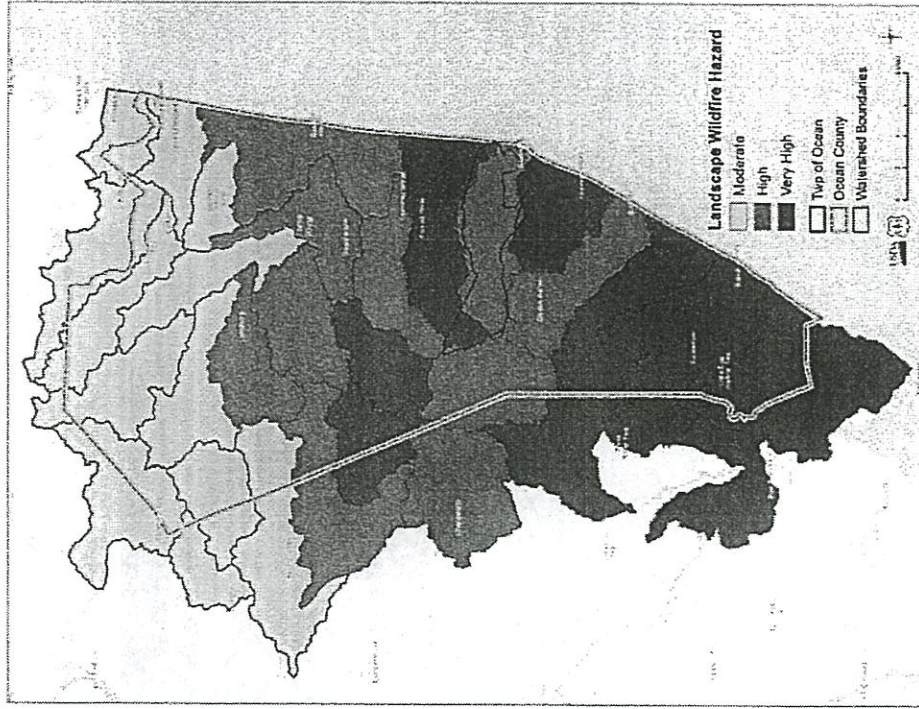
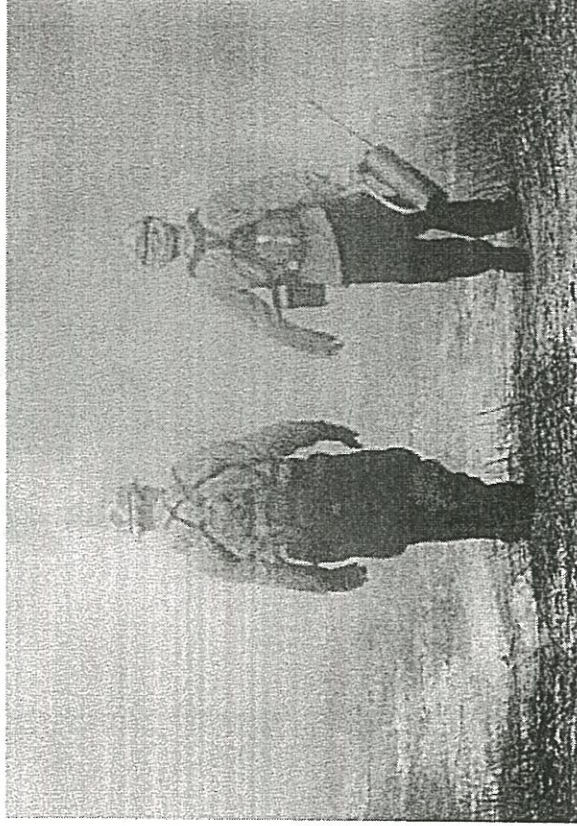


Figure 7. The Township of Ocean Landscape Wildfire Hazard Map

What is Ocean County Doing?

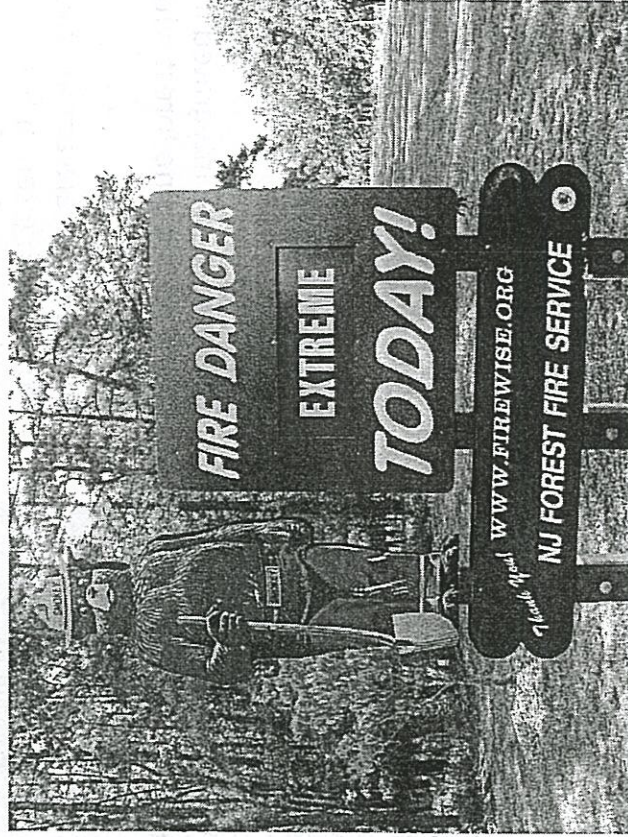
- We own over 30,000 acres of Open Space
- We believe we have a responsibility to manage our forests responsibly to: Improve forest health, mitigate wildfire danger, improve habitat and protect endangered species.
- Work cooperatively with Municipalities
- Educate the Public
- We have worked cooperatively with the NJ Forest Fire Service developing a wildfire mitigation program on County Lands including a prescribed burn plan and forest thinning/fuel breaks.
- We provide trained staff to assist the NJFFS on prescribed burns on County Lands. Without the NJFFS what we do would not be possible.



8/10/2

Current Projects

- Pancoast Road Fuel break
- Wells Mills Forest Stewardship Plan
- Manchester Fuel Break
- Continued execution of Prescribed Burn Plan



Case Study- Manchester Fuel Break Project

- The Roosevelt City section of Manchester is surrounded by State & County Forests.
- The developments on County Rt. 539 are in a High Hazard area.
- The houses are integrated into dense young pine forest with little buffer.
- These homes are among the most endangered in the Northeast for loss from a wildfire.



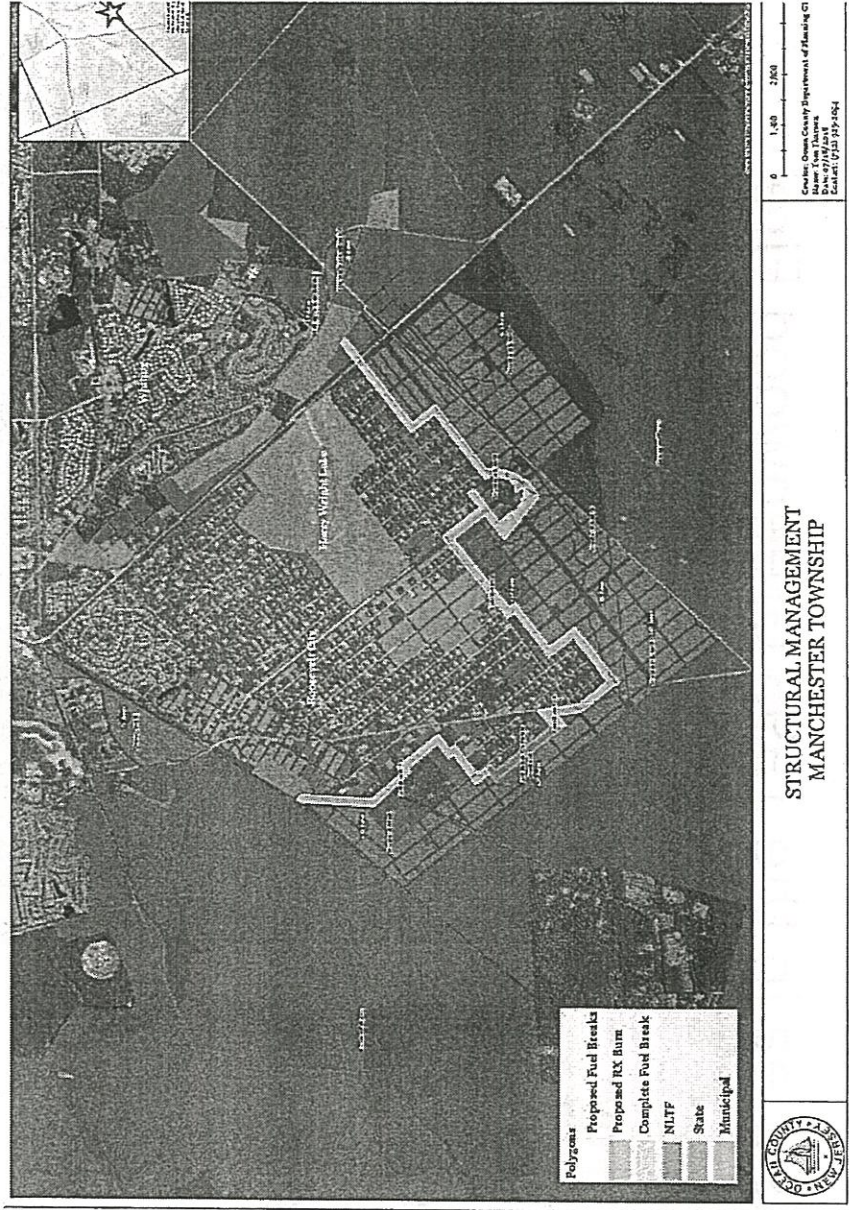
We almost lost this area in the 1995 Greenwood Fire

- The homes were saved by prescribed burning done by the NJFFS three weeks previously and a last second wind shift.
- Our work will protect the community and give it a much better chance of survival



Manchester Fuel Break

- April 4, 1995 Fire nearly destroyed hundreds of homes in the Roosevelt City Community
- We will thin the forest immediately surrounding the area.
- Than prescribe burn blocks to reduce the fuel





**New Jersey Legislature
Joint Hearing – New Jersey Pinelands Forest Health and Fire**

Assembly Agriculture and Natural Resources Committee & Assembly Environment and Solid Waste

14 March 2019

Trenton, New Jersey

Testimony from John Cecil, Vice President for Stewardship, New Jersey Audubon

Thank you Chairman Houghtaling, Vice-Chairman Taliaferro, Chairwoman Pinkin, Vice-Chairwoman Lopez and Committee members. It's a pleasure to join everyone today to discussion management of the Pinelands forests and the threat that wildfire poses to people, property, and habitat.

Background – Personal and New Jersey Audubon

My name is John Cecil. I am the Vice President for Stewardship at New Jersey Audubon. I oversee the organization's on the ground stewardship, management and restoration of wildlife habitat. This includes working with private and public landowners, land managers, foresters and farmers throughout New Jersey to implement best land stewardship and management practices. I have over 25 years of experience working in the wildlife management profession in a number of eastern U.S. states. For the past seven years I have been working here in New Jersey for New Jersey Audubon.

New Jersey Audubon (NJ A) is a privately supported, not-for-profit, statewide membership organization. Founded in 1897 and one of the oldest independent Audubon societies, NJ A fosters environmental awareness and a conservation ethic, protects New Jersey's birds, mammals, other animals, and plants, especially endangered and threatened species, and promotes the conservation and stewardship of New Jersey's valuable natural habitats. The organization has members, nature centers and sanctuaries throughout the state.

NJ Audubon owns seven wildlife sanctuaries within the Pinelands boundary. Most significantly we've been deliberately implementing a Forest Stewardship Plan at the ~500-acre Hovnanian Sanctuary to enhance Pineland's habitat and mitigate the threat of fire in the Wildland-Urban Interface between the Sanctuary and the adjacent Holiday Heights Community. In fact, thanks to the NJ Forest Fire Service, we were able to prescribe burn 66 acres of the Sanctuary just a couple of weeks ago and additional burning should be occurring at the sanctuary today. We are hoping to burn an additional 334 acres by the end of the year.

Scope of Issue

The risk we face from catastrophic wildfires in New Jersey is in large part due to decades of fire suppression. Fire is a normal and necessary process in all of New Jersey's forests, particularly the fire disturbance dependent Pinelands forests. Prior to 1940, when fire suppression in New Jersey began to take hold, it's estimated, more than 50,000 acres of the Pinelands burned annually. While that number varied from year to year, sometimes greatly, it represents a stark contrast with the amount of Pinelands





Forest that has burned annually since then. After 1940 the amount of Pinelands Forest that is estimated to have burned annually dropped by half to a pretty consistent 20,000 acres per year, as estimated into the 1980s.

Today the New Jersey Forest Fire Service and private landowners utilize controlled burns (a.k.a, prescribed fire) to reduce hazardous fuel loads but they are limited in their frequency due to several issues, including sufficient staffing and resources. In recent years, it's my understanding that Forest Fire has been limited to controlled burning on roughly 14,000-17,000 acres of state land and 5,000 acres of private land throughout New Jersey. State Forest Fire Service staff have indicated that, given sufficient resources, staffing and acceptable weather conditions, they could burn during the entire typical burning window (Mid-October until Mid-March in southern New Jersey) and still not complete the necessary amount of burns for safety and ecological purposes.

Thanks to the efforts of both Committees here today, the Legislature and the Governor, we are expecting the number of burned acres to increase due to the newly passed and implemented Prescribed Burn bill (A1675). NJ Forest Fire has estimated that they might be able to double the number of acres burned statewide from approximately 20,000 to 40,000 acres. While this will be a noteworthy achievement, there's still much work to do to burn the amount of Pinelands Forest that needs to be burned in order to protect life, property and restore habitat. The amount of Pinelands Forest that we should expect to see burned annually requires more discussion but could be on the order of 50,000 acres annually, with a need to burn another 10,000 acres statewide. We should also recognize that in order for many of these acres to be safely burned they need to be mechanically thinned first, as well as fire breaks being established.

Wildlife and Habitat Implications

Fire is a natural ecological process, and has long been a feature of New Jersey's landscapes, especially in the Pinelands, but also in the Highlands and New Jersey's other forests. Many plant and animal species have not only adapted to the occurrence of fires but depend on them to create the type of habitat or specific conditions that they need to thrive. Examples of New Jersey species that benefit from the habitat created by fire include Northern pine snakes, Pine Barrens treefrogs, Red-headed Woodpeckers, Bog lemmings, and Northern Bobwhite. Additionally, some species require fire for their survival and the absence or suppression of fire can create the same effect as direct habitat loss. For example, fire helps to maintain the early successional bog habitat required by Pine Barrens treefrogs by reducing the invasion of woody plants. The early successional habitats required by the frosted elfin, a state-threatened butterfly species, are being lost in part because of fire suppression. Also noted as one of the major threats to Northern pine snakes, fire suppression changes their preferred habitat of pines with open canopy to one of denser canopies dominated by oaks. Northern Bobwhite chicks benefit from the openings fire creates and the subsequent vegetative growth it stimulates, resulting in seeds and insects for quail to feed on. Adult quail like to nest in the grasses that regrow in the three months to a year post fire. Pitch Pine, a dominant Pinelands tree, requires fire to release seeds from its serotinous cones.





Species that inhabit fire-prone areas have adapted to avoid mortality from fires by evolving to have thick bark, deep root systems, animals retreat to moist areas, burrowing underground, or disperse. Studies have shown that high-intensity fires result in greater mortality in reptiles than low-intensity fires. New Jersey forests are more likely to endure high-intensity wildfires as result of continuing current management regimes that prohibit burning and allow for dangerously high fuel loads. Consequently, unplanned wildfires are more likely to cause wildlife mortality and increased air pollution.

Studies reveal that reptile species richness and abundance are increased at sites subject to more frequent fires. Similarly, plant diversity has been documented to be higher in post burn areas as compared to those before burning. The effects of fire on bird species is also decidedly more beneficial than not. Fire helps to maintain a patchwork of habitats with varying degrees of plant succession, benefiting a variety of bird and wildlife species. Overall, scientific research shows that the long-term impacts of burning outweigh any initial negative impacts after a fire.

In 2013 NJ Audubon partnered with the Pine Island Cranberry Company, Inc., Bill Haines and the Haines Family on an effort to restore a lost and iconic species to the New Jersey Pinelands. Impressed by the Haines Family's Stewardship of their 17,000 acres of Pinelands Habitat, under the guidance of forester Bob Williams of Pine Creek Forestry, LLC. The Haines Family had been managing the land under an approved Forest Stewardship Plan. The actions that they had been taking to manage the forest using mechanical thinning and prescribed fire helped to ensure a multitude of forest age classes, excellent wildlife habitat and a reduced threat from wildfire. With this as the palette, NJ Audubon and array of partners, including the NJ Division of Fish and Wildlife, the University of Delaware, Tall Timbers Research Station and Land Conservancy, Pine Creek Forestry and Pine Island Cranberry embarked upon a novel project to evaluate the effectiveness of translocating Northern Bobwhite from Georgia to the NJ Pinelands, a step towards re-establishing the species in NJ.

Colloquially known as the fire bird, Northern Bobwhite, a species that ranges widely across the southeast, central and eastern United States, was at one point plentiful throughout New Jersey. Range wide Northern Bobwhite has suffered one of the most severe population declines of any North American bird (an approximately 82% decline in the last forty years). This decline, attributed to habitat loss, fragmentation and predation, has also been connected to the significant loss of the young forest habitat. By the early 1900s quail were no longer in northern NJ. By the mid to late 1900s (1960 to 1980) quail began a steep decline resulting in their extinction in the Pinelands in the 1980s, the point of last known nesting. Today there are no known wild Northern Bobwhite in NJ, with the exception of the translocated birds and their offspring now at Pine Island.

NJ Audubon has been working on Northern Bobwhite recovery given a deep interest in restoring this lost species, but also to foster dialogue and action around Pinelands forest management and disturbance. Northern Bobwhite require a mosaic of habitats, especially early successional / young forest habitat. This habitat is often created as a result of disturbance from fire. By generating interest with landowners, land managers, foresters, hunters, birders and others we are aiming to stimulate more landowners to





take action as Pine Island Cranberry and the Haines family has. Cutting and burning Pinelands forests can be a very good thing to both protect people and create habitat for wildlife.

The Northern Bobwhite Restoration Initiative has successfully demonstrated that in a properly managed mosaic of habitats southern quail can overwinter in NJ, they can reproduce offspring and flourish from one breeding season to the next. Building on this success we are now recruiting other landowners to manage their Pinelands forests using mechanical forest thinning and prescribed fire. These tools can help restore habitat for Northern Bobwhite, Pine Snake, and many other birds, wildlife and rare Pinelands plants.

Recommendations

Given the experience we have had with the Northern Bobwhite Restoration Initiative, the management of NJ Audubon's Hovnanian Sanctuary and the experiences that have been shared with us by the Haines Family, other Pineland's cranberry farmers and landowners, we've identified several recommendations that if acted on would continue to improve the health and condition of Pinelands forest, all while reducing the threat of catastrophic wildfire. These recommendations include:

- Increase prescribed burning in the Pinelands to 50,000 acres or more annually, with another 10,000 acres burned statewide;
- Increase funding and staff for state agencies and departments supporting prescribed burning and forest management;
- Remove prescribed burning barriers by expanding the prescribed burning window to allow for growing season burns;
- Increase coordination and cooperation in the Pinelands between NJ Department of Environmental Protection, Pinelands Commission, U.S. Fish and Wildlife Service, Natural Resources Conservation Service and private landowners;
- Remove barriers to forest stewardship planning and implementation by evaluating the complex process and costs associated with Forest Stewardship Plan approvals in the Pinelands;
- Specific recognition in the Pinelands Comprehensive Management Plan that prescribed burning and forest management can be utilized for habitat restoration and enhancement. Currently the requirements for burning and mechanical thinning are focused on tree planting, cultivation and harvesting for the production of wood products, firewood and forest health;
- Develop a Pinelands Plan that will specifically identify areas, methods, and annual goals to plan for and implement forest stewardship, timber harvesting, thinning and prescribed burning for public safety, wildlife and habitat benefits.

Closing

Thank you again to the Committee's for taking up this important topic of Pinelands forest management. We must and can ensure public safety, while also ensuring habitat and wildlife are properly managed for and conserved, by managing the Pinelands responsibly. This requires the use of forest management and prescribed fire tools and techniques and needs to occur at an accelerated rate to hold off a catastrophic





wildfire and to also prevent the continuing decline and loss of wildlife. NJ Audubon, Pine Island Cranberry, Pine Creek Forestry and others have demonstrated that this can be done. The challenge now is to get to a much greater scale of implementation.

We would be happy to offer this Committee a tour of the Hovnanian Sanctuary and could look to arrange a visit to Pine Island Cranberry the location of the Northern Bobwhite Restoration Initiative.

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United States Department of Agriculture
Natural Resources Conservation Service



NEW JERSEY
AUDUBON
SOCIETY

NJ Biology Technical Note: Forest Management in Disturbance-Dependent Pinelands Habitats

Introduction

The Pinelands region of southern New Jersey includes 1.1 million acres of pine/oak uplands, Atlantic white-cedar swamps, pine plains, savannas, and streams. It spans all or part of seven counties (Ocean, Atlantic, Burlington, Camden, Gloucester, Cumberland and Cape May) and makes up approximately 22 percent of the entire state. Pinelands habitats are characterized by sandy and nutrient-poor soils, tea-colored waterways, and fire-adapted biota. In 1978, the Pinelands National Reserve, the first national reserve in the country, was created to protect the integrity of this unique ecosystem, the rare and endangered plants and animals that inhabit this area, and the sensitive water resources that underlie the region's sandy soils.

Rich in natural and cultural history, this area relies heavily on disturbances to the natural forests to maintain biodiversity and ecosystem health. The Pinelands has been largely shaped by natural and man-made disturbance, including fire, flooding, windstorms, agricultural practices, and timber harvesting. Although the Pinelands region is largely undeveloped, the frequency and intensity of these disturbances have changed over time, resulting in different effects on species composition and ecosystem structure. Approximately two thirds of the Pinelands are privately owned, and proper management of forested land is crucial for the protection of these unique habitats.

Why Is Forest Management Important in the Pinelands?

Disturbance of natural habitats is one of the most crucial aspects to maintaining the unique mosaic of Pinelands ecosystems. Many plants and animals that inhabit the Pinelands have adapted to withstand wildfires, flooding, and other disturbances, while several even require fire to reproduce and regenerate. When a habitat is disturbed, the structure is altered, which helps maintain a healthy cycle of succession. Soil conditions may change and light availability will often increase, providing many plant species the opportunity to regenerate. Different wildlife species will also benefit from certain changes in the habitat, such as the creation of standing snags or exposure of mineral soils.



This Pinelands forest is being managed under a Forest Stewardship Plan to increase ecosystem health, reduce fuel, and improve habitat for rare plants and animals (Kristen Meistrell, NJA)

Historically, wildfires were relatively large and frequent, with some literature suggesting that fire in pitch pine or pine-shrub oak-dominated stands reoccurred at intervals ranging from 5 to 25 years. The average area burned before the 1940s was around 110 acres per fire, but each wildfire was extremely variable. After 1940, the average fire was approximately 15 acres in size, and each fire was very similar in size and intensity. The decrease in size and variability can largely be attributed to suppression and pre-suppression efforts correlating to increased development in the region.

Prescribed burning and other forestry practices that mimic the results of natural disturbances can have several ecological, economic, and recreational benefits, including:

- Decreasing fuel sources that would otherwise contribute to intense, hard-to-control wildfires
- Maintaining biodiversity by promoting regeneration of disturbance-dependent plants
- Increasing forest stand health by removing competitive vegetation

Alor

- Creating open canopy habitat that is necessary for the survival of several species
- Preventing a shift in plant composition to later-successional ecosystem types (e.g. oak dominant)
- Increasing resistance to disease and insect outbreaks by promoting healthy tree growth
- Improving recreational opportunities and aesthetics

Although fire and disturbance are important components for maintaining the ecosystems of the Pinelands, it's essential to maintain safety and prevent property damage for the 700,000 residents of this area. Fortunately, proper forest management techniques can improve both ecosystem health and the safety of nearby residential areas.

Management Options

Depending on the landowner's goals and objectives as well as the habitat types present, management can be guided by a Forest Stewardship Plan drafted by an approved forester or natural resource professional. The Forest Stewardship Plan will reflect the guidelines in the New Jersey Pinelands Commission's *Recommended Forestry Management Practices* manual. Forestry work done in the Pinelands may also be regulated under the New Jersey Pinelands Commission's Comprehensive Management Plan. Silvicultural techniques that can enhance biodiversity and ecosystem health include:

- Prescribed burns
- Selective cutting and felling
- Girdling
- Herbicide application
- Tree and shrub establishment

Depending on the existing fuel loads, selective cutting may be a necessary first step before using controlled burns. Although these managed burns are very effective in the Pinelands, implementation requires special training, specific weather conditions, and a permit from the New Jersey Forest Fire Service. In addition to these general management options, certain techniques can be used to



The pygmy pine plains, shaped by frequent and severe wildfires, rarely reach a height above 6 feet (Rick Radis, NJA)



Open savannas provide valuable resources to rare and endangered plants and animals, including the endangered bog asphodel (Rick Radis, NJA)

enhance specific habitat types and to meet the needs of rare and endangered plants and animals. The following ecosystem types have been defined in the Pinelands Comprehensive Management Plan as well as the New Jersey Pinelands Commission's *Recommended Forestry Management Practices* manual.

Oak-Dominated Uplands

This habitat type is characterized by low fire frequency with a plant community dominated by several oak species, including post oak (*Quercus stellata*), black oak (*Quercus velutina*), and scarlet oak (*Quercus coccinea*). These ecosystems are normally found at the margins of the Pinelands and are an important habitat for many wildlife species. Wildfire frequency is typically lower than in pine-dominated forests; however, infrequent prescribed burns can be beneficial for maintaining ecosystem health and diversity. Selective cutting, herbicide application, and girdling can also be used to reduce competition, enhance forest regeneration, and promote tree vigor.

Pine-Dominated Uplands

As one of the most abundant upland habitat types in the region, pine-dominated forests have been shaped by moderate to frequent fire events. Pitch pine (*Pinus rigida*) makes up approximately 50 percent of the basal area in these forests; this species has physiological characteristics, such as serotinous cones and the ability to sprout from dormant buds, that give it a competitive advantage over other trees in ecosystems that regularly experience fire. Broadleaf trees, primarily black oaks (*Q. velutina*) and post oaks (*Q. stellata*), are present in this forest type; however, due to the moderate fire frequency, oaks are significantly less common in these areas. A dense shrub layer composed of various heaths, including black huckleberry (*Gaylussacia baccata*) and lowbush blueberry (*Vaccinium angustifolium*), is typically present in these forests. Prescribed burns integrated with selective removal of competitive vegetation can be an important tool for managing these habitat types. Selective cutting can mimic

some of the effects of a severe wildfire and this step, often accompanied by chipping or removal of some of the downed trees, may be advisable prior to a prescribed burn to help reduce fuel loads and create safer fire conditions. Prescribed fires require specific conditions, special training, and are not recommended for all situations.

Pine-Shrub Oak Uplands

Dependent on moderate to high fire frequency, pine-shrub oak uplands consist mainly of pitch pine (*P. rigida*), blackjack oak (*Quercus marilandica*), and scrub oak (*Quercus ilicifolia*). This habitat type is a mosaic of open, bare mineral soils and an open canopy of pines and oaks. The shrub layer is somewhat sparse, and the understory is comprised of early successional herbaceous species. Proper habitat management is crucial to preserve species composition and vegetative structure. Tree thinning, brush mowing, and prescribed burns can be used to maintain the open canopy characterized by these ecosystems. Depending on site conditions, selective cutting may be necessary before a prescribed burn. Once the habitat has been thinned and fuels are manageable, an integrated plan of different fire intensities can be implemented to maintain ecosystem structure. Because of the sensitivity of certain plants and animals, it is important to refer to the Pinelands Comprehensive Management Plan before implementing any forestry practices.

Pine Plains Uplands

Also known as pygmy pine forests, pine plains consist of pitch pines (*P. rigida*) and blackjack oaks (*Q. marilandica*) that rarely reach a height above six feet. Worldwide, the largest contiguous acreage of this rare and unique forest community can be found in New Jersey, spanning more than 3,000 acres. This area's long history of frequent and severe fires has shaped the unique characteristics of this habitat type. Bare mineral soil is abundant and is typically colonized by pyxie moss (*Pyxidantha barbulate*), golden heather (*Hudsonia ericoides*), and the rare broom

crowberry (*Corema conradii*). Integrating fuel reduction techniques with low-intensity fires, and eventually using higher-intensity burns, can help maintain this rare plant community. Creating soil disturbances by bulldozer scraping can also help mimic a severe burn until a larger prescribed fire is appropriate. In areas containing broom crowberry, it is important to consult the appropriate natural resource professional for assistance.

Savanna and Grassland Uplands

These habitat types are characterized by a dominant grassy herb layer with either widely spaced trees forming an open canopy (savanna) or no trees (grassland). Dry grasslands and savannas are typically the result of natural or man-made disturbance, such as an intense fire, frequent fire, or agricultural practices that create early successional habitat characteristics. Areas that encountered an extreme wildfire, were at one time cleared for agricultural purposes, or are burned annually may sometimes succeed to grassland habitat in the Pinelands. This ecosystem type can provide crucial resources to many rare and endangered animals, including the state threatened frosted elfin (*Callophrys irus*). Fire, selective cutting and felling, herbicide application, and girdling can be applied to remove competitive or encroaching vegetation in these habitats.

Atlantic White-cedar Swamps

Valued for its excellent timber quality, Atlantic white-cedar (*Chamaecyparis thyoides*) has become increasingly rare throughout the Eastern United States due to overexploitation. This forested wetland is characterized by even-aged, dense stands dominated by Atlantic white-cedar with few hardwood trees and pitch pines (*P. rigida*) scattered throughout. These swamps provide valuable resources to many rare and endangered plants and animals, including curly grass fern (*Schizaea pusilla*), swamp pink (*Helonias bullata*), and Hessel's hairstreak (*Callophrys hesseli*). Atlantic white-cedar is not fire tolerant, but disturbance, such as fire, flooding, or windstorms, does play a major role in regeneration. The seedlings require ample sunlight in order to grow, so clearings in mature stands can provide optimal conditions for regeneration. In an existing stand, strips or patches can be cleared, followed by natural regeneration or artificial planting. In some instances, new cedar stands can be established in areas that provide proper site conditions. When preparing an area for regeneration, it is important to remove existing vegetation, and typically a deer exclosure fence is needed to prevent overbrowse. Natural regeneration can occur if a seed source is nearby, but in some instances it may be necessary to obtain seedlings from a local nursery. It is important to monitor seedling growth and to control any competitive vegetation with mechanical or herbicide treatments. In mature stands, selective removal of



Atlantic white-cedar typically forms dense, even-aged stands (John Parke, NJA)

competitive vegetation by cutting, girdling, or herbicide application can help improve tree vigor. In some cases, harvested timber can be used for wood products; this may be regulated by the New Jersey Pinelands Commission's Comprehensive Management Plan. Guidelines for best management can also be found in the New Jersey Division of Parks and Forestry's *New Jersey Forestry and Wetlands Best Management Practices Manual* and the *Atlantic White-cedar Ecology and Best Management Practices Manual*.

Pitch Pine Lowlands

This forest type is generally dominated by pine, but also contains many moisture-loving plants, including red maple (*Acer rubrum*), highbush blueberry (*Vaccinium corymbosum*), and sweet pepperbush (*Clethra alnifolia*). In some areas, sphagnum moss (*Sphagnum* spp.) may cover the understory, creating a deep layer of organic material. These forests generally lie at or near the water table, but can sometimes seem drier than neighboring cedar swamps and herbaceous wetlands. Pitch pine is typically the dominant tree species in these areas, and disturbance plays an important role in restoring these habitats. In order to enhance ecosystem health and maintain diversity, selective cutting, felling, herbicide application, and girdling of competitive vegetation can be applied. Prescribed burns can then be used to maintain vegetative structure and forest health. Certain lowland plant communities are considered globally rare, including communities containing sand myrtle (*Leiophyllum buxifolium*) or certain reed grass species (*Calamovilfa* spp.), so it is important to refer to the Pinelands Comprehensive Management Plan and the *New Jersey Forestry and Wetlands Best Practices Manual* for guidance.

Hardwood Swamps

Hardwood swamps are not typically shaped by disturbances with the exception of natural fluctuations in the water table, but some forest stand improvement techniques can be implemented to increase ecosystem health and diversity. Generally located within floodplains,

these habitats are characterized by moisture-loving plants such as black gum (*Nyssa sylvatica*), red maple (*A. rubrum*), and highbush blueberry (*V. corymbosum*). Hardwood swamps provide critical habitat for many neotropical migrants and other rare and endangered species. To promote tree vigor, improve water quality, and preserve vegetative structure, a landowner can selectively remove competing vegetation by cutting, girdling, or herbicide application. Work conducted in wetlands may be subject to special wetland regulations; as with any forestry practice implementation, it is important to refer to state and Pinelands regulations. In some instances, a hardwood swamp can be converted to an Atlantic white-cedar stand, but regulations may apply. Before implementing such a project, it is important to review habitat on the landscape level and consider the site conditions and the species that occupy the area.

Savanna and Grassland Wetlands

Although small in acreage, wetland savannas and grasslands are rich in plant diversity and support a wide range of rare and endangered animals. Several species of orchids, carnivorous plants, and other rare plants, such as the curly grass fern (*S. pusilla*) and bog asphodel (*Narthecium ossifragum*), inhabit these areas. Sections of these wetlands that include Pine Barrens reed grass (*Calamovilfa brevipilis*) may support one of the largest populations of the endangered arogos skipper (*Atrytone a. arogos*). Disturbance such as fire and flooding play an important role in maintaining the open conditions that are critical for the survival of many plants and animals. Selectively removing encroaching trees by cutting, girdling, or herbicide application along with prescribed burns can help maintain these habitats. Additional caution and restrictions should be exercised when using heavy equipment and herbicides in and around wetlands.

Management Considerations for Select Rare and Endangered Species

The Pinelands region supports a wide variety of rare and endangered species, hosting some of the largest



(From left to right) The swamp pink (Mike Crewe, NJA), bog asphodel (Rick Radis, NJA), sand myrtle (John Parke, NJA), and Pine Barrens gentian (Rick Radis, NJA) are all unique plants that thrive in the harsh conditions of the Pinelands.



(From left to right) The threatened red-headed woodpecker (© Michael Hogan), the endangered corn snake (Kristen Meistrell, NJA), the threatened northern pine snake (© Nick Scobel), and the endangered timber rattlesnake (Kristen Meistrell, NJA) are all species that inhabit disturbance-dependent ecosystems.

populations of these plants and animals found throughout their range. When implementing a Forest Stewardship Plan, it is important to consider strategies to either minimize any negative potential impacts to these species, or to improve habitat conditions. Below are some general habitat characteristics needed for certain wildlife species that may exist in disturbance-dependent ecosystems listed in this document. It may be useful or necessary to consult the appropriate state or federal wildlife agency, such as the New Jersey Endangered and Nongame Species Program (ENSP) or the U.S. Fish and Wildlife Service (USFWS) before implementing habitat management practices for these species.

Red-Headed Woodpecker (*Melanerpes erythrocephalus*)

Threatened in New Jersey, the red-headed woodpecker thrives in open forest wetlands and uplands, often created by natural disturbance. This species requires dead snags for nesting and an open shrub layer for foraging during the breeding season. In the winter, an area with ample forage and mast production is crucial for the survival of this species. Preserving and creating snags by girdling select trees is recommended to create crucial nesting habitat.

Corn Snake (*Elaphe guttata*)

This secretive snake is endangered in New Jersey and reaches its northernmost extent in the Pinelands. It requires mature, dry pine/oak forests with a moderately dense shrub layer and plenty of forest openings for basking and foraging. Nesting and overwintering activities can take place within old stumps, logs, old railroad ties, or ground burrows, so leaving debris in or near cleared canopy openings is optimal for this species. In areas with known or potential den sites, restrict the use of heavy machinery and avoid disturbing soil and root structure.

Timber Rattlesnake (*Crotalus horridus*)

One of two venomous snakes in New Jersey, the state endangered timber rattlesnake occurs in the Pinelands, the Highlands, and the Ridge and Valley regions of the state. In the Pinelands, this species uses Atlantic white-cedar swamps and stream corridors as overwintering sites. During the active season (April through October), large contiguous forests with some canopy openings can provide this species with ample foraging and basking habitat. Preserving forest debris and enhancing vegetative cover for hunting activities is recommended. In areas with known or potential den sites, restrict the use of heavy machinery and avoid disturbing soil and root structure.

Timber rattlesnakes are considered passive animals, but may become defensive when threatened. If you happen to encounter a timber rattlesnake, do not attempt to handle or relocate it. Move to a safe distance and call NJ ENSP at 1-877-WARN-DEP for assistance.

Northern Pine Snake (*Pituophis m. melanoleucus*)

As one of the largest snakes in New Jersey, the state threatened Northern pine snake can be found in the Pinelands region. This extent of their range is relatively isolated from other populations in the Southern region of the United States, so protecting this species is critical. The northern pine snake requires dry, upland pine/oak forests and plenty of canopy openings and exposed mineral soils with little vegetative cover for nesting. This species is a fossorial nester, digging through the sand to lay their eggs underground. Overwintering sites are typically found near nesting sites; however, these areas may have more vegetative cover than nesting sites. Preserving forest debris and stumps during forest activities is recommended for this species. In areas with known or potential den and nest



(From left to right) The rare Hessel's hairstreak (© Chris Davidson), endangered arogos skipper (© Kevin Keating), threatened Pine Barrens treefrog (©

sites, restrict the use of heavy machinery and avoid disturbing soil and root structure.

Pine Barrens Treefrog (*Hyla andersonii*)

Threatened in New Jersey, the Pine Barrens treefrog is a vibrantly colored amphibian that has adapted to breed and survive in the acidic conditions of the Pinelands. Although this species does exist throughout the Southern region of the United States, the isolated population of New Jersey may serve as the stronghold for this species. They inhabit many wetland areas, including Atlantic white-cedar swamps, pitch pine lowlands, and herbaceous wetlands, but prefer to breed in early successional ponds, wetlands, and seeps with a high vegetative structure. Preserving breeding pools is crucial for the persistence of this species, so precautions should be taken when conducting any forestry activities near a potential breeding site.

Arogos Skipper (*Atrytone a. arogos*)

As a state endangered butterfly, the arogos skipper can be found in two isolated populations in New Jersey and persists throughout the eastern United States in small, disjunct populations. The habitat used by the arogos skipper varies regionally, but in the Pinelands it consists of post-burned wetlands with an abundance of its host plant, Pine Barrens reed grass (*Calamovilfa brevipilis*). Because this species has specific habitat requirements, additional precautions should be considered when working in savanna wetlands. Removing encroaching trees and shrubs is recommended to maintain open conditions.

Frosted Elfin (*Callophrys irus*)

The frosted elfin is a state threatened butterfly that occurs in scattered populations across the eastern United States. It prefers dry grasslands and savannas that contain its host plant, wild indigo (*Baptisia australis*), which thrives after wildfires. Mowing, controlled burns, and select removal of encroaching trees and shrubs are the best way to maintain early successional habitat for this species.

Hessel's Hairstreak (*Callophrys hesseli*)

This highly specialized butterfly is considered a species of special concern in New Jersey and is found within a small band along the East coast. It is found exclusively within Atlantic white-cedar stands, typically near areas with abundant nectar plants. Eggs are laid on cedar trees while the caterpillars feed on its foliage. Preserving, enhancing, and creating Atlantic white-cedar stands are highly recommended for the survival of this species.

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New Jersey Department of Environmental Protection
Natural and Historic Resources Group

New Jersey Forest Service

New Jersey Forest Fire Service

Points of Discussion

NJ Assembly Agricultural and Natural Resources Committee Hearing
March 14, 2019 - Trenton, NJ



New Jersey Forest Service Testimony

John Sacco – NJ State Forester

NJ Forest Service - Issue Identification:

- Conservation actions in New Jersey have long focused on protecting forests from development through land preservation but have ignored the harm caused by lack of stewardship.
- The Pinelands are a fire-prone, disturbance-dependent ecosystem. A history of fire suppression and lack of active forest management have caused excessive forest density that is unnatural, outside the range of historic variability, and is the root cause of many of the problems facing our forests today.
- Excessive forest density, particularly in the Pinelands, is making damaging wildfires and insect outbreaks more likely. This places human lives, developments, and watersheds at a risk, and is responsible for much of the decline in rare, disturbance-dependent species.
- Market forces and social trends inhibit corrective forest density management. For instance, removing small-diameter trees (thinning) is not economically viable and lack of an appreciable wood products industry in New Jersey inhibits timber harvesting in general. Also, many members of the public hold very negative views of forest industry and tree cutting.
- Stakeholdering with the public and interdisciplinary experts, building consensus based upon empiric data, and obtaining necessary permits and approvals from other resource agencies is essential in formulating effective forest management plans. This is very important to us, as we aspire to put forth the best plans and gain as much agency buy-in and public support as possible. However, these activities are time-intensive, complex, and require substantial staff resources.

NJ Forest Service – Response:

- Wildfire risk reduction is a primary focus of our 2020 Statewide Forest Action Plan currently in draft and stakeholder development. The Forest Action Plan is a strategic planning document and in it we are:
 - Developing a measurable scientific approach to identifying critical areas for forest management and prescribed fire in Wildland Urban Interface areas.
 - Developing a measurable and scientific approach to identify and mitigate forest conditions exceeding 80 square feet per acre of basal area which indicates that wildfire and forest health threats are likely.
- NJ Forest Service and NJ Forest Fire Service work closely together to locate, prioritize, and implement fire risk reduction activities on the landscape.
- Through our Stewardship and Farmland Tax Assessment Programs, the NJ Forest Service promotes the reduction of hazardous fuels with private woodland owners.
- The NJ Forest Service continues to work with the Pinelands Commission, Natural Heritage Program, and NJ Division of Fish & Wildlife to expedite permits and approvals for forest management activities.
- NJ Forest Service has invested in a rigorous forest inventory and monitoring program. State owned forests are inventoried at a rate of approximately 40,000 acres per year for Management Plan

development. The NJ Forest Service buys into the federal Forest Inventory and Analysis (FIA) program for a continuous forest inventory product at two times the National intensity and an accelerated collection timeframe of 5-years, meaning 1/5 of all forested land in NJ is measured annually on both publicly and privately held forested lands.

- Forest Inventories inform not only the NJ Forest Service, but also public stakeholders, interdisciplinary experts, and regulators. We use this empiric data to drive consensus and develop our management plans. The forest inventory for Penn State Forest is complete. The inventory for Wharton State Forest will be completed this year. Development of the Forest Management Plan for Wharton and Penn will start next year. A contract is in development to inventory Brendan T Byrne State Forest, Bass River State Forest, Belleplain State Forest, and Greenwood Wildlife Management Area.
- Since 2014, NJ Forest Service has conducted 29 silvicultural projects related to fire mitigation totaling approximately 4,000 acres, more than had been done in the 10 preceding years. However, this is inadequate to deal with the problems of excessive density, and we recognize the need to do more, and we will.
- Next, I'd like to provide an example that is very illustrative of the situation we're in. We recently initiated an 800-acre fuel break and forest thinning project along Washington Turnpike in Wharton State Forest. This was the first time a project of this size was attempted in recent decades. This project was initiated in spring of 2014 and took about a year to get through the stakeholdering and regulatory process. It was then bid a first time with the goal of obtaining some wood utilization and financial return to offset cost. We had prospective bidders, but none were interested in paying us for the thinned material. We bid the job a second time, with the willingness to now pay for thinning services. Those bids came in higher than expected costs utilizing our existing term contract, thus we rejected it and utilized our term contract. We did as much as we could afford, \$358,000, and work was suspended in 2018, halfway through the project, around 400 acres completed.
 - This is not a sustainable way to deal with the more than million acres of publicly owned forest in New Jersey. Clearly, we need another way.
- To that end, the NJ Forest Service continues to explore various forest management and density reduction projects, including attempts to partner with private enterprise, that may enable us to cost-effectively realize our broader ecological management and fire safety goals.

NJ Forest Service - Suggested Improvements:

- We must execute broad-scale forest management that is both cost-effective *and* respectful of the natural resource concerns that drove the acquisition of so much public land in the first place.
- We must explore and support options for commercial utilization of wood from fuel reduction activities, especially low-quality small diameter material.
- Create a "Fuels Crew" in partnership with the NJ Forest Fire service to conduct fuel reduction work as well as pre/post burn fuel loading measurements.
- Develop a new term contract for forest management that can provide for more equipment and technique options, so we can implement less economically viable projects.

- Secure additional stable sources of funding for continued and improved forest inventory, monitoring, and management.
- Continue to promote our philosophy of managing the public's forests for ecological services such as watershed protection, wildlife habitat, plant diversity, and carbon sequestration, and address the public's negative emotions about forest management activities through evidence and communication.

New Jersey Forest Fire Service Testimony

Gregory McLaughlin – NJ State Forest Fire Warden

I. Current State of Conditions

A uniquely convenient place to live, with over 9 million residents, NJ hosts the nation's most dense population, yet the state is approximately 40% forested.

- Periodic booms in residential construction driven by factors like outmigration from nearby metropolitan areas continue to push homes farther into fire dependent ecosystems.
- New Jersey is not immune to the national trends of hands-off preservation and fire exclusion which have allowed forests to grow to hazardous, unhealthy densities with excessive fuel buildups in vulnerable areas.

The USDA Forest Service has characterized over half of NJ as high-risk Wildland Urban Interface (WUI): areas where development meets or mixes with forest and other vegetation (2010).

- Approximately 1/3 of NJ's population resides in the WUI.
- The number of homes in NJ's WUI grew 20% from 1990-2010 (750-900 thousand homes).

The condition of NJ's forests imposes added complexities on wildland fire managers to operate safely.

- Overstocked forests can provide the fuel structure necessary for wildfires to progress from the ground to treetops quickly, allowing them to burn more aggressively and unpredictably.
- Vegetation in fire-adapted ecosystems of the Pine Barrens is some of the nation's most volatile fuels, adding complexity to wildland fire management.
- Existing condition of forest road networks causes delays and compromises in fire response and suppression tactics.

II. A Snapshot of the FFS' Capacity and Resources to Manage Wildland Fire

Through a reliable wildfire detection system and implementation of hazard reduction treatments, NJFFS strives to reduce the potential for and severity of wildfires.

- A network of 21 lookout towers are staffed for quick detection of wildfires, rapid dispatching and careful tracking of resources, and communication of critical information. Small fires are safer to suppress and potentially cause less harm.
- Specialized aviation resources, both fixed wing and rotor aircraft, aid in wildfire detection and provide for safe and rapid suppression efforts.
- Specially designed and fabricated vehicles permit direct, aggressive attack of wildfire.
- A planned, coordinated and strategic fuels mitigation program supports the reduction of hazards and lessening of risk. This includes the use of prescribed burning as well as mechanical fuels treatments such as mowing and thinning.

Employing well-trained, experienced staff along with a customized fleet, the FFS fights wildfires every month of the year.

- Forest Firewardens not only respond to wildfire incidents for initial and extended attack, but also train crew members and volunteers, plan and execute hazard mitigation activities, investigate and prosecute arsonists, maintain forest roads, permit open burns and campfires, deliver educational programs and support other statewide natural disasters such as hurricanes and floods.
- FFS staff benefits from frequent and diverse training opportunities, often crossing boundaries to interface with various types of land management and emergency response professionals.
- Three divisional maintenance shops are staffed with full-time mechanics for fabrication and maintenance of the vehicle and equipment fleets. When fire danger is low, Fire Observers support shop services and building and grounds maintenance. In house construction of specialized off-road wildland engines saves the state \$75,000 per unit.

Preparedness measures build connections to create communities more resilient to wildfire.

- NJFFS routinely practices interagency cooperative response during WUI preparedness drills to familiarize all parties with wildland fire protection protocols, resources, and needs during a wildfire incident.
- Various community assistance programs are administered to guide development of Community Wildfire Protection Plans (CWPPs), offset costs of hazard mitigation, and provide wildland firefighting equipment to local fire departments.
- Outreach and education programs take place throughout the year, with NJFFS representation at events like local fire prevention expos, NJ Teachers Convention, Firewise Community Open Houses, and various DEP events.

III. Needs and Recommendations

Rising demand for action.

- The agency has identified the need to treat approximately 30,000 acres annually with prescribed fire to reduce hazardous fuels, however, based on capacity, the annual average number of acres treated falls well short at 15,000 acres per year.

Modern Wildland Fire managers have more diversified duties and must make tough decisions to allocate preparedness assistance and implement hazard reduction.

- Heightened land use pressure broadens exposure of wildland fuel to human activity, increasing ignition potential.
- Sprawl into the wildland increases the vulnerability of lives, homes, infrastructure, and firefighter safety.
- Processes for obtaining permits and approvals for mitigation activities can be inefficient and obstructive.
 - It is time to identify WUI "Zones" and adopt WUI standards for fuels mitigation treatments within these zones. Silvicultural and forestry practices are agricultural activities and as such, should be afforded the same protections under the NJ Right to Farm Act.
 - The FFS has the full authority of the law to take the actions necessary to control a wildfire. Similarly, there must be a means to achieve swift, deliberate and planned actions in high-risk WUI "Zones".

**Prepared Testimony for the New Jersey Assembly Agriculture and Natural Resources Committee for
the Public Hearing on Pinelands Wildfires – March 14, 2019**

Dr. Michael R. Gallagher, Research Scientist, USDA Forest Service Northern Research Station

My name is Dr. Michael Gallagher. Thank you for inviting me to speak here today. I am here to speak to you today as a research scientist and wildland fire expert for the USDA Forest Service Northern Research Station. My knowledge of wildland fire draws from over 10 years of experience studying prescribed- and wildfire behavior and effects in the New Jersey Pinelands, with the support of the New Jersey Forest Fire Service and the New Jersey Bureau of Forestry. This work has produced numerous peer-reviewed articles, and my talk today summarizes key ideas in those publications. My knowledge also draws from approximately 2,000 hours of progressive fireline experience as a wildland firefighter on assignments in New Jersey, Pennsylvania, New York, Florida, Idaho, Montana, Utah, California, and Alaska.

Heat, oxygen, and fuels are the three key ingredients required to produce a fire. Like in baking, adding different proportions of ingredients will produce vastly different end results. In the case of wildland fire, these results can be thought of as fire intensity, speed, smoke, and subsequent environmental effects. With prescribed fires we get a say about all of the ingredients by choosing when and where the fire will be, and thus can produce nuanced fire behavior to help achieve certain types of desirable outcomes. With wildfires, however, fuels are the only ingredient that we might be able to proactively adjust before a fire to influence the end result. Seasonal patterns in weather and plant life cycles provide predictability in fire behavior and effects, and provide diverse management opportunities. However, predictions of increased extreme weather for our region reduce the reliability of these patterns.

Not every inch of forest can be treated for fuel hazards at once, and treated fuels do grow back with time; but strategies can be employed that account for risk, hazards, and other goals that need to be balanced. For example, New Jersey Forest Fire Service is working with the US Forest Service to conduct a Statewide Wildfire Hazard Assessment to guide risk mitigation recommendations for specific communities, building on a recent pilot assessment in the Township of Ocean. Many programs exist to guide homeowners and communities in following such recommendations, such as maintaining fuel breaks around their homes. However, it should be pointed out that some homeowners do not actually have jurisdiction over the forest fuels that put them at risk, particularly when those fuels occur on neighboring private properties.

It should also be pointed out that fuels near homes are critical not just because they risk flame impingement on homes, but for managing for ember conditions. In fact, embers are an important component of short and long distance fire spread. In this way they are a common yet often under-appreciated ignition source to homes and outbuildings during wildfire events. Ember showers act like snow showers, but instead of snowflakes they produce anywhere from flurries to squalls of glowing hot particles that can accumulate and set fire to structures or adjacent forest units when fuels are contiguous or receptive.

In conclusion, fire behavior and management are complex and we are constantly expanding our understanding of both. But we know enough about the drivers of wildfire, the “ingredients,” to work with communities to assess and reduce risk, as long as we appropriately anticipate possible future conditions. I thank you for your time today and would be happy to answer any questions.

Forestry Notes



Prescribed Fires

IN NEW JERSEY PRESCRIBED FIRES ARE USED TO REDUCE HAZARDOUS ACCUMULATIONS OF FOREST FUELS
This aids in the prevention of catastrophic wildfires

Fire is part of the Forest Environment

Fire, in a natural or prescribed form, is important to the maintenance and health of most ecosystems. However, with more residential subdivisions and developments in New Jersey, especially in the fire prone pinelands, the dangers and damages from wildfires continue to increase.

The wise use of prescribed fires to reduce forest fuels, coupled with other fire protection measures helps provide an effective level of fire protection in the wildland urban interface.

As the name implies, prescribed fires are used only when weather, and other conditions in the forest and surrounding areas, meet the conditions as described in the prescription.

Other benefits of prescribed fires:

- More economical and less destructive than mechanical ways to reduce fuel
- Helpful in managing wildlife habitat
- Used in removing certain non-native invasive plants
- Helpful in preparing sites for seeding and planting
- Vital in the perpetuation of fire dependent forest trees such as pitch, pond, and shortleaf pine trees
- For disposing of logging debris
- Used to enhance appearances
- To Manage endangered species
- Useful in Nutrient Recycling
- Used in Forest Disease and Pest Control

THERE ARE BAD FIRES AND GOOD FIRES



WILDFIRES ARE BAD FIRES

They are one of the most destructive forces known to mankind.

Wildfires destroy forests, homes, wildlife habitat and people. They are caused by careless debris burning, discarded cigarettes, sparks from equipment, children playing with fire, arson, lightning, and many other causes.

THEY ARE UNPLANNED FIRES



PRESCRIBED FIRES ARE GOOD FIRES

They can imitate natural forest events and help protect property, lives, and natural resources.

THEY ARE CAREFULLY PLANNED FIRES

PRESCRIBED FIRE REGULATIONS

In New Jersey, prescribed burning plans for private forestlands must be developed by the landowner, a professional forester, or a legally authorized agent.

These plans must be submitted to the New Jersey Forest Fire Service for review, approval, and permits.

The prescribed burns must be completed at the owner's expense; however, the New Jersey Forest Fire Service can provide specialized equipment if the landowner is willing to reimburse the Forest Fire Service for its equipment and operator's wages.

New Jersey's prescribed burning season is limited to between October 1 and March 31. Only about 15 optimum burning days occur during this period.

Using prescribed fire to reduce fuels loads on the forest floor (accumulated leaves, brush and other vegetation) is not without challenges. This is especially true where rural land and developed areas meet, or in the "Wildland Urban Interface" (WUI). Sometimes burning in the WUI is difficult because smoke can be a problem for nearby homeowners. Also burning of dense fuels requires extra control lines and added resources in order to safely and effectively conduct a prescribed burn.



UCA1162065

BAD FIRES DO HAPPEN IN NEW JERSEY

Large disastrous wildfires, have occurred many times in New Jersey's history.

A few memorable and historic wildfires are:

- ◆ **1838** — 179,000 acres in Burlington and Monmouth counties
- ◆ **1871** — 50,000 acres in Bass River area
- ◆ **1930** — 267,547 acres burned and a huge fire leveled town of Forked River
- ◆ **1963** — 83,000 acres including 186 homes, 197 buildings & several deaths
- ◆ **1995** — 9,225 acres in Ocean County
- ◆ **1997** — 800 acre fire damaged over 300 homes in the Berkeley Township
- ◆ **2007** — 15,000 acre fire consumed pinelands vegetation and damaged homes in the Warren Grove area
- ◆ **2008** — Two 2,000 acre fires in the Wharton State Forest
- ◆ **2010** — 2,240 acre Ft. Dix Range 1-14 fire
- ◆ **2011** — Jan 1 to May 1, 283 fires, 239 acres burned

An average of 1,500 wildfires damage or destroy 7,000 acres of New Jersey's forests each year.

Wildfires damage our woodlands, and are becoming an increasing threat to homeowners who live within the Wildland Urban Interface and to residents and visitors who use New Jersey's great outdoors for recreation.

Prescribed Fires Help Reduce Wildfires.

Forestry Notes



Wildfires in New Jersey

What Causes Them? What can you do about it?

People cause 99% of wildfires in New Jersey

Causes of fire	Percent of wildfires caused by people
Arson	53%
Children	15%
Smoking	12%
Miscellaneous	9%
Campfires	4%
Equipment use	3%
Debris fires	2%
Railroad operation	1%
	Percent caused by nature
Lightning	1%

People-caused fires are preventable

- ◆ **Arson fires**, willfully and maliciously set, cause the most wildfires.
- ◆ **Children** playing with matches and lighters is the next major cause.
- ◆ **Careless smoking** - discarding lit cigarettes, cigars, pipe heels, and matches.
- ◆ **Miscellaneous causes** are lumped together such as resulting from a car wreck, spreading from a house fire, or fireworks.
- ◆ **Campfires** left unattended, adjacent fuels and faulty campfire rings result in wildfires.
- ◆ **Careless equipment use** such as cutting torches, parking equip. with a hot muffler in high grass, or using chain saws with poorly maintained spark arresters.
- ◆ **Debris fires** — open burning without a permit is prohibited.
- ◆ **Railroad fires** still occur because of un-maintained right-of-way, spark arresters, and pieces of hot brake shoes.

Lightning fires are not preventable

Lightning fires are caused by nature.

New Jersey Wildfires

Disastrous wildfires have occurred many times in New Jersey's history.

Here are a few statistics:

- ◆ In 2008 two fires burned in the Wharton State Forest on 2,000 acres.
- ◆ In 2007 a wildfire claimed 15,360 acres and destroyed three homes in the Warren Grove area.

On an April weekend in 1963 wildfires burned 183,000 acres, 186 homes, 197 other buildings, and causing 7 deaths.

- ◆ In 1997 an 800-acre wildfire burned over 800 acres and damaged 53 homes.
- ◆ In 1995 one wildfire burned over 19,225 acres.
- ◆ In 1930 267,547 acres burned and a huge fire leveled the town of Forked River.
- ◆ In 1838 179,000 acres burned in Burlington and Monmouth counties.
- ◆ In 1871 50,000 acres burned in the Bass River Area.

In 2009, three hundred and thirty two fires burned 500 acres of vegetation in New Jersey. By early April 2010 more than double the number of fires than in 2009 had already burned.

New Jersey Surprises

New Jersey is well known as having the highest population per square mile of any other state in the U.S.

Yet most people are surprised to learn that:

- ◆ Forty-five (45)% of New Jersey is forested and wildfires can burn anywhere in New Jersey's forests.
- ◆ There is an average of 1500 wildfires per year state-wide in New Jersey.
- ◆ In the average year, about 7,000 acres of wildland resources, homes, other personal property, and even more tragically, human lives are sometimes lost.
- ◆ Another surprise is that 99% of new Jersey's wildfires are caused by people.
- ◆ Only 1% of NJ wildfires are caused by lightning. This contrasts to the western US forests where the majority of wildfires are caused by lightning.

You Can Help Prevent Wildfires

Here are ten ways you can help prevent wildfires:

1. Teach children about the danger of playing with matches and lighters.
2. Assure that barbeque stoves are stable, and the area 10 feet around has no burnable materials.
3. Dispose of hot charcoal briquettes by soaking them in water until cool.
4. Clear leaves and brush 10 feet away from a campfire ring before lighting.
5. Never leave a campfire unattended.
6. Grind out cigars, cigarette, and pipe tobacco in the dirt.
7. Never smoke while hiking, horseback riding, or trail biking.
8. Use the ashtrays while in cars or trucks.
9. Keep spark arresters clean on chainsaws, mowers and leaf blowers.
10. Be extra careful with fires on hot, dry, and windy days.



Wildfire photo from NJFFS B-10 Paramount Fire collection



Campfire photo by Charlie Newlon

To report a
fire
CALL:
911



Wildfire photo by John Matel

Forestry Notes



Firewise Plant Selection

**Firewise plants in the right place
can help protect your home from wildfire**

Firewise Landscape, Defensible Space, and Defensible Zones

Firewise Landscape

The term "**Firewise Landscape**" means to design and manage the outdoor area around a home or structure to reduce wildfire risk.

Defensible Space

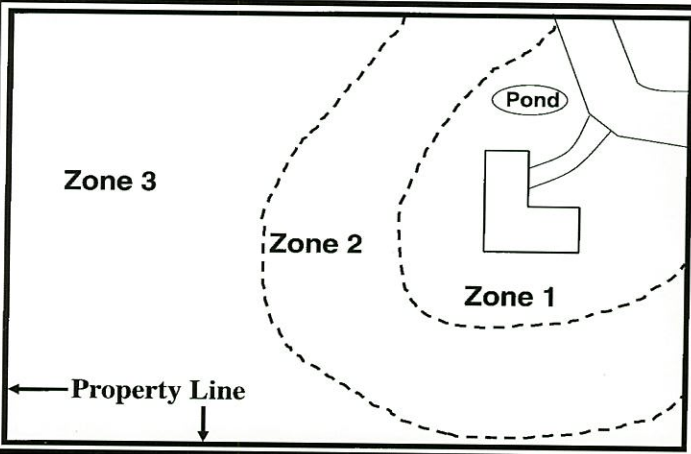
This is an area around a structure which provides space for fire fighters where vegetation is managed to slow the spread of wildfire.

Defensible Zones

These are up to 3 areas, or vegetative zones, around homes that are managed to provide the best mix of fire protection and landscaping.

The 3 zones ideally are:

- Zone 1** — 0 to 30 feet around the home
- Zone 2** — 30 to 75 feet
- Zone 3** — 75 to 100 feet from the home.



Plants for Defensible Zones

Ideally here are three Defensible Zones designated around a *Firewise* home and structures where the homeowner manages the vegetation to reduce the wildfire risk.

- Zone 1** — 0 to 30 feet around the home
- Zone 2** — 30 to 75 feet
- Zone 3** — 75 to 100 feet

A Firewise landscape plan design preferably uses native plants to reduce the risk of a wildfire.

Here are recommended plants with *Firewise* characteristics:

Firewise Ground Covers

Common Name

Ajuga (bugleweed)*
Bearberry (kinnikinnick)
Sedum
Bigleaf periwinkle*
Periwinkle (vinca)*
Bigblue lirope*
Lirope*

Botanical Name

*Ajuga reptans**
Arctostaphylos uva-ursi
Sedum spp.
*Vinca major**
*Vinca minor**
*Lirope muscari**
*Lirope spicata**

Grass ground covers are good if kept mowed and irrigated:

Kentucky bluegrass *	<i>Poa pratensis</i> *
Tall fescue*	<i>Festuca arundinacea</i> *
(* non-native)	



Bearberry ground cover by David Powell, USDA Forest Service, Bugwood.org

Native *Firewise* Shrubs That are Best for Zones 2 and 3

<u>Common Name</u>	<u>Botanical Name</u>
Chokeberry, black	<i>Aronia melanocarpa</i>
Chokeberry, red	<i>Aronia arbutifolia</i>
Dogwood, gray	<i>Cornus racemosa</i>
Dogwood, osier	<i>Cornus serica</i>
Dogwood, silky	<i>Cornus amomum</i>
Spirea, meadowsweet	<i>Spirea alba</i>
Spirea, steeplebush	<i>Spirea tomentosa</i>
Viburnum, mapleleaf	<i>Viburnum acerifolium</i>
Viburnum, arrowwood	<i>Viburnum dentatum</i>
Viburnum, blackhaw	<i>Viburnum prunifolium</i>
Viburnum, cranberrybush	<i>Viburnum opulus</i>
Witch hazel	

Large, Native *Firewise* Trees (taller than 30 feet) for Zone 3

<u>Common Name</u>	<u>Botanical Name</u>
Basswood, American	<i>Tilia Americana</i>
Birch, black (sweet)	<i>Betula lenta</i>
Birch, gray	<i>Betula populifolia</i>
Birch, yellow	<i>Betula allegheniensis</i>
Hickory, bitternut	<i>Carya cordiformis</i>
Hickory, mockernut	<i>Carya alba</i>
Hickory, pignut	<i>Carya glabra</i>
Hickory, sand	<i>Carya pallid</i>
Maple, red	<i>Acer rubrum</i>
Maple, sugar	<i>Acer saccharum</i>
Oak, chestnut	<i>Quercus prinus</i>
Oak, scarlet	<i>Quercus coccinea</i>
Oak, northern red	<i>Quercus rubra</i>
Oak, pin	<i>Quercus palustris</i>
Oak, white	<i>Quercus alba</i>
Sweetgum	<i>Liquidambar styraciflua</i>
Yellow-poplar	<i>Liriodendron tulipifera</i>



Red maple—a tall *Firewise* tree

Use Plants with *Firewise* Characteristics

Choosing Plants

A *Firewise Landscape* with Defensive Zones, uses plants to meet landscape design goals and to help protect property. Some plants contain more oils and resins and are more likely to catch fire and burn hotter than other plants.

While there are no *fireproof plants*, choosing less flammable species can help to reduce the chance of wildfire damaging your home.

Desirable *Firewise* Plants:

- Slow-growing plants
- High moisture content plants
- Plants that produce less dead plant tissue
- Plants with less resins and oils in leaves
- Plants with broad, thick leaves
- Plants with open branching patterns

Most deciduous trees are generally good *Firewise* Landscape choices.

Contact your local nursery for more ideas.



Basswood—a tall *Firewise* tree

Forestry Notes



Defensible Space Check List

**Can You Defend Your Home from Wildfire?
Do you live in a Firewise home?**

Living with Wildfire

Forty-two % of New Jersey is forested. Many people live in the area where structures meet or intermingle with undeveloped wildland. This is the Wildland–Urban Interface (WUI). Here it is critical that people and homes Firewise practices and defensible space are used to help protect life and property from wildfire Firewise

What is Defensible Space?

Defensible Space is the area around your home or structures that can be managed to help protect them from damage by a wildfire. Defensible spaces are usually defined as three zones of increasing distances from the home or structure where zone-specific management practices are established. Ideally here are three Defensible Zones designated around a *Firewise* home and structures where the homeowner manages the vegetation to reduce the wildfire risk.

The zones are:
Zone One - 0 to 30 feet around the home or structure.
Zone Two- 30 to 75 feet
Zone Three- 75 to 100 feet

What is a Firewise home?

A Firewise home or community in the WUI of New Jersey is one that is well defended not only by Defensible Space Zones but also is built or improved by use of Class A fire rated building materials. Such materials used with proper underlayment include roofing materials of metal, clay tile, slate and fiber cement shingles; siding of cement fiber material; soffits of non flammable material and decks that are enclosed to prevent hot embers from blowing under them. These, and keeping property free of flammable materials, are a few of the many *Firewise* practices that can be used to help protect property and loved-ones from wildfires.

Desired Defense Practices

- No branches overhang structures.
- Gutters are kept clean of leaves.
- Dead leaves and wood are promptly removed.
- Roofing material is non-flammable.
- Siding materials are non-flammable.
- A shovel, rake and a hose attached to a reliable water source are available.
- ♦ **Within 30 feet of structures:**
 - No tall trees or plants grow here, especially resinous evergreens.
 - No flammable mulches are used.
 - No propane tanks or woodpiles are stored here.
- ♦ **Within 100 feet of structures:**
 - Tree canopies do not touch each other.
 - Grasses are kept mowed and irrigated.
 - Ladder fuels are removed.



A well defended home in the NJ pine barrens

114x

Improve and Maintain Your Defense

- Routinely remove branches that grow to overhang structures.
- Use safe ladders and water power to clean gutters.
- Rake and remove leaves and deadwood throughout the seasons.
- Replace existing roofing with metal and underlayment or other Class A rated fire resistant roofing.
- Keep a shovel, rake and hoses protected from sun damage under an accessible, visible, shelter.

◆ Within 30 feet of structures:

- Remove tall trees. Plant non-resinous low plants shrubs more than 3 feet away from foundations.
- Use stone mulches within 3 feet of foundations.
- Store propane tanks and wood piles at least 30 feet from structures.

◆ Within 100 feet of structures

- Routinely prune branches so tree canopies are 10 feet or more apart.
- Keep grasses mowed to 6 inches or less.
- Irrigate lawns and grasses.
- Remove branches (ladder fuels) up to 8 feet above the ground.



Warren Grove Fire in 2007 claimed 15,360 acres and 3 homes

New or Improvement Construction

- Construct roofing with non-flammable Class A fire resistant material such as metal, clay tile, fiber-cement or slate shingles.
- Use non-flammable siding such as cement based siding.
- Install self-cleaning gutters.
- Use non-flammable mulch such as gravel or stones within 30 feet of structures.
- Construct roofs with a minimum overhangs and fire-resistant soffits.
- Provide barriers so burning embers cannot enter vents or under decks.
- Remove all tall trees, especially resinous evergreens, within 30 feet of structures.
- Prune all trees to minimize fire jumping from one-tree-to-another or up-from-ground fires-to-branches.



This *Firewise* home with defensible zones survived a wildfire

Remember:

All vegetation is flammable

Forestry Notes



New Jersey Fire Lookout Towers

New Jersey Fire Lookout Towers



Cedar Bridge Tower, Ocean County

To report a fire

CALL:

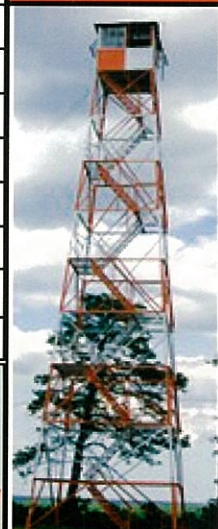
911

The 21 Active Fire Lookout Towers

Tower	County
Apple Pie	Burlington
Bass river	Burlington
Batsto	Burlington
Bearfort	Passaic
Belleplain	Cape May
Blue Anchor	Camden
Budd Lake	Morris
Catfish	Warren
Cedar Bridge	Ocean
Culvers	Sussex
Dias Creek	Cape May
Greystone	Morris
Jamesburg	Middlesex
Lakewood	Ocean
Lebanon	Burlington
McKeetown	Atlantic
Medford	Burlington
Millville	Cumberland
Milton	Morris
Mizpah	Atlantic
Ramapo	Passaic



Jamesburg Tower



Apple Pie Tower

Smokey says:
PREVENT FOREST FIRES!
NEW JERSEY FOREST FIRE SERVICE

11/6/20

How Does a Lookout Precisely Locate Fires?

The **fire observer** in the lookout tower uses a dispatch radio to keep in constant communication with other towers.

After spotting a fire the observer uses a **Osborne Fire Finder**, a type of alidade, to sight the compass direction to the fire.



The observer then calls in a “smoke report” to the Division Headquarters. Observers ask another tower to get a sight line on the fire. Where the two sight lines intersect is the precise location of the fire. With other instruments and topographic maps on the tower walls the observers and the dispatcher can determine the travel distance so fire fighters on the ground can respond to the fire.

The fire observer is also responsible for gathering weather data used to determine fire danger ratings and expected fire behavior.

← The first Fire Lookout Tower in New Jersey was the cupola of the Batsto Village Mansion



A Typical Day In a Fire Tower

Your day begins with the long climb to the 8 x 8 foot fire cupola on top of the steel tower. Most of the towers are about 60 to 100 feet tall and this means a journey of at least 80 to 135 stair steps. Be sure to carry your lunch and everything you need for the day!

- ◆ Check in by radio with the Division dispatcher and other fire towers.
- ◆ Begin your day-long viewing routine of looking in all directions over the landscape.
- ◆ Take routine measurements of air temperature, wind speed and relative humidity.
- ◆ Keep in constant communication with other observers and division HQ about weather and fuel conditions.
- ◆ When you spot a smoke use your fire finder to determine, with the aid of other towers, where the fire is on the ground and notify the dispatcher at division HQ.
- ◆ Keep watch on the spread of the fire and be on the alert for other fires that may occur. Others are relying on your observation skills.
- ◆ At dusk, make the long climb down and rest for the next day.

At least one tower in each division is in operation when the woods are dry enough to burn. All towers are staffed in March, April, May, October, and November

**When you see a fire!
Call 911**

Forestry Notes



Pitch Pine—A Tree Born of Fire

This native of the New Jersey Pine Barrens Thrives in a Fire Dependent Ecosystem

Pitch Pine Withstands Fire

Pitch pine in New Jersey's Pine Barrens has evolved the unique ability to survive fire even if all of the needles are destroyed by the fire.

It withstands fire because of its thick protective bark; its ability to re-sprout rapidly; its wide-spreading root system; and the buds lying dormant in the trunk that are stimulated to grow by fire. Even when all of the needles on a pitch pine are burned, the crown can recover and be almost back to normal in just a few years.

Pitch pine is the most abundant tree species in the most frequently and intensely burned parts of the New Jersey Pine Barrens. Pitch pine grows well in the Pine Barrens, an area of about one million heavily forested acres on the nutrient poor soils of the coastal plain of southern New Jersey.

The Pine Barrens

The "Pine Barrens" were so-named by European settlers whose imported crops grew poorly on the sandy, acidic soils. Pitch pine earned its common name from the high pitch, or resin, content as compared to most other pines.

Pitch pine grows in fire dependent forest communities which often include oak trees and scrub oaks. These special plant communities are influenced by landscape features, soil types, climate, fuel types, and fire.



In the Pine Barrens, pitch pines can grow to **50 to 90** feet tall.

The Pygmy or Dwarf Pine Plains Forests

The pygmy or dwarf pine plains forests are unique areas scattered in the Pine Barrens that are well-known for frequent and intense fires.

Here pitch pines and scrub oaks seldom grow more than **5 to 10** feet tall. The pines produce serotinous cones which release seeds after fire melts the resins holding the cone scales closed.



Some pitch pine cones, especially those from trees in the pygmy forest, need fire to open the scales to release seeds.

Pitch Pine is a Tree Dependent on Fire

Pitch pines are dependent on fire and must be carefully managed with fire to assure that the ecosystem provides habitat for wildlife, quality water supplies, and safety for visitors and residents of the pinelands.

Prescribed fire is an important management tool for healthy, productive and safe pitch pine forests.

Pitch pine is.....

Stiff Needles and Rigid Cone Scales

The Latin name of pitch pine - *Pinus rigida* - means rigid or stiff, and refers to both the cone scales and the wide-spreading, sharply-pointed needles. The needles grow in bundles of three. The wood is coarse-grained, moderately strong and quite resinous. It is used primarily for rough construction and where decay resistance is important.



Special Uses

Naval stores and lumber. Pitch pine was an important tree during the days of wooden ships. In Colonial times, pitch pines were a source for pitch, tar, rosin, and turpentine. These were vital in keeping wooden sailing ships afloat. Because of its high pitch content, the wood resists decay, which made it particularly useful for ship building, and today, for rough construction, mine props, fencing, and railroad ties. It is also used for pulpwood, crating, and fuel.

Charcoal. Huge acreages of pitch pine and oaks in the pinelands were cut in the 1700's and 1800's to create charcoal to feed furnaces to make iron, glass and brick.



Pinelands charcoal unearthed from a site where charcoal was made in the 1700's or 1800's near Speedwell, NJ

a forest fire opens them. Seeds shed in mid-winter are an important source of food for squirrels, quail, and small birds such as the pine warbler, pine grosbeak, and black-capped chickadee. White-tailed deer and rabbits also browse young sprouts and seedlings.

Wildlife food.

Pitch pine is a food source for wildlife. Cones of pitch pine often remain on the trees unopened for several years or until the heat from

.....a tree adapted to fire

The Pitch Pine Type Is the Primary Forest Type in the Pinelands

According to the U.S. Forest Service Forest Survey, the pitch pine type covers more than more than 700,000 acres in New Jersey.

Pitch Pine Cones

Pitch pine is reported to bear good crops of cones at approximately three-year intervals, although production may be irregular. In southern New Jersey, good to excellent crops have occurred at intervals of four to nine years. Occasionally, poor crops are borne in two successive years, although usually a poor crop is followed by fair to excellent crops for one to three years.

On some trees, the cones open soon after maturity. At the other extreme, some cones remain closed for many years until the heat of a fire opens them or until the trees are cut. Trees of the latter type are characteristic of the areas with a long history of wildfire. On trees showing cone behavior between the two extremes, the cones open erratically within a few years after maturity. Apparently there is no fixed pattern of when, what, or how many cones open .

Pitch Pine Seeds

Seed dispersal begins about November 1 in southern New Jersey when cones open soon after maturity, and ends in April. The seeds will not germinate well if they fall onto a thick leaf litter covering the surface of the ground. In one study by USFS research scientist Dr. Silas Little, few seedlings were found in July on the thick litter of unburned sites. On similar sites treated with a severe September fire before seedfall, 6,700 to 22,800 seedlings per acre were counted on very poorly to imperfectly drained sites, and 900 per acre on upland sites.



A Unique Ability to Withstand Fire



Fire is truly critical in the life of pitch pines. Wildfires, however, can result in poorly formed trees and losses of life and property. Prescribed fires are the key to maintaining a healthy forest and to protecting life and property from devastating wildfires.



Forestry Notes



Splitting and Burning Firewood

The ease of splitting and the burning qualities of wood can vary by tree species. Some split easier than others, and some have better burning qualities than others.

Ease of Splitting

Short lengths of straight-grained, knot-free wood usually will split easily. White oaks, ash, and maple split easier when green (wet). Red oaks and black oaks split easier when dry.

Species that usually split easily

Ash, white Basswood Cherry, black Cottonwood Douglas-fir	Elm Fir, white Locust, honey Maple, red Mulberry	Oak, bur* Osage-orange Spruce Walnut, black Willow, black
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*Bur is a red oak

Species that have a medium "split-ability"

Apple Birch, paper	Hickory, bitternut Maple, silver	Oaks, white Pine, eastern white
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Species that are difficult to split

Boxelder Beech Catalpa Elm, American	Ironwood Locust, black Elm, Chinese Elm, Siberian	Gum, black Hickory, shagbark Plane, London Sycamore
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Potential for sparking and popping

Throwing sparks can be a fire hazard. Trapped gases and water vapor can cause sparking. Proper drying before burning can minimize this problem.

Species that pop and spark

Redcedar, eastern Spruce	Larch Tamarack	Hemlock Yellow-poplar
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Burning qualities of wood

The density or actual weight of wood fiber determines the amount of fuel value or burning quality of wood. Lightweight hardwoods of low density such as basswoods and yellow-poplar do not provide as much heat as heavier hardwoods such as white oak and black locust.

Softwoods, or conifers, such as pines, contain resins that burn at higher heat per pound than cellulose, the main constituent of wood. Even so, pines, spruces, firs and cedar produce less heat than hardwoods when measured by volume rather than weight.



White ash is excellent firewood. It is easy to split, has a very high heat value, burns with little smoke, and as written long ago "Ash wet or Ash dry, a king shall warm his slippers by." Photo by Andy Kimm

Softwoods are resinous; easier to ignite; burn more rapidly with a high, hot flame; burn out quickly and require more attention. Hardwoods are generally more difficult to ignite; burn less vigorously with a shorter flame; but last longer and produce more coals than softwoods.

Authors: **Mark C. Vodak, Ph.D.** Forestry Extension Specialist, Rutgers Cooperative Extension and **Charles J. Newlon, CF, USFS, retired.** Adapted from: **Firewood: Cords, Pickup Truck loads, and other Measurements. Fact Sheet FS262, Cooperative Extension, New Jersey Agricultural Experiment Station, Rutgers University.**
Published by: **The New Jersey Forestry Association**

FN6 04/2011

Forestry Notes



Buying or Selling Firewood? How much firewood is in a pickup load?

Cords or fractions of a cord

The New Jersey Office of Weights and Measures regulations require that, except for packaged firewood and whole logs, sellers of firewood are required to sell firewood by using the term "cord" or fractional parts of a cord.

Regardless, homeowners still see offers of a face cord, fireplace cord, rick, rank, short cord, stack, trunk load, unit, and pickup load.

What is a cord of wood?

A standard cord is a stack of wood 4 feet high x 4 feet wide x 8 feet long with a total volume of 128 cubic feet.

How much firewood is in a cord?

However, a cord of firewood normally contains about 75 to 90 cubic feet of solid wood. The rest is bark and air.

Factors that affect the amounts of solid wood in a cord include, how straight or crooked the pieces are, whether or not the wood is split, and how well the wood is stacked. The diameter of the pieces affects the amount of wood in any of the measurements.

What is a face cord?

A face cord is wrongly called a cord. It is 4 feet high x 8 feet long x the length of the pieces in the stack (less than 4 feet long). A face cord with:

- 24" long pieces = 1/2 a standard cord
- 16" long pieces = 1/3 a standard cord
- 12" long pieces = 1/4 a standard cord



How much wood is in a pickup load?

So, how much firewood is in a pickup load?

It depends!

The size of the truck bed, stacking method, and the height of the stack greatly affect the amount of firewood a pickup will hold. Many people over-estimate the amount a pickup will hold.

Theoretically, the firewood capacity can be calculated by the length, width and height of the truck's box. This assumes the wood is uniform, and is tacked tightly and level with the top of the box.

Using just the volume calculated from the pickup box dimensions will result in an over-estimation.

Clemson University studied firewood loading and measurements using 18-inch-long firewood and a short-bed, standard-size 1/2 ton pickup truck with fenders outside the box and a box capacity of 48.5 cubic feet.

When the wood was:

- randomly piled to just the top of the box it held **28 cubic feet** of firewood (.22 cord).
- randomly piled above the top of the box it held **38 cubic feet** of firewood (.30 cord).
- stacked to just the top of the box it held **40 cubic feet** of firewood (.31 cord).
- stacked above the top of the box it held **51 cubic feet** of firewood (.40 cord).

Authors: **Mark C. Vodak, Ph.D.** Forestry Extension Specialist, Rutgers Cooperative Extension and **Charles J. Newlon, CF, USFS, retired.**

Adapted from: **Firewood: Cords, Pickup Truckloads, and other Measurements.** Fact Sheet FS205, Rutgers New Jersey Agricultural Experiment Station. Published by: **The New Jersey Forestry Association**

FN5 04/2011

Forest Management in the Pinelands

Background

1. Forest Management ensures public values such as improved forest health, wildlife habitat enhancement, public safety through hazardous fuel-load reduction and restoration of habitat for threatened and endangered plants and animals through various silvicultural techniques.
2. Forest Management does not create a “change in use” of the landscape.
3. The federal National Parks and Recreation Act of 1978, establishing the Pinelands National Reserve, specifically recognized existing economic activities within the area and sought to protect and enhance such activities as farming, **forestry**, proprietary recreational facilities, and those indigenous industries and commercial and residential developments which are consistent with the findings and purposes of the Act.
4. The Pinelands Protection Act defines “agricultural or horticultural purposes” or “agricultural or horticultural use” as “any production of plants or animals useful to man, including but not limited to ... trees and forest products....” In its findings and declarations in support of the Act, the Legislature found the continued viability of the Pinelands and its resources to be “threatened by pressures for residential, commercial and industrial development.” The Legislature specifically exempted improvement, expansion, construction or reconstruction of any structure used exclusively for “agricultural or horticultural purposes” from an “Application for Development”.
5. Under Title 13, the Department, and hence Division, under the direction of the Commissioner, shall “develop, improve, protect, manage and administer all state forests, ...; and protect all forest, brush land and marshes from damage by fire, insects and diseases, and promote the use of good forest management principles on all forest lands.”
6. There currently are no professional foresters, forest fire fighters or wildlife biologists working for the Pinelands Commission. DEP has professionally trained staff in all of these areas.
7. The Pinelands regulations, known as the Comprehensive Management Plan, or CMP, defines forestry as “development” and therefore regulates all forest management activities the same as a “development proposal.
8. There currently exists MOUs between the Pinelands Commission and DEP that define exempt activities. These are
 - Fish and Wildlife activities for up to 100 acres per year of forest management without permit application
 - For Atlantic White Cedar management
 - Division of Parks and Forestry maintenance and minor improvements
9. Discussions began in 2009 to have a comprehensive DEP and Pinelands MOU incorporating all of the activities covered by current MOUs as well as forest management activities. The goal was to implement a simplified approval process both for planned land management activities on public and private lands proposed by DEP, and for private sector forest stewardship plans, provided there is no resulting change in land use. Discussions ceased June 2011 due to differences in goals and objectives.

1 THE NATIONAL PARKS AND RECREATION ACT OF 1978

The Congress finds that -

(1) the Pinelands area in New Jersey, containing approximately 1,000,000 acres of pine-oak forest, extensive surface and ground water resources of high quality, and a wide diversity of rare plant and animal species, provides significant ecological, natural, cultural, recreational, educational, agricultural, and public health benefits;

(C) recognize existing economic activities within the area and provide for the protection and enhancement of such activities as farming, forestry, proprietary recreational facilities, and those indigenous industries and commercial and residential developments which are consistent with the findings and purposes of this section.

2. PINELANDS PROTECTION ACT

13:18A-3 Definitions

As used in this act: a. "Agricultural or horticultural purposes" or "agricultural or horticultural use" means any production of plants or animals useful to man, including but not limited to: forages or sod crops; grains and feed crops; dairy animals and dairy products; poultry and poultry products; livestock, including beef cattle, sheep, swine, horses, ponies, mules or goats, and including the breeding and grazing of any or all of such animals; bees and apiary products; fur animals; aquatic organisms as part of aquaculture; trees and forest products; fruits of all kinds, including grapes, nuts and berries; vegetables; nursery, floral, ornamental and greenhouse products; or any land devoted to and meeting the requirements and qualifications for payments or other compensation pursuant to a soil conservation program under an agency of the Federal Government;

b. "Application for development" means the application form and all accompanying documents required by municipal ordinance for approval of a subdivision plat, site plan, planned development, conditional use, zoning variance or other permit as provided in the "Municipal Land Use Law," P.L.1975, c. 291 (C. 40:55D-1 et seq.), for any use, development or construction other than the improvement, expansion or reconstruction of any single-family dwelling unit or appurtenance thereto, or the improvement, expansion, construction or reconstruction of any structure used exclusively for agricultural or horticultural purposes;

"Major development" means any division or subdivision of land into five or more parcels: any construction or expansion of any housing development of five or more dwelling units: any construction or expansion of any commercial or industrial use or structure on a site of more than 3 acres: or any grading, clearing or disturbance of any area in excess of 5,000 square feet for other than agricultural or horticultural purposes.

3. PINELANDS COMPREHENSIVE MANAGEMENT PLAN

"Agricultural or horticultural purpose or use" means any production of plants or animals useful to man, including but not limited to: forages or sod crops; grains and feed crops; dairy animals and dairy products; poultry and poultry products; livestock, including beef cattle, sheep, swine, horses, ponies, mules or goats, and including the breeding and grazing of any or all such animals; bees and apiary products; fur animals; trees and forest products; fruits of all kinds, including grapes, nuts and berries; vegetables; nursery, floral, ornamental and greenhouse products; aquaculture; or any land devoted to and meeting the requirements and qualifications for payments or other compensation pursuant to a soil conservation program under an agency of the Federal Government.

"Development" means the change of or enlargement of any use or disturbance of any land, the performance of any building or mining operation, the division of land into two or more parcels, and the creation or termination of rights of access or riparian rights including, but not limited to:

1. A change in type of use of a structure or land;
2. A reconstruction, alteration of the size, or material change in the external appearance of a structure or land;
3. A material increase in the intensity of use of land, such as an increase in the number of businesses, manufacturing establishments, offices or dwelling units in a structure or on land;
4. Commencement of resource extraction or drilling or excavation on a parcel of land;
5. Demolition of a structure or removal of trees;
6. Commencement of forestry activities;
7. Deposit of refuse, solid or liquid waste or fill on a parcel of land;
8. In connection with the use of land, the making of any material change in noise levels, thermal conditions, or emissions of waste material; and
9. Alteration, either physically or chemically, of a shore, bank, or flood plain, seacoast, river, stream, lake, pond, wetlands or artificial body of water.

7:50-4.1 Applicability

(a) For the purposes of this subchapter only, the following shall not be considered development except for development of any historic resource designated by the Pinelands Commission pursuant to N.J.A.C. 7:50-6.154:

3. The improvement, expansion, construction or reconstruction of any structure used exclusively for agricultural or horticultural purposes; ...

12. The clearing of land solely for agricultural purposes; ...

16. The following forestry activities:

i. Normal and customary forestry practices on residentially improved parcels of land that are five acres or less in size;

ii. Tree harvesting, provided that no more than one cord of wood per five acres of land is harvested in any one year and that no more than five cords of wood are harvested from the entire parcel in any one year;

iii. Tree planting, provided that the area to be planted does not exceed five acres in any one year, no soil disturbance occurs other than that caused by the planting activity and no trees other than those authorized by N.J.A.C. 7:50-6.25 are to be planted; and

iv. Forest stand improvement designed to selectively thin trees and brush, provided that no clearing or soil disturbance occurs and that the total land area on the parcel in which the activity occurs does not exceed five acres in any one year;

17. Prescribed burning and the clearing and maintaining of fire breaks....

Title 13 – Conservation and Development

13:1B-15.101. Powers and duties

The division shall, under the direction and supervision of the commissioner:

- a. Develop, improve, protect, manage and administer all State forests, State parks, State recreation areas, State historic sites, and State natural areas, excepting those regulated by interstate compact.
- b. Protect all forests, brush lands and marshes from damage by fire, insects and disease, and promote the use of good forest management principles on all forest lands.

13:1L-4. Powers

The department shall acquire, plan, design, construct, operate and maintain State parks and forests and shall have the power to:

- f. Sell or exchange forest products or products reasonably related to recreational activities on State park and forest land.

L.1983, c. 324, s. 4, eff. Sept. 1, 1983.

13:1L-13. Forest management program

The department shall plan, develop and implement a forest management program for the forest resources of the State parks and forest and by providing technical information, advice and related assistance to promote the best technical management practices for public and private forest landowners and managers, vendors, forest operators, wood processors, public agencies and individuals regarding:

- a. The harvesting, marketing and processing of timber and other forest resources and the development of maximum efficiency in the utilization of wood and wood products consistent with the principle of maintaining long-term, sustained yield of these products;
- b. Conversion of wood to energy for domestic, industrial, municipal and other uses;
- c. Management planning and treatment of forest land, including but not limited to, protection, site preparation, timber stand improvement, reforestation, prescribed burning and other practices designed to increase the quantity and improve the quality of timber and other forest resources;
- d. Protection and improvement of: forest soil fertility; watersheds to enhance the quality and quantity of water yields; and beneficial effects of forest habitat on fish and wildlife.

L.1983, c. 324, s. 13, eff. Sept. 1, 1983.

3:1L-15. Protection of trees and wood from insects and disease

The department shall protect from insects and diseases the trees and forests and wood products, stored wood, and wood in use in the State. This protection shall include, but not be limited to:

- a. Conducting surveys to detect and evaluate insect infestations and disease conditions affecting forests and trees;
- b. Determining the biological, chemical and mechanical measures necessary to prevent, retard, control or suppress incipient, potentially threatening or emergency insect infestation and disease conditions affecting trees;
- c. Taking any other actions deemed necessary to protect the State's trees, forests and wood products from insects and diseases.

L.1983, c. 324, s. 15, eff. Sept. 1, 1983.

3:1L-16. Fire protection; technical assistance to local government

The department shall:

- a. Minimize the threat to life, property, and damage to forest resources through the use of appropriate fire prevention, presuppression and suppression practices;
- b. Provide information and technical assistance to units of local government, including but not limited to Shade Tree Commissions and Soil Conservation Districts, to encourage urban and community forestry programs.

L.1983, c. 324, s. 16, eff. Sept. 1, 1983.

3:1L-17. State forester

The chief forester employed by the department shall be designated and known as the State Forester.

L.1983, c. 324, s. 17, eff. Sept. 1, 1983.

**Public Hearing – Testimony
 Environment and Natural Resource Committee
 Committee Room 11
 State House Annex
 Trenton, New Jersey**

Bill Brash
 NJ Forest Association
 NJ Fire Safety Council

March 14, 2019

First things first. The Pinelands forest is in poor health. Portions of the Pinelands suffer from infestations of Southern Pine Beetle and Turpentine Beetle. Beetle infestations are an indication of poor forest health as healthy Pine stands have a much better chance of withstanding Southern Pine Beetle impacts than do stands suffering from reduced growth due to overcrowding. Crowded trees are weakened trees.

I am currently conducting forest inventory data collection in the Whiting section of Manchester Township, Ocean County. This data is part of a Pinelands permit application for the Ocean County Parks Department to complete a protective fuel-break around the 1200 unit Roosevelt City development. The data reveals that every one of the Pinelands forest stands in the inventory (there are eight, (8) stands) is overstocked, with competition impacting the growth and health of individual trees. Simply put, there are too many trees competing with each other to the point that growth rates and tree health are low.

This additional health impact of overcrowding also contributes to tree mortality and subsequent increases in fuel loads resulting in increased risk of wildfire to Pinelands residents.

Stand Number	Relative Density*	Notes
1	63.1	The stand relative density is 63 of the average maximum stocking expected in undisturbed stands of similar size and species. This density is within the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably excellent, while growth rate of the medium and smaller-sized trees is probably good and mortality due to crowding low.
2	86	The stand relative density is 86 of the average maximum stocking expected in undisturbed stands of similar size and species. This density is higher than the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably moderate, while growth rate of the medium and smaller-sized trees is probably fair and mortality due to crowding moderate.
3	112.3	The stand relative density is 112 of the average maximum stocking expected in undisturbed stands of similar size and species. This density is well above the range for best individual tree growth. At this relative density, growth rate of the biggest trees is probably moderate, while growth rate of the medium and smaller-sized trees is probably poor and mortality due to crowding high.
4	136.4	Same as Stand 3
5	82.8	Same as Stand 2.
6	127.8	Same as Stand 3
7	127.6	Same as Stand 3
8	106.6	Same as Stand 3

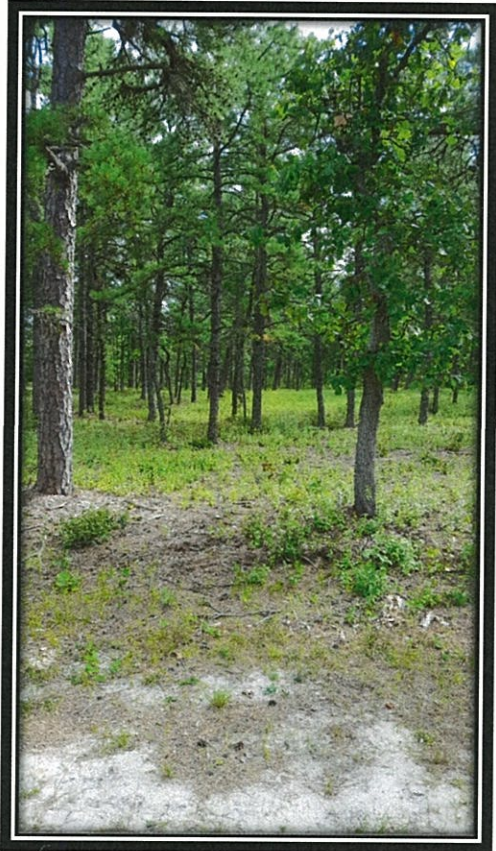
* Relative density is a measure of tree crowding that accounts for both the size of the tree and the amount of space typically occupied by a tree of that size and species, so it is an especially useful measure in mixed species stands. A relative density of 100 percent implies that the growing space is fully occupied and trees must either slow their growth to survive or some trees will be crowded out and die, making room for more vigorous ones. Maximum stand growth occurs near 60%.

88% of the forest stands in the Roosevelt City study are overstocked with reduced growth and increased mortality.

What the data is telling us is that the trees are too crowded, and this overcrowding is reducing growth and health while increasing fuel loads and fire risk.



Overstocked stand (Stand 3) in the Roosevelt City Fuelbreak Project. Manchester Township, Ocean County. Fuel loadings and fire risk in the Pinelands are high, growth rates and forest health are low.



This is what the Forest Stand density should look like for forest health, improved growth rates, and reduced wildfire risk.

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What can the Pinelands Commission do to help reduce wildfire risk and improve forest health?

1. Begin better cooperation with other state agencies like the NJ Forest Fire Service. In 2017 the Pinelands Commission proposed amending the Comprehensive Management Plan (CMP) to begin requiring permits for firebreak installation and/or maintenance activities that exceeded six (6) feet in width. They proposed this amendment without ever conferring with the NJ Forest Fire Service (NJFFS) to see what the impact would be on risk reduction or fire suppression. (See attached PhillyNews.com article). The Pinelands Commission many times acts unilaterally seeking changes to their CMP without seeking input from other agencies that would be affected by the proposed changes. As a result, instead of a meeting or sub-committee workshop between state agencies to work out a potential conflict, local residents in Barnegat Township were motivated to organize and demand the proposed Pinelands firebreak amendment be removed from consideration. This type of anti-Pinelands CMP activity is time-consuming, counter-productive and creates bad press. This is not the way cooperative state agencies should interact.

The Pinelands Commission needs to work cooperatively with the NJ Forest Fire Service to resolve potential conflicts before they become bigger issues.

2. In 2018 the NJ Forest Fire Service proposed a thinning for fuel reduction and wildlife habitat enhancement around the *Pinewood* and *Brighton* communities on Route 72 in Barnegat Township. The NJ Forest Fire Service agreed to conduct the thinning with the NJ Division of Fish and Wildlife, on their land under a previous longstanding agreement that NJ Fish and Wildlife has with the Pinelands Commission for habitat enhancement. The NJFFS would conduct the thinning and when completed, the NJ Fish and Wildlife would have enhanced wildlife habitat on their property, and the NJFFS would have reduced fuel loads around the perimeter of two very at-risk communities. These two communities lost homes in the 1971 Barnegat Fire and the 2007 Warren Grove Fire. They planned to utilize this long standing agreement between the Pinelands Commission and Fish and Wildlife instead of a formal permit process to expedite the process. When the Pinelands Commission discovered that the NJFFS was conducting the thinning, they issued a stop work order. Apparently an agreement for thinning for wildlife habitat enhancement is acceptable to the Pinelands Commission but not acceptable for additional risk reduction to residents of the Pinelands by the NJ Forest Fire Service. This Stop Work order was eventually rescinded by Pinelands and the fuel-break was completed in early January, 2019.

The NJ Forest Fire Service and Pinelands Commission should complete a Memorandum of Agreement (MOA) that allows an acceptable annual acreage of fuel-break establishment around priority at-risk communities similar to the MOA the Pinelands Commission has with the Division of Fish and Wildlife for habitat enhancement. The existing MOA between the Pinelands Commission and NJ Fish and Wildlife is 200 acres.

3. It seems at times the Pinelands Commissioners struggle with their fiduciary duties as a State Agency. In regards to the Bass River Fire Tower for the first and only time in their history the Commissioners ignored the recommendation of the Pinelands staff and did not approve the NJFFS's application for removing 16 acres of trees that were obstructing the view from the North, South and East sides of the fire-tower. The project according to Pinelands staff met the conditions and regulations of their CMP and they recommended it for approval. Local residents objected to the removal and proposed "alternative technologies" such as NASA satellite coverage, cameras and even drones. Despite the tree removal project meeting their approval criteria the Commissioners failed to approve the project and demanded more information on the alternatives even though this is not a part of their CMP. The NJFFS was forced to withdraw their application and re-apply to answer the alternative technology questions raised by well-meaning but ill-informed local residents. See the two attached articles on the Bass River Fire Tower controversy.

Why did the Pinelands Commissioners decide that an "alternative technology" proposed by local residents was more worthy of consideration than a sister state agency's application that was recommended by their own staff?

It comes down to understanding fiduciary responsibility and the need for a more cooperative relationship between the Pinelands Commissioners and other state natural resource agencies. The responses and information provided by the professionals at New Jersey's natural resource agencies do not appear to be weighted objectively by the Commissioners when compared to local resident's comments when tree cutting is proposed.

Collectively this aversion to tree harvesting even when necessary to protect the life-safety concerns of the region is puzzling. This very same aversion has also begun to impact the health of the Pinelands forest and the safety of its residents.

The days of the Pinelands needing to protect the region from loggers is over, they have successfully preserved the Pinelands. It's time to move on from preservation to properly managing the resource. Now, let's concentrate on managing the forest for health and wildfire risk reduction. That management requires, tree harvesting, thinning, and increased prescribed burning activities.

New Jersey needs to fully staff the NJ Forest Service and NJ Forest Fire Service so that both Natural Resource Agencies have the staff and the ability to manage, not preserve the resource. The continued lack of management if it continues will eventually negate the successful preservation efforts made by the Pinelands Commission.

Forest health and wildfire risk reduction are goals we can all agree on. What we also need to agree on is what the science tells us, that to meet these goals and successfully manage the resource, it requires tree harvesting.

My name is Tony Petrongolo. I am representing the NJ Forestry Association. I worked as a wildlife biologist for the NJDEP, Division of Fish and Wildlife for 35 years before retiring in 2015. I started working in 1979 and in 1982 was appointed the Division of Fish and Wildlife's liaison to the newly established Pinelands Commission. Later in my career I was appointed Chief of the Bureau of Land Management. In that position, I was responsible for managing the Division's 360,00 acre Wildlife Management Area System, 181,000 acres of which were in the Pinelands. You could say that I worked with the Pinelands Commission my entire career given that I was responsible for managing wildlife habitat on State lands in the Pinelands and that the Commission was charged with maintaining the Region's "ecological integrity," but that's not the case. From day 1, the relationship was adversarial and contentious, and it remains so to this day.

Public land managers responsible for maintaining habitat for native species and maintaining forest health including protecting the Pinelands region from wildfires, facing this adversarial relationship presents a significant problem and normally one that is insurmountable given the limited budgetary resources involved. The problem is a relatively simple one to understand: the Pinelands is a resilient, DISTURBANCE-DEPENDANT ecosystem. That concept bears repeating. The Pinelands ecosystem is DISTURBANCE-DEPENDANT. In the NJ Pinelands, disturbance translates to fire. For thousands of years, the Pinelands has burned on a regular basis. Today, it no longer does. To illustrate how significantly Pinelands ecosystems are impacted, one need only to look at the Pine Plains regions, formerly dominated by pygmy pines less than 3' in height and inhabited by the eastern prairie chicken. Today the eastern prairie chicken is extinct and these Pine Plains areas, which are mostly on State lands, are generally over 20' tall and represent a wildfire waiting to happen. The only intact Pine Plains ecosystems left are those that get bombed regularly by the Air Force at Warren Grove Bombing Range and are out of the jurisdiction of the Pinelands Commission.

In a nutshell, the problem boils down to the use of ecological burning that can be hotter than would typically be done for strictly fire control. This cannot be done safely without significant forestry preparation in those areas where there's an excessive build-up of hazardous fuels. The Pinelands Commission makes difficult, if not impossible, to accomplish these necessary forestry activities. Instead of ENCOURAGING scientifically-based forest management in the disturbance-dependant ecosystems of the Pinelands, they DISCOURAGE it. Given the limited budgets available to State government agencies to accomplish the goal of properly managing a disturbance-dependant ecosystem, the roadblocks placed in the way by the Pinelands Commission, usually make the difference between success or failure of a forestry project. The result is the tinderbox which characterizes the existing Pinelands region, along with the decline of many native species of wildlife and the recent extirpation of the ruffed grouse and bobwhite quail from the region. Why an agency with limited scientific expertise, charged with maintaining the ecological integrity of the Pinelands, would adopt such policies is beyond reasonable explanation.

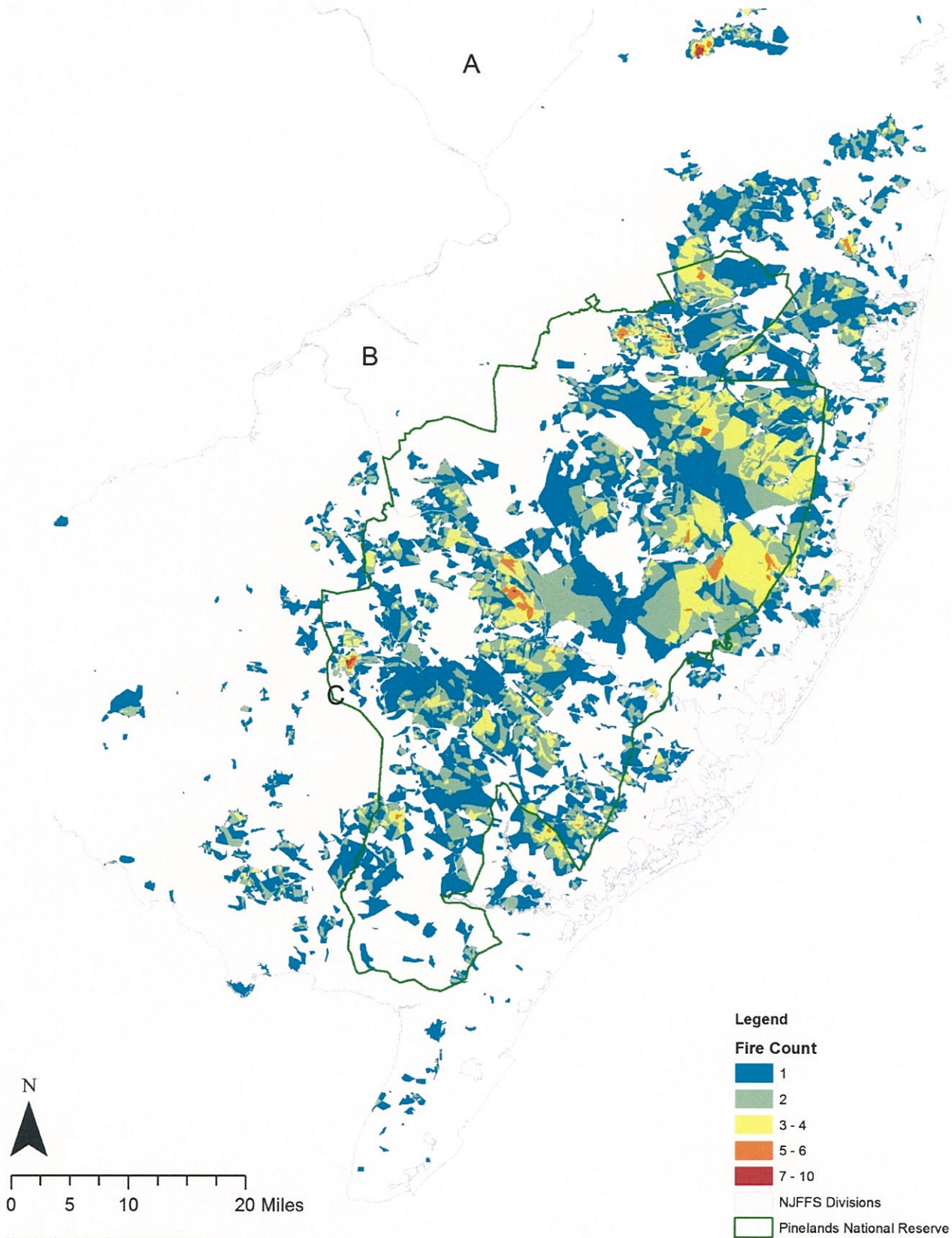
A parallel problem for public land managers in accomplishing wildlife habitat restoration projects is the lack of a thriving forestry industry in the Pinelands. When meaningful habitat management plans are developed by State agencies, the only economically feasible way to carry them out, many times, is through the private sector. The beauty of these habitat projects, in an environment where State agency budgets are extremely tight, is that they can potentially be carried out for little or no cost because the trees have value. The problem is that there are few bidders for most of these projects because there are

so few forestry businesses left in the Pinelands. Over the past 40 years, Pinelands regulations have resulted in the disappearance of the forest industry despite the fact that the original Pinelands Act recognized that forestry was consistent with the purposes of the Act. Forestry is classified as DEVELOPMENT, the same as building a house or a road and this type of DISCOURAGEMENT has resulted in the gradual decline of the industry.

Forestry conducted to by State agencies to restore rare species habitat or for other ecosystem restoration purposes is classified the same way, DEVELOPMENT. State agencies must apply and pay for a permit to conduct activities that will maintain the ecological integrity of the Pinelands, a goal that the Pinelands Commission is supposed to be espousing and encouraging! And the process for getting a permit is time-consuming, expensive and ultimately not always successful. In the absence of uncontrolled wildfire, comprehensive forest management, including burning activities, is the only reasonable way to maintain a million acre, DISTURBANCE-DEPENDANT ecosystem. It should be a win-win for everybody. Over the last 40 years, the policies of the Pinelands Commission have turned it into a major lose-lose, with the worst (catastrophic, western-type wildfires) yet to come!

Map 1

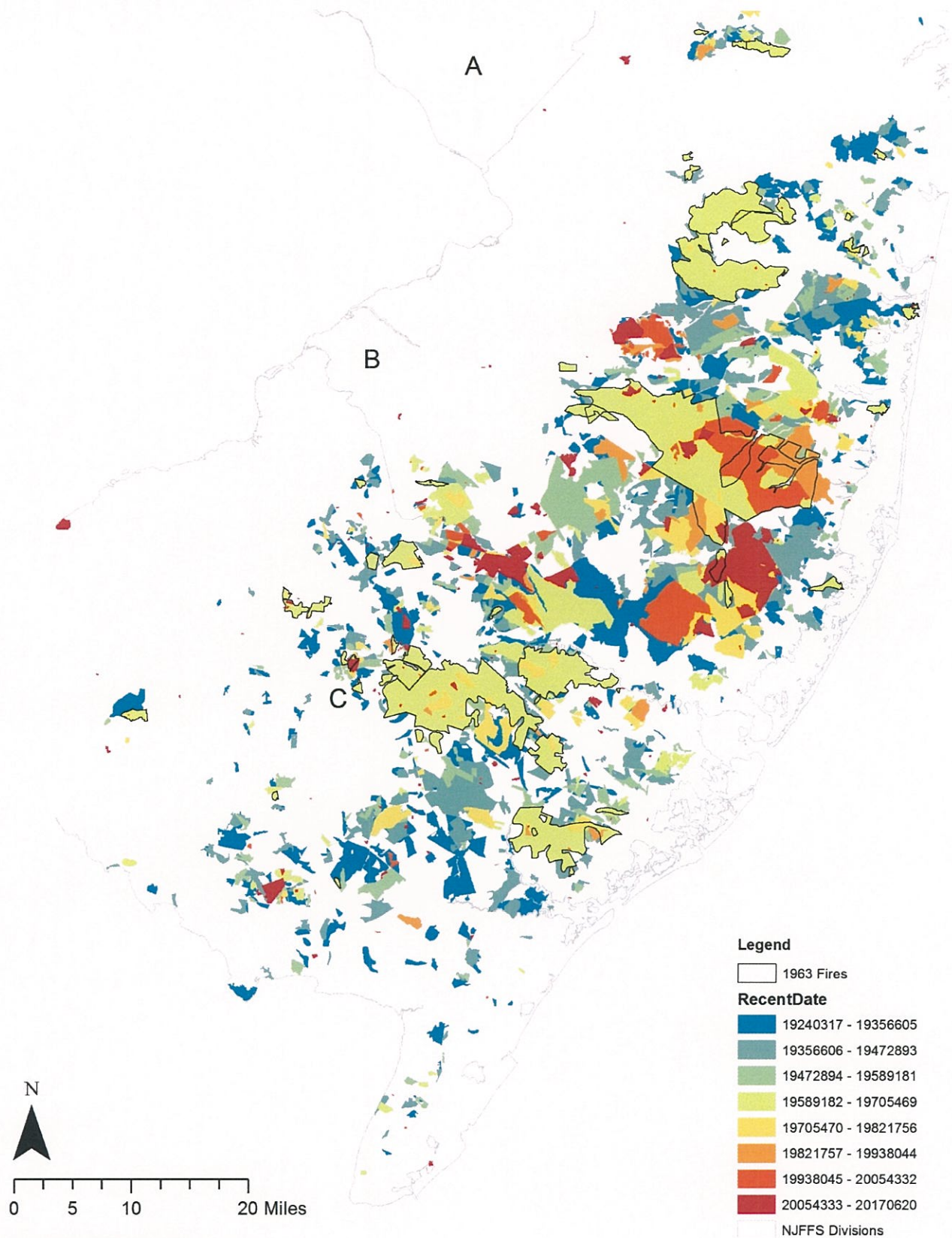
Number of Wildfires 1924-2017



Map by Inga La Puma 3/2019
Center for Remote Sensing and Spatial Analysis
Rutgers University
Data provided by NJFFS and NJGIS

Map 1b

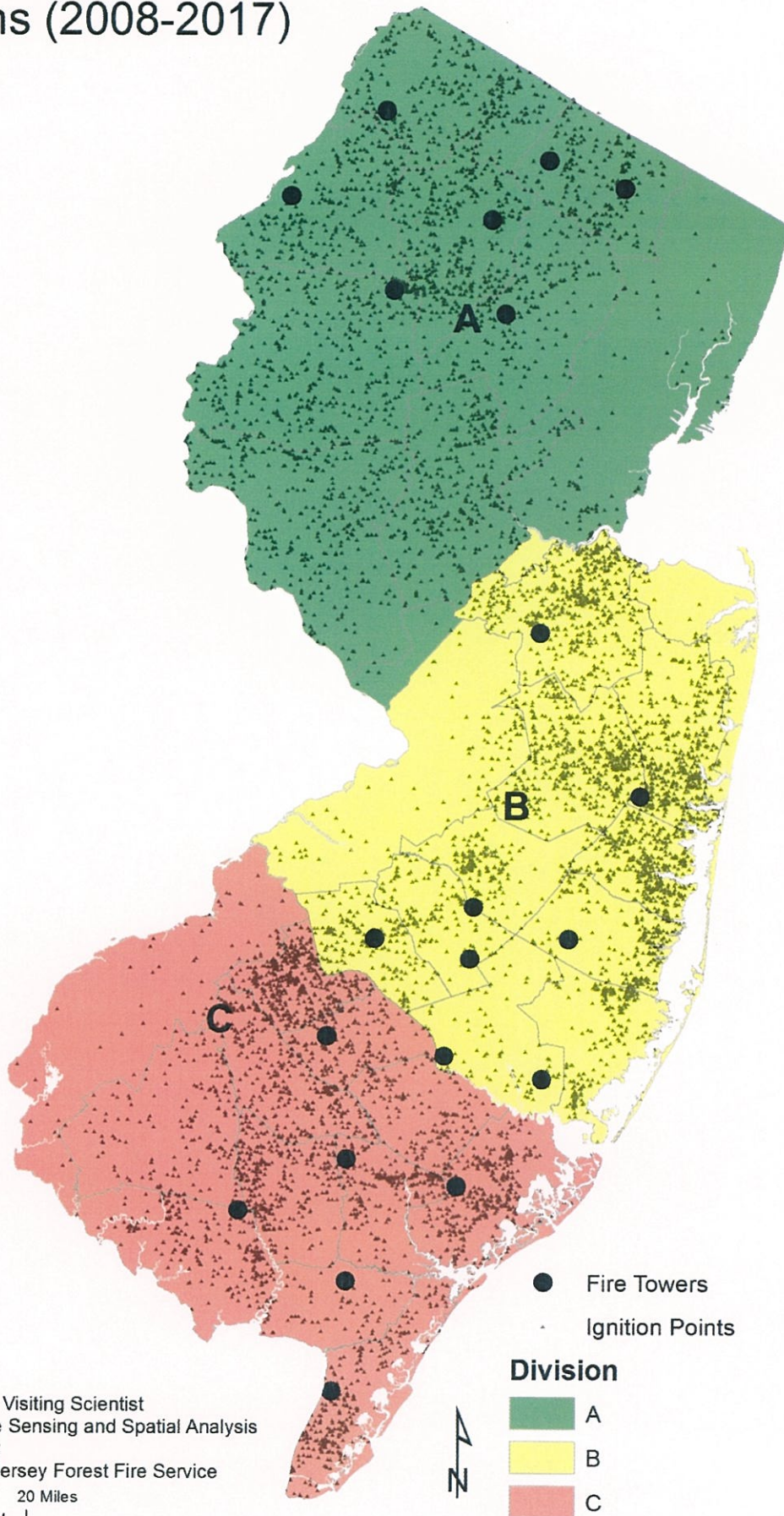
Date of Last Wildfire (1963 in black)



Map by Inga La Puma 3/2019
Center for Remote Sensing and Spatial Analysis
Rutgers University
Data provided by NJFFS and NJGIS

Map 3

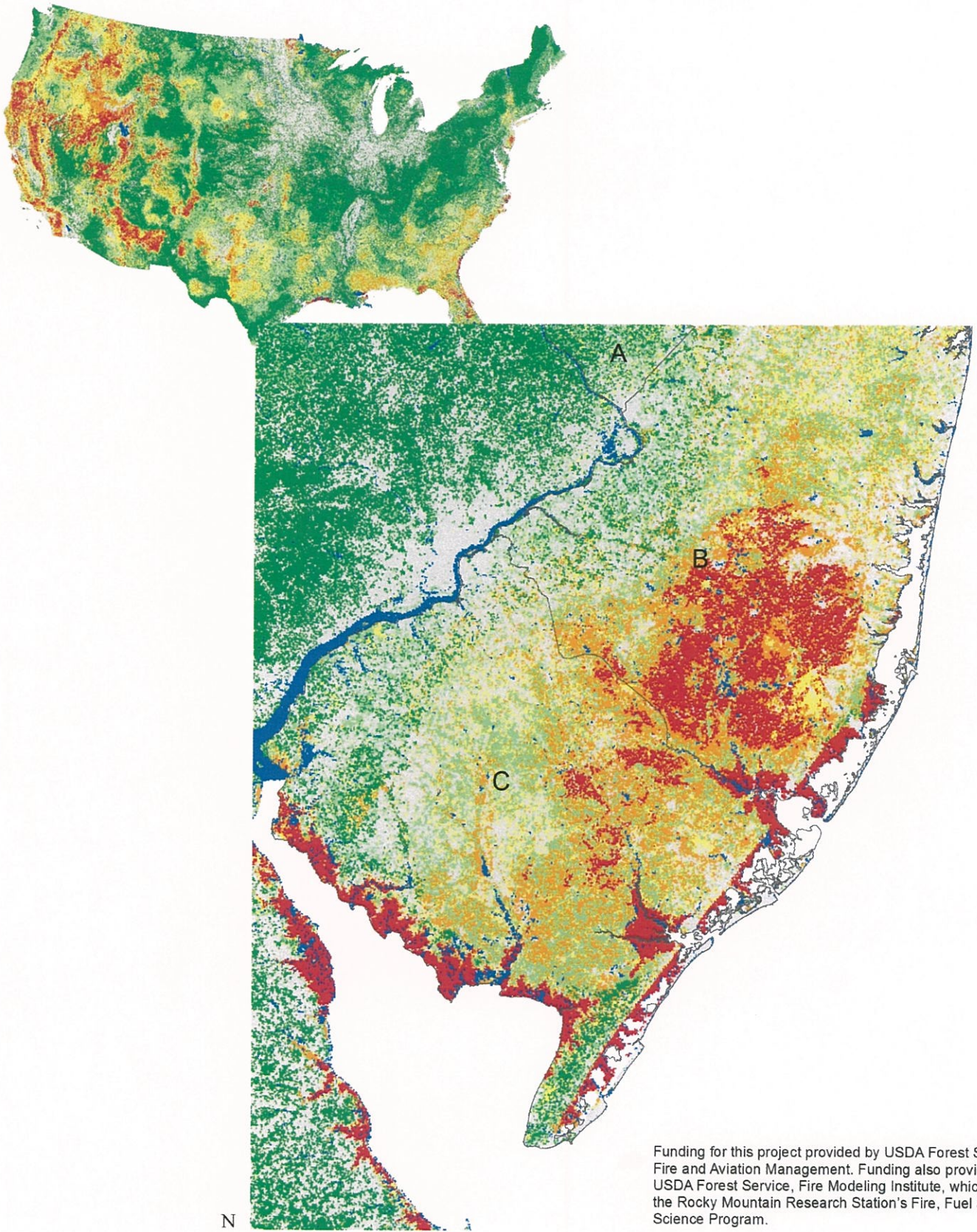
Ignitions (2008-2017)



Inga P. La Puma - Visiting Scientist
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Consultant: New Jersey Forest Fire Service

0 5 10 20 Miles

Map 4 USDA Forest Service Wildfire Hazard 2018



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Map by Inga La Puma 3/2019
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Rutgers University
Data provided by USDA Forest Service

ADDITIONAL APPENDIX MATERIALS
SUBMITTED TO THE
ASSEMBLY ENVIRONMENT AND SOLID WASTE COMMITTEE
and
ASSEMBLY AGRICULTURE AND NATURAL RESOURCES COMMITTEE
for the
March 14, 2019 Meeting

Submitted by Stephen V. Lee IV, Committeeman, Township of Tabernacle; and
Representing, American Cranberry Growers' Association:

Kyle Dickman, Rolling Stone Reports, "Apocalypse in the Garden State," *Rolling Stone*,
May 5, 2016. © 2018 Rolling Stone, LLC.

Submitted by William F. Brash, Jr., President, Board of Trustees, New Jersey Faire
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Jacqueline L. Urgo, "Pinelands residents worry about proposed rules change the could
hamper creation of firebreaks," *phillynews.com*, November 12, 2017. © 2019
Philadelphia Media Network, LLC.

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Press of Atlantic City*, August 29, 2018. © 2019 BH Media Group, Inc.

Michelle Brunetti, "To cut or not to cut? Fate of historic white pines again in
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