Arizona Forest Resource Strategy

A comprehensive strategic plan to address forest-related conditions, trends, threats, and opportunities as identified in the 2010 Arizona Forest Resource Assessment

June 18, 2010

Arizona State
Forestry Division

ARIZONA FOREST RESOURCE STRATEGY

Prepared for the
Arizona State Forestry Division and U.S. Forest Service
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1.0 Executive Summary

Introduction

Arizona is a land of diverse landscapes. The diversity of Arizona forests ranges from riparian gallery forests traversing the low desert to sub-alpine and montane forests above 9,000 feet in elevation (O'Brien 2002). Forests cover roughly 27% of the state and occupy 19.4 million acres. These forests are comprised of 37 species of coniferous and hardwood trees. The majority of forestland is located above the Mogollon Rim with distinct areas scattered throughout the rest of the state. Juniper (*Juniperus* spp.) and pinyon-juniper(*Pinusedulis-Juniperus*spp.) woodlands are the most abundant forest type in Arizona, occupying approximately 14.8 million acres, or 20.3% of the state. The rarest and most significant in ecological terms is riparian forest, which occupies less than one-half of 1% of Arizona's land.

Land ownership within Arizona is also quite diverse. Federal and state agencies and Native American Tribes manage the majority of lands. Only a small portion is privately owned. *Arizona's Forest Resource Assessment* and *Strategy* are truly reflective of this diverse land base and draw on the strong relationships with many organizations and agencies. This collaborative "all lands" approach for the *Assessment* and *Strategy* is critical for successful near-term and long-term outcomes on the landscape.

The development of this *Assessment* and *Strategy* was prompted by federal legislative requirements. The amended Cooperative Forestry Assistance Act of 2008 (commonly referred to as the Farm Bill) added new requirements for the states to identify priority forest landscape areas (i.e., a statewide assessment of forest resources) and highlight work needed to address national, regional, and state forest management priorities (i.e., a statewide forest resource strategy).

States must complete the assessment and strategy in order to qualify to receive funds under the Cooperative Forestry Assistance Act (CFAA). The CFAA funds are provided to states through the State and Private Forestry (S&PF) program of the USDA Forest Service. Currently, Arizona receives several million dollars annually to protect communities from wildfire, assist private forest landowners, promote healthy forest practices, and assist communities with their urban forests. Most of the CFAA funding received by the Arizona State Forestry Division (AZSFD) is given as grants to local organizations that provide matching funds and additional implementation resources. The combination of state and local efforts, along with coordination and collaboration with federal, tribal and other land management agencies, provides substantial leveraging of these funds to benefit Arizona forests and citizens.

The responsibility for developing the statewide assessment and strategy belongs to the State Forester and the AZSFD. The State Forester appointed a task group with diverse representation to work with AZSFD staff to develop the *Arizona Forest Resource Assessment* and make recommendations for the *Arizona Forest Resource Strategy*.

Basic principles for the *Assessment* were identified early in the process:

1. Build upon a strong collaborative foundation
2. Use and leverage existing work to the fullest extent possible
3. Develop a strong framework for future work.

Overview of Issues

The Arizona Forest Resource Assessment Task Group devoted hundreds of hours reviewing existing planning and assessment documents, gathering input from partner agencies and stakeholders, and discussing the

classification of Arizona forest issues. The group ultimately decided to organize the state's critical forest resource issues into seven major categories:

1. People and Forests
2. Ecosystem Health
3. Water & Air
4. Fire
5. Economics
6. Climate Change
7. Culture

As forest resource issues were identified, evaluated and classified, it became clear that there were three overarching needs that cut across all issue categories:

1. Funding to accomplish forest management activities
2. Developing the capacity to collaboratively accomplish forest management goals
3. Educating the public about forest management.

It is clear that various aspects of funding, capacity and education must be considered as strategies are developed and implemented and priority/focus areas addressed.

Purposes and Uses

The *Assessment* and *Strategy* put forth a broad array of issues, goals, and necessary actions. ***In short, these documents attempt to addresses those things that forests affect as well as those things that affect forests.*** The assessment also addresses the three national themes outlined in the Farm Bill:

1. Conserve working forest lands
2. Protecting forests from harm
3. Enhance public benefits from trees and forests

The *Assessment* provides the following information as a foundation for the *Strategy*:

- An analysis of present and future forest conditions, trends, and threats on all ownerships in the state using publicly available information.
- Identification of forest-related threats, benefits, and services consistent with the Farm Bill national themes.
- A delineation of priority rural and urban forest landscape areas that will be addressed in the *Strategy*.
- Identification of opportunities for working with neighboring states and governments to address multi-state priority areas.
- An analysis of how to incorporate existing statewide plans, including Wildlife Action plans and Community Wildfire Protection plans, and planning for existing State Forestry programs and initiatives.

The *Strategy*:

- Outlines long-term coordinated approaches for addressing forest resource issues and opportunities in priority landscapes.
- Describes how the state proposes to invest federal funding and other resources to address state, regional, and national forest management priorities.
- Identifies key partners and stakeholders for future program, agency, and partner coordination.
- Incorporates existing statewide plans including the State Wildlife Action Plan (SWAP) and Community Wildfire Protection plans (CWPP), and
- Discusses the resources necessary for implementation.

Collaborative Goals for Arizona

People and Forests

- People and communities receive maximum benefits from forests and trees.
- Minimized negative impacts to trees and forests.

Ecosystem Health

- Resilient and diverse forest ecosystem structures, processes, and functions
- Progress toward landscape scale outcomes, restoration of unhealthy ecosystems, and enhanced sustainability with negative impacts.

Water and Air

- Improved water quality and quantity from forested watersheds.
- Improved health and resiliency of forested aquatic systems (riparian areas, springs, and wet meadows)
- Increased public understanding of the importance of forests to Arizona's water quality.
- Improved air quality.

Fire

- Wildland ecosystems where appropriate fire regimes maintain health and resiliency of natural vegetation.
- "Fire Adapted Communities" that provide shared stakeholder responsibility for healthy landscapes and wildfire prepared communities.
- Enhanced wildland fire management capacity in Arizona.
- An Arizona public and government leadership that is well informed about wildland fire management, science, and prevention issues.

Economics

- Realized long-term economic potential of sustainable forest products and bioenergy (while achieving Ecosystem health goals)
- Protection of areas with economic development potential related to ecosystem services.
- Community recognition of the economic importance to protecting healthy natural systems.

Climate Change

- Increased resilience of ecosystems to climate change.
- Reduced rate of future climate change through maximized carbon sequestration in Arizona forests and trees.
- Broad public and community understanding of climate change science – Arizona's variable climate and current and future impacts.

Culture

- Improved communication between all land management agencies, indigenous tribes, and other cultural groups about varying perspectives and beliefs related to forests, trees, and other natural resources.
- Effective collaboration mechanisms for sharing of information about resources, priorities, policies, and management strategies between Tribes and non-Tribal organizations.

Table 1. Collaborative Goals for Arizona. A total of 20 broad collaborative ***Goals*** are identified for Arizona. The strategy also identifies a long list of more specific ***Objectives*** and ***Actions*** to focus ongoing work to accomplishing these goals.

It is intended that the *Strategy* be implemented using an "all lands" approach whereby projects and programs are effectively implemented across multiple ownerships and jurisdictions. Given the themes and broad components of the *Assessment*, the *Strategy* lends itself to a wide variety of applications that go beyond the state level.

Conclusion

Arizona forests, regardless of ownership, are national treasures and it is impossible to measure their values with dollars and cents. They provide a variety of critical ecosystem services. However, the demands and pressures on our forests are greatly increasing in Arizona and nationwide.

The *Assessment* and *Strategy* will provide steps that will greatly assist a variety of partners and stakeholders in:

1. Taking actions that will better address priority issues
2. Receiving funding based on a broadly supported, effectively designed approach
3. Improving communication, collaboration, and leveraging of resources to address issues
4. Successfully implementing projects, programs, and initiatives across landscapes involving multiple ownerships
5. Improving the livability of communities by enhancing Arizona's urban forests
6. Enhancing the capacity of Arizona's forests to provide life-giving ecosystem services and products such as clean water, clean air, recreational experiences, traditional and non-traditional forest products, and quality habitat for wildlife.

2.0 Introduction and Background

Introduction

The forests and trees of Arizona are an invaluable asset vital to all of the state's citizens. Arizona has more than the typical image of saguaro cactus in the Sonoran Desert. It is a land of diverse landscapes and diverse forests. There is an array of forests and woodlands from the cottonwood bosques hugging our river courses to the subalpine firs cloaking our tallest peaks to the paloverdes shading our urban communities

To many, it comes as a surprise to learn that Arizona has more than 20 million acres of forest land. These forests provide substantial benefits or "ecosystem services" to the people of Arizona. Many of these goods and services are traditionally viewed as free benefits to society. One of many examples of such an "ecosystem service" is clean drinking water. According to the National Academies, forests in the United States provide two-thirds of the nation's drinking water. This is an extremely critical function in an arid state undergoing rapid population growth. In 2000 , the Arizona census recorded 5.1 million people and that number is expected to double by the year 2030. Other ecosystem services provided by forests include wildlife habitats, clean air, recreation and renewable energy.

The management of lands within Arizona is very diverse. Federal and state agencies and Native American Tribes manage the majority of Arizona lands. Only a small portion is owned privately. Different federal agencies have responsibility for specific lands including the USDA Forest Service, USDI Bureau of Land Management, and USDI National Park Service. The USDI Bureau of Indian Affairs also assists certain tribes with the management of tribal lands. There are also forest areas under the jurisdiction of the Department of Defense. These multiple ownerships can create substantial complexity when trying to address forest issues on a larger scale that affect lands under different ownerships or jurisdictions in the same area of the state. Thus, it is critical to develop and draw upon strong relationships with many organizations and agencies for any statewide assessment or strategy to be truly reflective of this diverse land base. This collaboration will be critical to both the short- and long-term success of this process.

In Secretary of Agriculture Tom Vilsack's speech outlining his vision for our nation's forests, he said, "a healthy and prosperous America relies on the health of our natural resources, and particularly our forests. America's forests supply communities with clean and abundant water, shelter wildlife, and help us mitigate and adapt to climate change. Forests help generate rural wealth through recreation and tourism, through the creation of green jobs, and through the production of wood products and energy. They are a source of cultural heritage for Americans and American Indians alike. And they are a national treasure--requiring all of us to protect and preserve them for future generations." Secretary Vilsack has further articulated that the threats facing our forests don't recognize property boundaries. In developing a shared vision for our forests, we must also be willing to look across property boundaries and we must operate at a landscape-scale by taking an 'all-lands' approach. The *Assessment* and *Strategy* follow this approach. They also build upon and broaden the 2007 *Statewide Strategy for Restoring Arizona's Forests* created by the Governor's Forest Health Council.

Vast areas of the 20 million acres of Arizona's forest lands are unhealthy and vulnerable to unnatural fire because of accumulated fuels, overcrowding, and drought. In 2002, the catastrophic Rodeo-Chediski Fire burned 470,000 acres, destroyed more than 400 homes, and threatened many others. The containment and suppression costs exceeded $50 million as well as other immeasurable costs of rebuilding the communities and restoring the ecosystems destroyed by the fire.

The challenge of addressing these threats is compounded by Arizona's rapidly increasing population and shrinking state and municipal budgets. This stark reality helps to further emphasize the need to set funding priorities according to which landscapes and ecosystems are most critical. It also brings to light the importance of collaboration with agencies, organizations, and citizens working together to address similar or common issues. Such approaches are being emphasized more and more across all sectors of government and funding in the United States. Performance that demonstrates limited dollars are being used effectively to address the most important of needs now carries a great premium. It is our intent, through the implementation of this *Strategy*, that we make the best use of limited dollars to meet the greatest needs for Arizona's citizens and forest resources. Arizona will be positioned to improve funding, demonstrate results and achieve priority outcomes.

Background

Farm Bill and Cooperative Forestry Assistance Act

Commonly referred to as the Farm Bill, the Food, Conservation and Energy Act of 2008 was enacted on June 19, 2008. This legislation amends the Cooperative Forestry Assistance Act of 1978 and requires each state to complete a statewide forest resource assessment and a statewide forest resource strategy to receive, or continue to receive, funds under the Cooperative Forestry Assistance Act (CFAA).

The CFAA funds are provided to states through the State and Private Forestry (S&PF) section of the USDA Forest Service (USFS). Currently, Arizona receives several million dollars annually to protect communities from wildfire, assist private forest landowners, promote healthy forest practices, and assist communities with their urban forests. Most CFAA funding received by the Arizona State Forestry Division (ASFD) is passed through to local organizations by way of grants that require matching funds and additional implementation resources. The combination of state and local efforts along with coordination and collaboration with federal, tribal, and other land management agencies provides substantial leveraging of these funds to benefit Arizona forests and citizens.

To receive CFAA funding, the 2008 legislation also requires that states focus on landscape-level outcomes to achieve national private forest conservation priorities. These priorities, which are a result of the "redesign" effort within the S&PF section of the USFS, include:

- **Conserve working forest landscapes**
- **Protect forests from threats**
- **Enhance public benefits from trees and forests**

The amended CFAA of 2008 also requires states to identify priority forest landscape areas and highlight work needed to address national, regional, and state forest management priorities.

The State *Assessment* and *Strategy* are submitted to the U.S. Secretary of Agriculture or designee for final approval.

Federal Guidance

The National Association of State Foresters (NASF) and US Forest Service S&PF collaborated to provide specific guidance to states beyond that provided in legislation. Their guidance identifies the following minimum requirements for the Resource Assessment:

- **Provide an analysis of present and future forest conditions, trends, and threats** on all ownerships in the state using publicly available information.

- **Identify forest-related threats, benefits, and services** consistent with the S&PF Redesign national themes.
- **Delineate priority rural and urban forest landscape areas** to be addressed by the state forest resource strategy.
- **Work with neighboring states and governments** to identify any multi-state areas that are a regional priority.
- **Incorporate existing statewide plans**, including Wildlife Action plans and Community Wildfire Protection plans, and address existing S&PF program planning requirements.

Forest Resource Strategy, Annual Reporting, and Updates
The *Strategy* is being developed as a separate companion document to this *Assessment* and, where possible, will complement other state and federal agency assessment and planning work.

Annual reporting will be required by the Arizona State Forestry Division (ASFD), beginning in 2011. Reporting is expected to include information about activities of ASFD as well as activities of other agencies and organizations working toward common forest resource objectives and outcomes.

The 2008 Farm Bill requires states to update their Forest Resource Assessment and Strategy every five years or as required by the Secretary of Agriculture. Work will continue with partner agencies and organizations to coordinate further refinement of the ongoing assessment and strategy work.

3.0 Summary of Forest Resource Assessment

(The full *Arizona Forest Resource Assessment is* available as a separate document)

Introduction

The diversity of Arizona forests ranges from riparian gallery forests traversing the low desert to sub-alpine and montane forests above 9,000 feet in elevation. Forests cover roughly 27% of the state and occupy an area of more than 20 million acres. Comprised of 37 species of coniferous and hardwood trees, the majority of forestland is located above the Mogollon Rim with distinct areas scattered throughout the rest of the state. Juniper and pinyon-juniper woodlands are the most abundant forest type in Arizona, occupying approximately 13.5 million acres, or 20% of the state. Riparian forests are one of the state's rarest and most significant forests in ecological terms, occupying less than one-half of 1% of Arizona's land.

Land ownership within Arizona is also very diverse. Federal and state agencies and Native American Tribes manage the majority of land; only a small portion is privately owned. The *Assessment* and *Strategy* are truly reflective of this diverse land base and draws upon strong relationships with many organizations and agencies. This collaborative, "all-lands" approach for the A*ssessment* and *Strategy* is critical for achieving successful, near-term and long-term outcomes on the landscape.

Responsibility for developing the statewide assessment rests with the State Forester and the Arizona State Forestry Division (ASFD). The State Forester appointed a task group with diverse representation to work with ASFD staff to develop the *Arizona Forest Resource Assessment*. Recommendations consistent with the three national themes outlined in the Farm Bill--Conserve Working Forest Lands, Protect Forests from Harm, Enhance Public Benefits from Trees and Forests--were then addressed during development of this *Strategy*.

Basic principles for the *Assessment* and *Strategy* were identified early in the process:

1. Build upon a strong collaborative foundation
2. Utilize and leverage existing work to the fullest extent possible
3. Develop a strong framework for future work.

The *Assessment* provides the following information as a foundation for the *Strategy* and its scope.

- Provides an analysis of present and future forest conditions, trends, and threats on all ownerships in the state using publicly available information,
- Identifies forest-related threats, benefits, and services consistent with the Farm Bill national themes,
- Delineates priority rural and urban forest landscape areas to be addressed in the *Strategy*,
- Identifies opportunities for working with neighboring states and governments to address multi-state areas that are a priority,
- Incorporates existing statewide plans including Wildlife Action plans, Community Wildfire Protection plans, and addresses planning for existing ASFD programs and initiatives.

Forest Resources and Ecoregions

Existing information about the vegetation structure of forested ecosystems was reviewed, and six forest and woodland types were classified for the *Assessment*. The distribution of aspen, mixed conifer, pine-oak, pinyon-juniper, ponderosa, and riparian forests throughout the state was mapped (Figure 1, Table 2) and the more than 20 million acres of forest land in Arizona identified and described as follows:

Forest Type	Acres
Aspen	111,293
Mixed Conifer	450,221
Pine-Oak	1,779,475
Pinyon-Juniper	13,429,572
Ponderosa	4,043,854
Riparian	328,693
TOTAL	20,134,109

Table 2. Size of Arizona Forest Types

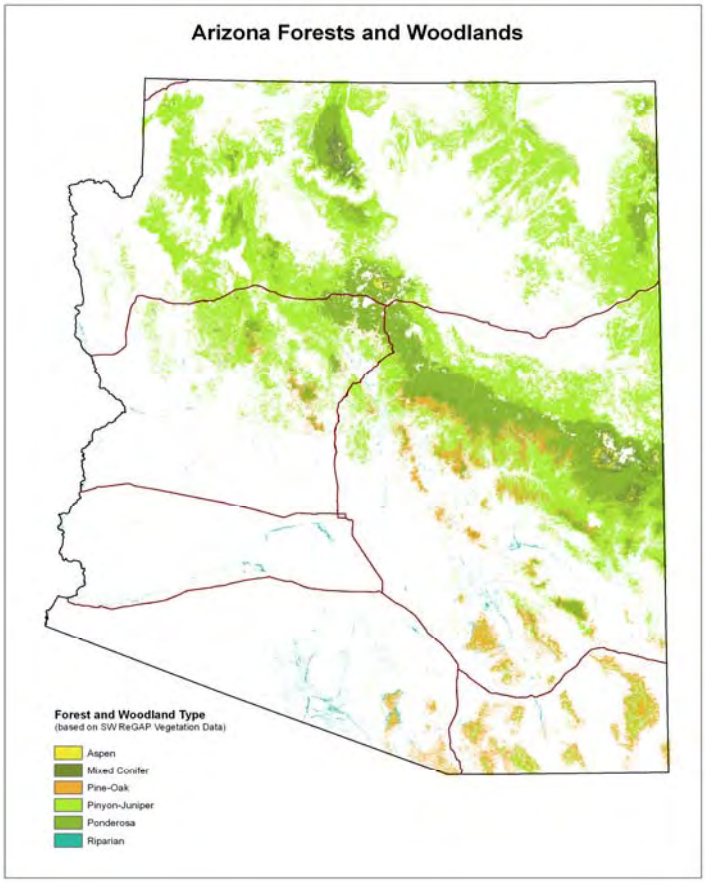

Figure 1. Arizona Forests and Woodlands

Aspen Trembling or quaking aspen (*Populus tremuloides* Michx.) ranges in occurrence from small discontinuous patches of tens to hundreds of acres up to large, contiguous mountainsides and plateau-tops (thousands of acres) throughout Arizona, at elevations ranging from 5,500 feet to 11,500 feet. Aspen is a seral species in several coniferous habitat types, including spruce-fir and mixed conifer habitat types and mesic ponderosa pine forest, and in montane grasslands with fire exclusion or after heavy livestock grazing.

Mixed Conifer Forests At higher elevations in mountainous regions (above approximately 7,800 ft.) a variety of conifer species are dominant. At elevations between 7,800 and 10,200 feet, forests are dominated by Douglas-fir (*Pseudotsuga menziesii* var. *glauca*), white fir (*Abies concolor*), blue spruce (*Picea pungens*), Engelmann spruce (*Picea engelmannii*), and subalpine fir (*Abies lasiocarp*), with ponderosa pine (*Pinus ponderosa*) present at the lower end of those elevations.

Pine-Oak Pine-oak is made up of two principal types--pine-oak forests where oaks (*Quercus* spp.) are common or co-dominant in mixed conifer or ponderosa forests at higher elevations, and evergreen oak woodlands where several oaks dominate with a mix of conifers. This latter type is found at mid to higher elevations (2,900 to 9,500 feet) throughout forested areas of Arizona. The pine-oak forest type is found as patches or broad bands of mostly Gambel oak (*Q. gambelii*) throughout mixed conifer and ponderosa forest types.

Pinyon-Juniper Pinyon-juniper woodlands constitute the largest forest type in Arizona. These coniferous woodlands exist in a gradient of juniper-dominated (*Juniperus* spp.) to pinyon-dominated (*Pinus* spp.) woodlands, with pinyon pine (*P. edulis*) and juniper present throughout the range. They are found at elevations ranging from approximately 4,500 to 7,500 feet.

Ponderosa Ponderosa pine (*Pinus ponderosa*) is the most widely distributed pine in North America, extending from British Columbia, Canada to northern Mexico. Throughout its range, ponderosa pine can be found at elevations from near sea level to about 9,500 feet. Most ponderosa pine forest occurs in large, contiguous patches throughout Arizona, at elevations ranging from 5,500 feet to 8,500 feet. These relatively warm and dry forests are dominated by ponderosa pine, pinyon pine, junipers, and several oaks.

Riparian Forest Arizona's riparian ecosystems range from sea level to 10,000 feet. Riparian forests exist as a component of the forests and woodlands previously described as well as within other vegetation communities at lower elevations, like the semi-desert grasslands and Sonoran Desert. The vegetation found along riparian corridors is dependent on the availability of surface and ground water throughout the year, especially during the growing season. Some riparian forests are sustained by regulated water releases from reservoirs.

While not traditionally considered a forest type, Arizona's urban forests comprise "cosmopolitan ecosystems" comprised of trees and vegetation that have a special relationship to people. Not enough tree canopy studies have been completed to provide percentages of types and species of vegetation that make up the urban forest. However, urban forests typically are composed of a mix of native and exotic (introduced) tree species. Cosmopolitan ecosystems in southern Arizona include native tree species (e.g., palo verde, ironwood, mesquite and cottonwood) and exotics such as eucalyptus, causurina, and various pines. Northern Arizona urban ecosystems are populated predominately by ponderosa and pinyon pine, oak and juniper, along with several introduced species– elms, poplars, and spruce. The urban forest can be found in and along urban parks, street trees, landscaped boulevards, public gardens, washes and wetlands, greenways, and nature preserves.

Land Use and Changes in Forested Ecosystems

Resource conditions have changed as human populations lived in and used forest ecosystems. Historic land use practices, especially logging, grazing and fire suppression, have caused shifts in ecosystems processes that resulted in: loss of old-growth, large-tree forests and eruptions of numerous small trees; altered fuel loading and fire regimes; increased insect and disease outbreaks; increased introduction and spread of exotic species; loss of wildlife habitat; habitat fragmentation for both plants and animals; altered watershed values; and depletion of ecosystems services. Overall, trends point toward reduced resource values and increased threats to ecosystem services and other values-at-risk. Active management by diverse land management agencies seeks to restore ecosystem health and resiliency, and to document economic and cultural values of natural and urban forests.

Ecoregion Analysis

Ecoregions used in the *Assessment* are based on the premise that ecological regions can be identified through analysis of the patterns and composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity. These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another. Arizona ecoregions were derived from the Environmental Protection Agency (EPA)/Commission for Environmental Cooperation (CEC) classification system for North America (EPA/CEC 2002), which was in turn derived from Omernik (1987) and from refinements of Omernik's framework.

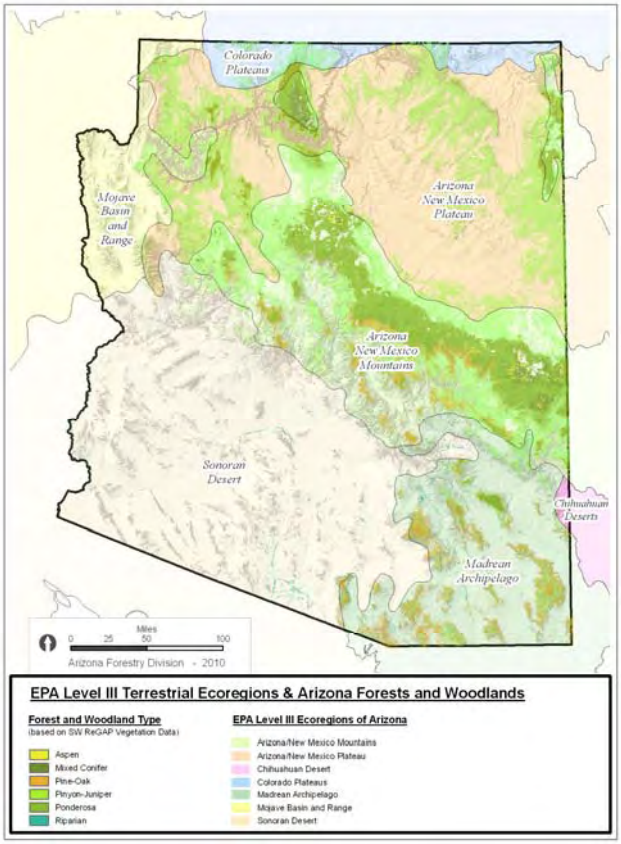

Figure 2.

Overview of Issues

Prior to this current effort, state and federal agencies, non-profit organizations, academic institutions, and collaborative groups completed considerable analysis and planning work to address Arizona forest resource issues. A large portion of this *Assessment* builds on these earlier activities. The following list includes most of the existing documents in Arizona that were relied upon for development of the *Assessment*.

- **Arizona Urban & Community Forestry Plan**
- **Community Wildfire Protection plans** (27 approved)
- **Forest Legacy Program Assessment of Need**
- **Forest Stewardship Program State Priority Plan**
- **Forest Stewardship Spatial Analysis Project**
- **Statewide Strategy for Restoring Arizona's Forests**
- **State Wildlife Action Plan**

In addition, extensive resource-based planning and analysis has been completed or is ongoing in Arizona by numerous government agencies and non-governmental organizations, which include, but are not limited to:

- **ADEQ 5-Year Nonpoint Source Management Plan** (Section 319, Clean Water Act of 1989-1990)
- **Arizona and Utah Regional Coordinated Resource Offering Protocol** (CROP)
- **BLM Land Use Plans and BLM Rapid Eco-Regional Assessment** (in process)
- **Four Forests Restoration Initiative**
- **National Forest Land/Resource Management plans**
- **Northern Arizona Wood Supply Analysis**
- **Western Mogollon Plateau Adaptive Landscape Assessment**
- **White Mountains Landscape Assessment**

The Assessment Task Group devoted many hours reviewing the planning and assessment documents listed above, gathering input from partner agencies and stakeholders, and discussing classification of Arizona

forest issues. Following this, the Task Group identified Critical Forest Resource Issues for Arizona and grouped them into seven major categories described as follows:

People and Forests **-** Arizona's population has grown for decades at a tremendous rate, and expectations are for continued growth through mid-century and beyond. This expansion brings people into ever-closer proximity to Arizona's forests--allowing people to garner a broad array of benefits from the forests, yet affecting these ecosystems in many negative ways. What were once remote forest wildlands with occasional visitors are becoming backyards and crowded playgrounds to expanding suburban neighborhoods. People migrating from urban areas are often choosing to live within, or adjacent to, forests where they face new challenges such as fire, smoke, forest access, water supply, and land use issues. At the same time, distant metropolitan areas continue to increase demand for some of our forest's most precious commodities.

Ecosystem Health **-** Throughout the forest ecosystems of Arizona, evidence of their declining health, function and sustainability is readily apparent. Dramatic signals of unraveling ecosystems include large, uncharacteristic crown fires; effects of prolonged drought; excessive fuel buildup; vegetative loss from insects and tree pathogens; and widespread decreases in the biodiversity of both plants and animals. Evidence-based research indicates that some Arizona ecosystems are very different from historic conditions. Factors include changes in nutrient cycling, decreases in understory species diversity, increased invasion by exotic species, and disruption of natural fire regimes. It is essential that Arizonans accurately identify the reasons for decline in the health of forest ecosystems and respond appropriately.

Water & Air **-** As two of life's most important elements, water and air play critical roles in the sustainability of a vibrant Arizona. Water is scarce in Arizona. A decline in precipitation during the last several decades has brought about earlier spring runoff and reduced watershed yield. Long-term drought continues to challenge our ability to balance increasing demands for water from agriculture, industry, and an expanding population. Likewise, clean air, often taken for granted, is threatened by many factors--industrial and auto emissions, dust from uncovered soil, smoke from increasing wildfire occurrence and forest management activities. These changes related to water and air have resulted in widespread forest impacts including tree mortality due to fire and drought, reduced air quality and ecosystem diversity, degraded water quality, and increased soil erosion**.**

Fire **-** Fire in Arizona is a complex issue. Recent trends show increasing size and severity of wildland fire occurrence, and increasing costs for fighting and managing these fires. Although natural fire is necessary in many forest types, it can occur as desirable fire, undesirable fire, or as a managed tool for achieving and sustaining desired ecological conditions. We know fire is a key process in many forest ecosystems and reestablishing natural fire regimes where appropriate is an ongoing challenge. At the same time, protecting the safety of citizens and other important values--communities, infrastructure, and habitat for imperiled species-- is a critical concern. A fundamental challenge facing Arizona is maximizing the many benefits of fire while reducing its significant costs.

Economics **-** Forests have always contributed to Arizona's economy and quality of life. Historically, forests provided an abundance of natural resources--forage for cattle and sheep; trees for lumber, firewood, mine timbers and railroad ties; wild game for consumption; and water for irrigation and municipal uses. Forests sustained a timber industry fueling a century of rural development. Although tourism, watershed protection, and evolving forest management goals and objectives have more recently provided new challenges for rural and state economies, the importance of forests to Arizona's economy has not changed. Forests remain the economic and aesthetic foundation of many rural communities. Today, Arizonans demand more goods and services from our forests than ever before, and balancing these demands presents ongoing management challenges as we strive to ensure long-term forest sustainability.

Climate Change **-** Arizona's climate has experienced wide swings in temperature and precipitation for thousands of years. A naturally variable climate has given rise to changes in fire frequency, wide variation in flood and drought severity, and has influenced Native American population shifts throughout the region. Recent changes in temperature and precipitation over several decades, caused in part by human activity, have increased the severity of forest insect outbreaks and have contributed to some of the largest wildfires in Arizona's history. While climate has always been variable with time, rapid climate change creates cascading effects of tree mortality, increased catastrophic disturbance, and shifting zones of suitable habitat that could alter Arizona's forested landscapes dramatically.

Culture **-** Human cultures and Arizona's forests have been inter-dependent for more than 10,000 years. During this time, forests have provided human cultures with a variety of resources including shelter, building materials, wild game, water, seasonal fruits and seeds, ceremonial plants, medicines, minerals and land for farming and grazing, and as a source of spiritual renewal. Human interaction with, and dependence on, forests will continue to be influenced by the specific set of values, norms, and beliefs held by different cultural groups. While there are many shared beliefs, values and uses across cultural and interest groups, there are also distinct differences that require a balance among competing interests. While challenging, the integration of an array of cultural values in the management of our forests represents a more holistic approach and helps increase the interaction and collaboration between groups.

As forest resource issues were identified, evaluated and classified, it became clear that there were some overarching themes that cut across all seven issue categories. These themes are:

- Funding to accomplish forest management activities
- Capacity to collaboratively accomplish forest management goals
- Educating the public about forest management.

It is clear that as strategies are developed and implemented and priority/focus areas addressed, various aspects of funding, capacity and education must be considered.

Arizona is home to millions of acres of public land (i.e., parks, forests, wilderness areas, wildlife refuges, grasslands, and others) managed by several different agencies, including the National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and Arizona State Parks. Arizona is also home to 21 federally recognized Native American tribes, several of whom have substantial acreage of forested lands. Many of these managed lands (and many of the forest resource issues Arizona faces) cross state, national or sovereign boundaries. Although political borders can sometimes complicate issues and their resolution, identification of common goals and challenges can often strengthen an effort by focusing additional resources. Cooperative working relationships across all borders aid in the efficient allocation of resources and sustainability of forest lands.

Although the exact terminology and issue description may vary, several common concerns are apparent. The issues involving People, Ecosystem Health, Economics, Water, and Fire all show strong correlation with adjoining states, as illustrated in the following matrix.

Arizona Assessment	New Mexico		Utah		Colorado		Nevada		California	
People and Forests	●	- Fragmentation - Development - Green Infrastructure	●	- Urban & Community Forestry	●	- 3 National Themes	●	- WUI development - Land Mgmt access - Community Forestry	●	-People and Communities
Ecosystem Health	●	- Forest Health - Fish and Wildlife Habitat	●	- Forest Health - Wildlife	●	- 3 National Themes	●	- Forest Pests/ Pathogens - Riparian Systems - Habitat Management	●	- Forest / Forest Health - Wildlife
Climate Change	⊙	(Acknowledged)	⊙	(Acknowledged)	⊙	(Acknowledged)	●	- Climate Change	●	- Climate Change
Economics	●	- Economic Potential	○		●	- 3 National Themes	●	- Economic Opportunity - Fragmentation	●	- People & Communities
Culture	⊙	(Acknowledged)	○		○		○		○	
Water	●	- Water Quality & Supply	●	- Water Quality	●	- Water & Watersheds	●	- Water Quality/ Quantity	●	- Water
Air	○		○		○		○		○	
Fire	●	- Wildfire Risk	●	- Wildland Fire	●	- 3 National Themes	●	- Wildfire Scale/ Intensity	●	- Wildfire
Other Major Issues Identified:	- Rangeland		- Riparian Areas		- Wildlife habitat - Invasive species		- Rangeland analysis - Land management threat		- Range Management	
Common Issues Identified along Arizona Border:	**Yes**		**No**		**No**		**No**		**No**	

Key: ● - Issues correspond significantly, ⊙ - Issue acknowledged but not a major focus, ○ - No corresponding reference identified

Focus Areas

For each issue category, spatially explicit data sets were used to see where each issue was most significant within Arizona. These data sets (maps) were overlaid with forest and woodland distribution to identify forest resource focus areas for the seven issues.

Focus maps for each issue are used here to illustrate how broad overlap of resource issues exists on the land. They are used in the *Strategy* as a starting point for identification of priority areas throughout Arizona.

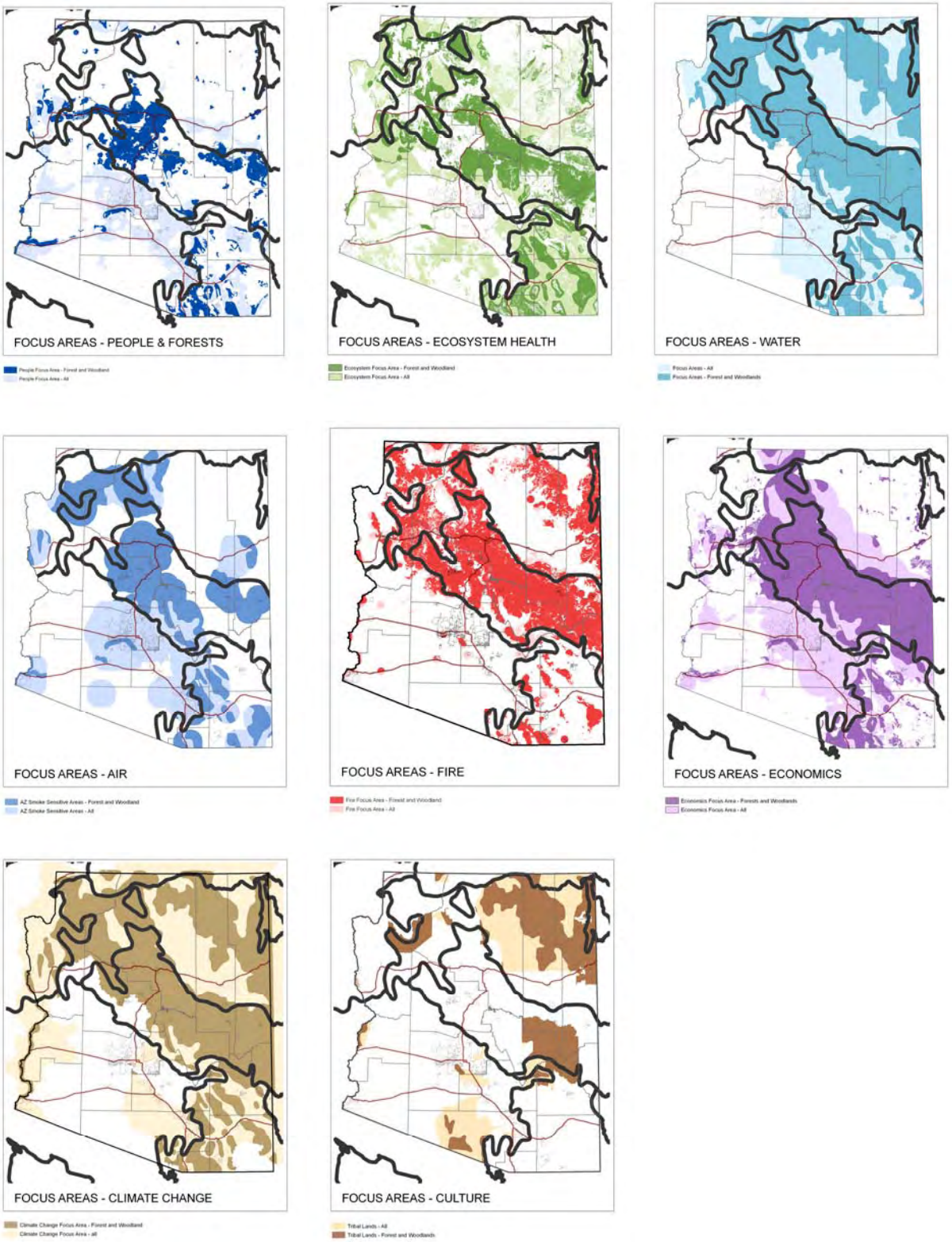

Figure 3. Arizona Focus Areas Overlay Maps. These focus area maps will be used to help identify priority areas in the *Strategy*, to communicate possible implications of issues and actions, as an aid in developing needed strategies, and as a tool to identify synergistic opportunities and leverage resources. The maps will be revised as better information is gathered and evaluated.

The *Assessment* identified a broad array of issues critical to the management and sustainability of Arizona forests. This *Strategy* has taken that information and developed goals, objectives and actions to address the critical issues and identify priority areas. In a "nutshell" these documents attempt to address **those things that forests affect as well as those things that affect forests**.

4.0 Strategy Introduction

The Strategy Team started with the work of the Assessment Team (see the *Arizona Forest Resource Assessment* report) and then went on to analyze existing management plans, strategic plans, and other related program work to determine what types of strategies (goals, objectives, actions, etc.) had previously been established by resource management agencies and organizations. It was obvious that a considerable amount of work had been done.

One significant collaborative effort produced a key document--the *Statewide Strategy to Restore Arizona's Forests*. It formed a basis for the Strategy Team's effort. Prepared by the Arizona Forest Health Advisory & Oversight Councils in 2007, the *Statewide Strategy* integrated the best-available ecological, economic, and socio-political science into a strategy. The document contains a fairly aspirational vision: *Healthy, diverse forest ecosystems supporting abundant populations of native plants and animals; thriving communities in attractive forested landscapes that pose little threat of destructive wildfire; and sustainable forest industries that strengthen local economies while conserving natural resources and aesthetic values*. The *Statewide Strategy* outlined five strategic challenges, 15 recommendations, and 51 action items designed to achieve that vision. It emphasized planning and implementation at the landscape scale and the absolute necessity of engaging industry to utilize and add value to restoration byproducts and to offset the tremendous costs associated with ecological forest restoration.

In addition to using many recommendations and action items from the *Statewide Strategy* into this this document, the Strategy Team found that the *Statewide Strategy* provided five key themes and needs:

- **Increased capacity**
- **Increased integration**
- **Increased strategic efficiency**
- **Increased support for ecologically sustainable economic activity**
- **Increased public awareness.**

These themes were informally carried forward and were generally reflected in the three cross-cutting issues identified in the *Assessment*: 1) funding to accomplish forest management activities, 2) capacity to collaboratively accomplish forest management goals, and 3) education of the public and decision makers about forest management. It is clear that strategies must address various aspects of funding, capacity, integration, efficiency, economics, and education.

Funding considers several sub-issues: government funding for project planning, design and implementation; private investment to develop industries that can offset significant treatment and management costs; valuation of ecosystem services that are often taken for granted and/or not valued; stability in critical aspects of funding systems; and comparing investments now with what it should save in future costs (e.g., investment in fuel reduction treatments now vs. inevitable wildfire suppression costs later). We need strategies that will invest in the restoration of natural capital and leave the next generation with a natural inheritance at least as valuable as the one we received.

Capacity refers to the combined resources and ability of various entities cooperating to accomplish restoration and management at the landscape scale. Projects will necessarily have to scale up from thousands to hundreds-of-thousands of acres, and move into innovative approaches that may not have been tried before. Obviously, funding is required to create, maintain or expand capacity, however, capacity must be specifically addressed and integrated into overall strategies.

Significant integration on many issues at the national, regional, state, and local levels exists throughout Arizona. The Ponderosa Fire Advisory Council in northern Arizona and FireScape projects in southern Arizona are prime examples. However, additional integration will be required as forest resource restoration and management efforts are scaled up to the landscape level. The Four Forests Restoration Initiative is an excellent model for enhanced integration across jurisdictional boundaries with unlimited public and stakeholder participation encouraged. We will also need integration across issues--fuels and fire specialists will need to coordinate with wildlife and exotic weed specialists, economists with community leaders and politicians, urban residents with rural communities, and so on.

Striving for *increased efficiency* is always desirable, especially as we gear up to forest treatments on hundreds of thousands of acres. New approaches must be explored, adaptive management used, and persistence exhibited in the face of challenges imposed by fiscal constraints. This is where "lessons learned" from projects like the White Mountain Stewardship Contract will prove invaluable as we attempt to mesh limited resources and capacity with ambitious goals and objectives.

The recent global recession demonstrates that it is challenging, but not impossible, to have *sustainable economic enterprises* that are dependent primarily on forest restoration by-products and other forest resource amenities. As with many economic endeavors, the local ideal of diverse, appropriately scaled, community-based industries creating value-added products can seem at odds with the multinational, big-box, one-size-fits-all approach to maximum resource utilization and economic profitability. If truly sustainable businesses are to be encouraged and nurtured, strategies must be developed to balance these approaches.

Education of the public and decision makers is necessary to assure their support for the kinds of actions required to implement each strategy. Knowledge, understanding and involvement of diverse participants are required for appropriate forest ecosystem management and restoration to move forward. Without an educated public, support may be tentative, litigation more likely, and funding may be diverted to other priorities.

The Strategy Team considered all of this, in addition to "strategies" identified during the assessment phase, in preparing the matrices of Goals, Objectives, and Actions recommended for each issue in the *Assessment*. Continued refinement will be necessary as we begin to implement this *Strategy* and integrate the results into an effective adaptive management framework.

5.0 Critical Forest Resource Strategies

5.1 Overview

With the seven Critical Forest Resource Issues from the *Assessment* in mind, the Strategy Team identified strategies for addressing these issues and organized Goals, Objectives, and Actions into a matrix for each issue. Recognizing that these general issues are broad groupings of related sub-issues, we identified key stakeholders and partners that would be involved, as well as currently available resources and resources that might be needed as we begin to implement this *Strategy*. Additional stakeholders and resources specifically related to each issue are sometimes listed in that section.

An extensive, but incomplete, list of the key partners and stakeholders that could be tasked with planning and/or implementing broad or specific components of this *Strategy* include:

Key Partners / Stakeholders

- U.S. Forest Service, including the six national forests in Arizona, State & Private Forestry, and the USFS Rocky Mountain Research Station in Flagstaff
- National Park Service
- Bureau of Land Management
- Bureau of Indian Affairs
- Natural Resources Conservation Service
- U.S. Geological Survey
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Department of Energy
- USDA Rural Development
- Tribes, tribal governments and Tribal Natural Resource Management programs
- Arizona State Forestry Division
- Arizona State Land Department
- Arizona Game and Fish Department
- Arizona Department of Agriculture
- Arizona Department of Water Resources
  Arizona Department of Environmental Quality
- Arizona Commission of Indian Affairs
- Governor's Forest Health Council
- Arizona Community Tree Council
- Fire departments, districts, and management organizations (e.g., Ponderosa Fire Advisory Council)
- Recreation associations and groups
- County supervisors, managers, planning and zoning committees
- Municipal mayors, council members, managers, planning and zoning commissions
- Developers, builders, and related associations
- Ecological Restoration Institute
- ForestERA
- Northern Arizona University
- University of Arizona
- Arizona State University
- Cooperative Extension Service
- Forest products and logging industries

- Environmental and conservation non-governmental organizations:
  - Arboretum at Flagstaff
  - Arizona Association for Environmental Education
  - Arizona Native Plant Society
  - Audubon Society
  - Environmental Education Exchange
  - Diablo Trust
  - Grand Canyon Trust
  - Sierra Club
  - Center for Biological Diversity
  - The Nature Conservancy
  - Land trusts
  - Environmental education centers
- Private businesses
- Private landowners, ranchers, recreationists, and the general public

Resources currently available to address all aspects of the S*trategy* include:

- Federal and state land management agencies (USFS, BLM, AZSLD, etc.) that develop forest/land management plans and implement forest/land management practices.
- Arizona State Forestry Division (ASFD) staff and consulting foresters provide assistance to private landowners and other entities.
- Local, state, and regional non-governmental conservation organizations (e.g., Greater Flagstaff Forests Partnership, Natural Resources Working Group, The Nature Conservancy, Center for Biological Diversity) address forest issues.
- Existing forest products and logging industries
- Local, state, and regional non-governmental economic development organizations (e.g., Northern Arizona Wood Products Association, Southwest Sustainable Forests Partnership) provide technical assistance, financial support, and grant writing assistance.
- State universities (Arizona State University, University of Arizona, Northern Arizona University) and affiliated institutes (Ecological Restoration Institute, ForestERA) provide science-based support and other resources.
- Local Natural Resource Conservation districts provide technical assistance.
- Committees and councils, such as the Arizona Forest Stewardship Committee, Governor's Forest Health Council, and Arizona Community Tree Council.
- Educational institutions (e.g., K-12 schools, universities, environmental education centers) develop and provide outreach materials for distribution to the public.

Resources that may be needed to address all aspects of the S*trategy* include:

- Consistent funding to support forest management and state and private forestry programs. Budget constraints often limit the ability of federal agencies to meet management targets.
- Secure funding for research and monitoring to evaluate the efficacy of forest treatments and modify them appropriately using an adaptive management framework.
- Coordination, involvement, and support from all land management agencies, as well as from county and community leaders.
- Explore the establishment of an ecosystem services market as a way to support costs of continued restoration and maintenance.

- Appropriate human resources within the Arizona State Forestry Division, such as a tribal liaison position.
- An expanded and sustainable forest products industry in order to achieve forest management goals and objectives.
- Direction for biomass industries. Outstanding questions include: Ethanol vs. pellets vs. direct power generation vs. cogeneration? Will future policies, incentives, and regulations impact the industries and/or promote biomass utilization? What is the role of the Arizona Corporation Commission (state utility regulator)?
- Better information and education about the costs and benefits of prescribed and natural fires.
- An improved private forest resource inventory that will allow resource managers to more accurately assess comprehensive economic and management options. Federal and state land inventories exist, but private land inventories are less common.
- Streamlined process for working across boundaries/ownerships, such as the "Good Neighbor Authority."
- Improved urban forestry inventory and local government capacity to sustain green infrastructure.

In addition to these needs, there are data, information and education needs that can be provided by multiple entities. These include:

- Additional data about forest inventory and forest management, and the ability to share and access that data.
- Better information and education about the costs and benefits of ecosystem management activities including prescribed and natural fires, and forest restoration.
- Value estimates for the numerous non-market benefits that forested lands provide, such as clean water, wildlife habitat, aesthetics, and recreation.
- Economic data on the potential for carbon sequestration projects and associated markets.
- Data that would indicate current and future land use classifications in GIS, and other data that will show future statewide development patterns (zoning information, master planning and development information, land value changes with and without development, values for "adjacency" to forested open space, etc.).
- Data and accurate information about the economic benefits of forest-based recreation and tourism.
- Information about urban forestry: tree inventory, assessment of community tree health, economic data associated with urban forestry benefits (use computer models like USDA Forest Service's UFORE).

Finally, there will be a need to develop collaborative mechanisms to integrate and promote cooperation between the various key partners and stakeholders. These might be councils, committees, and the like that already exist or, more likely, they will need to be developed. It will be critical for all resource elements to participate and contribute to these collaborative mechanisms in order to meet the goals and objectives, and implement the actions, of this *Strategy.*

Connections to State and Private Forestry National Themes

All seven Issues identified in the *Assessment* and the strategies developed to address them in this *Strategy* are connected to the three national themes in the following ways:

Conserve Working Forest Lands

Across the state of Arizona, forests and other open space landscapes are being fragmented and converted for development. Placing an emphasis on understanding and preserving the economic values of working forest lands and integrating them into planning efforts will help in the identification, protection, and maintenance of important forest landscapes.

Protecting Forests from Harm

A healthy landscape has the capacity for renewal and for recovery from a wide range of disturbances while continuing to provide public benefits and ecosystem services. Providing economically viable solutions to forest restoration and management actions will help protect, restore, and sustain forest resources. Two critical aspects of this will be: 1) restoring healthy forest landscapes to achieve acceptable fuel loads that reduce threats to resources and communities from uncharacteristic wildfire, and 2) support existing, and develop new, sustainable wood products industries that can provide the resources necessary to accomplish landscape-scale forest restoration.

Enhance Public Benefits from Trees and Forests

Restoration, conservation, and protection of forest resources will enhance the economic, environmental, and social benefits from trees and forests. This includes urban forestry as well as the management of all forested lands to provide a multitude of benefits to the people of Arizona. This goal recognizes that our nation's federal, state, urban and private forests are the natural backyards for many communities and serve as society's connection to nature. Forest management strategies will conserve and enhance a green infrastructure that effectively connects people and their cultures with the natural environment.

Comparison between the Arizona Strategy and the USDA Strategic Plan FY 2010-2015

The USDA 5-year Strategic Plan was finalized shortly before the completion of this document. The Task Group reviewed the mission statement, vision statement, core values, and strategic goals of the USDA strategy to see how it aligns with the Arizona *Assessment* and *Strategy* . Overall, there is strong alignment between the federal and state documents, and the *Strategy.* Some of the common themes include: 1) using a science-based approach, 2) collaboratively solving forest issues, 3) engaging tribal governments in natural resource management, and 4) restoring declining ecosystems and protecting healthy ones to ensure the nation's lands are resilient to threats and impacts, including climate change.

The objectives for goals 1 and 2 in the USDA Strategic Plan are closely linked to the goals developed for the seven issues in the Arizona *Strategy*. Both documents recognize the importance of protecting critical natural resources; improving economic opportunities, community infrastructure, and environmental health; developing ecosystem services; climate change; working with private land owners to maintain working lands; protecting and enhancing water resources; and reducing the risk of catastrophic wildfire and restoring fire to its appropriate place. Both strategies focus on the need to develop collaborative efforts with all landowners, state and local governments, and all appropriate federal agencies, tribes, and private sector organizations to address natural resource management issues. The documents also recognize the importance of education, technical support, and partnerships.

The chart in Appendix A-3 displays the alignment between the goals in the Arizona *Strategy* and the goals in the USDA Strategic Plan (http://www.ocfo.usda.gov/usdasp/sp2010/sp2010.pdf).

5.2 PEOPLE AND FORESTS

Critical Issue Description

Arizona's population has grown for decades at a tremendous rate, and expectations are for continued growth through mid-century and beyond. This expansion brings people into ever-closer proximity to Arizona's forests – allowing us to garner a broad array of benefits from the forests, yet affecting these ecosystems in many negative ways. What were once remote forest wildlands with occasional visitors are becoming backyards and crowded playgrounds to expanding suburban neighborhoods. People migrating from urban areas are often choosing to live within or adjacent to forests and thus face new challenges such as fire, smoke, forest access, water supply, and land use issues. At the same time, distant metropolitan areas continue to increase demand for some of our forest's most precious commodities.

Introduction

People have been relating to, and dependent on, forests for thousands of years. Forests of all kinds provide significant ecosystem services important for society. Forests are responsible for much of our nation's primary production--the conversion of sunlight into life-giving energy. Forests build soils and protect them from erosion. They also absorb 10% of the carbon dioxide that Americans emit each year. It has been estimated that the forested lands of Arizona contribute nearly 90% of the total stream flow in the state, in addition to providing unknown quantities of water to underground aquifers. Forests shelter fish and wildlife, and offer aesthetic beauty and spiritual renewal for people. Forests bolster our economy through recreation and tourism, through the creation of green jobs, and through the production of wood products, fuelwood, and other energy products. Forests are part of our cultural heritage as Americans; they are a national treasure to be protected and preserved for generations to come.

There are four key elements related to this issue:

1. Healthy forest ecosystems are ecological life-support systems. They provide a full suite of goods and services that are vital to human health and livelihood, natural assets known as ecosystem services. Many of these goods and services are traditionally viewed as free benefits to society, or "public goods."
2. Urban and community forests form the green infrastructure system upon which many communities depend, while at the same time conversion of forestland to urban and suburban uses-- development and sprawl--depletes natural forestland.
3. Globally, it is estimated that almost 20 percent of human-caused carbon emissions are from deforestation. In Arizona, though numbers are likely much smaller, deforestation-type impacts occur through loss of forests to stand-replacing fire, land development, and other forested land use changes. Finding ways to reduce the rate of deforestation globally, and similar impacts in Arizona, could have substantial benefits in reducing human-related carbon emissions as well as sequestering carbon in forested ecosystems.
4. Recreation pressures on public lands will increase as private and state trust lands are developed. As opportunities for recreation are reduced on these lands due to Arizona's rapidly expanding population, public lands will be relied on more heavily to provide recreation opportunities.

Priority Areas

Focus areas for the People and Forests issue are identified in the *Assessment* and mapped in Figure 4. These focus areas were used as the initial priority areas for this issue. Additional criteria that will be used to refine priority areas, or identify additional priority areas, include:

- Areas with high recreational use.
- Areas of wildland/urban interface (WUI) or forested areas with high development potential.
- Forest landscapes impacted by the socio-economic threats to working forests, such as the loss of private forest lands to residential, commercial, and industrial development.
- A combination of overlays that show areas of: critical resource value, forest health issues, fire risk, areas where private land conversion would most likely contribute to significant fragmentation, etc.
- Urban forest areas or mapping of communities engaged in Tree City USA or other community forestry work.

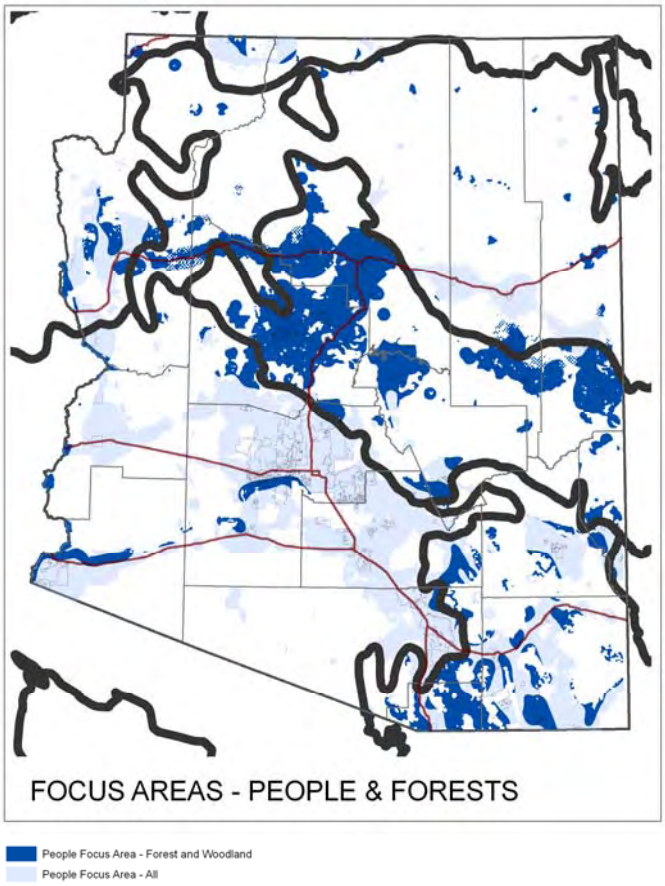

Figure 4.

Goals, Objectives, and Actions

The Strategy Team identified two goals, seven objectives, and 24 action items to address the People and Forests issue (see People & Forests Strategies Matrix). Goals were designed to enhance the benefits people receive from trees and forests, and to reduce the negative effects of people on trees and forests. Objectives were designed to:

- Improve understanding of the benefits of trees and forests, and engage people in environmental stewardship.
- Enhance urban and community trees, and improve energy conservation through tree planting and maintenance.
- Better manage recreation impacts on forests.
- Minimize forest loss and fragmentation from development.

Resources – Existing and Needed

Existing Resources:

- Arizona State Forestry Division (ASFD) staff and consulting foresters provide assistance to private landowners and other entities.
- Arizona and local non-governmental conservation organizations (e.g., Greater Flagstaff Forests Partnership, The Nature Conservancy).
- State universities and institutes provide science-based support and other resources.
- Local Natural Resource Conservation Districts provide technical assistance.
- Committees and councils (e.g., Arizona Forest Stewardship Committee, Governors Forest Health Council, and Arizona Community Tree Council).

Resource Needs:

- Appropriate human resources within the ASFD, such as a Tribal Liaison position.
- Involvement and support from community leaders.
- Better information and education on the costs and benefits of ecosystem management activities including: prescribed and natural fires; forest restoration; marketable value for the numerous benefits that forested lands provide, such as clean water, wildlife habitat, aesthetics, and recreation.
- Economic data on the value of ecosystem services (need data to show the valuation of these services so they can be promoted and included in land management planning decisions).
- Data and accurate information on the economic benefits of forest-based recreation and tourism.
- Information on urban forestry: tree inventory, assessment of community tree health, economic data associated with urban forestry benefits (use computer models like USDA Forest Service's UFORE).

Key Partners/Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Arizona Community Tree Council
- Arizona Forest Stewardship Council
- Environmental and conservation non-governmental organizations
- Recreation associations and groups
- County supervisors, managers, planning and zoning committees
- Municipal mayors, council members, managers, planning and zoning commissions
- Developers, builders and related associations
- Governor's Forest Health Council
- State universities
- USDA Forest Service

People and Forests

Goal 1:	People and communities receive maximum benefits from Forests and Trees.	
	Objectives	*Arizona Actions*
	Objective 1: Connect people to trees & forests and improve their understanding of the benefits provided by Arizona's forests.	Develop and implement educational programs for county and community leaders, schools, and civic groups to increase public awareness regarding the benefits of sustainable trees and forest ecosystems, and impacts of urban heat islands, impervious surfaces, and other forest resource issues.
		Improve access to forests and trees for recreation, education, and other uses.
		Develop and maintain data such as street-tree & canopy-cover inventories, as well as research on the interaction of people with forests, to improve knowledge of the benefits provided by forests and trees.
		Expand collaborative efforts with academic organizations and schools to strengthen environmental education of Arizona youth.
	Objective 2: Enhance urban and community forests	Maintain and update the Urban & Community Forestry one- and five-year plans to increase benefits from urban forests.
		Engage communities, tree organizations, conservation groups, and green industry groups to identify local community needs and build local capacity.
		Identify, fund, and encourage partnerships to facilitate stewardship in urban tree protection and planting programs.
		Promote and support Tree City USA , Tree Campus USA, Tree Line USA and similar programs.
		Encourage and conduct educational outreach that empowers communities and schools to sustain and enhance forests and urban canopy programs.
		Educate community leaders on urban forest issues, including tree ordinances, development standards, and the need to support urban forest infrastructure.
		Work with the Arizona Community Tree Council and communities to plant area-specific, drought-tolerant trees.
	Objective 3: Improve energy conservation through tree planting and maintenance.	Promote and facilitate development of urban forestry policies, ordinances, development standards, tree canopy standards, and best management practices to protect and maintain valuable tree assets.
		Increase tree planting aimed at energy conservation in accordance with the American Forests tree canopy recommendations.
		Promote Tree City USA and similar programs to communities and continue to expand collaborative efforts with groups like Arizona Community Tree Council to educate communities on the energy benefits that trees provide.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

People and Forests

Goal 2: Minimized negative human impacts to trees and forests.	
Objectives	*Arizona Actions*
Objective 1: Increase awareness of threats to Arizona's forests - and awareness of available tools to mitigate those threats.	Engage state and federal agencies, land trusts, and other conservation partners to increase awareness about threats to Arizona forests and trees.
	Develop and maintain education materials, programs, and outreach to increase awareness of available tools to address forest threats.
	(See Ecosystem Health Strategies)
Objective 2: Engage people in environmental stewardship activities.	Increase awareness, coordination, and landowner participation in technical & financial assistance programs.
	Implement reforestation, afforestation, and forest health improvement projects to enhance forested ecosystems.
Objective 3: Manage recreation impacts on forests	Participate in and support public land travel management planning and implementation and other efforts to manage impacts of outdoor recreation.
	Strengthen Off-Highway Vehicle (OHV) education and enforcement efforts.
Objective 4: Minimize forest fragmentation from development.	Work with state and local governments on policy development and program implementation to protect forest ecosystems from fragmentation.
	Utilize land exchange, conservation easements and fee title purchase programs (i.e. Land & Water Conservation Fund, Wetlands Reserve Program, Farm & Ranchlands Protection Program, Forest Legacy Program, etc.) to consolidate ownership and prevent fragmentation of forest lands.
	(See Ecosystem Health Strategy - Goal 1, Objective 5)

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

5.2 ECOSYSTEM HEALTH

Critical Issue Description

Evidence of their declining health, function and sustainability is readily apparent throughout the forest ecosystems of Arizona. Dramatic signals of unraveling ecosystems include large, uncharacteristic crown fires; effects of prolonged drought; excessive fuel buildup; vegetative loss from insects and tree pathogens; and widespread decreases in the biodiversity of both plants and animals. Evidence-based ecological research indicates that some Arizona ecosystems are very different from historic conditions. These changes include alterations in nutrient cycling, decreases in understory species diversity, increases in exotic species, and disruption of natural fire regimes. It is essential that we accurately identify the reasons for decline in the health of forest ecosystems and respond appropriately.

Introduction

Ecosystems must be accurately identified to enable science-based strategies to be implemented at an accelerated pace on a landscape scale. Defining and assessing the health of complex ecosystems is not easy. Ecosystem health issues result from human activity, are brought to light because of human concerns, and are addressed through human intervention. Indicators of healthy ecosystems include: 1) biological diversity, 2) biotic integrity and resilience, and 3) supporting human needs and uses. These three indicators accurately reflect the biological, physical, and human dimensions required for sustaining ecosystems.

Indicators used to assess components of ecosystem health:

- Uncharacteristic wildfire
- Forest insects and pathogens
- Ecosystem integrity and resilience
- Increased introduction of invasive/exotic species
- Changes in forest diversity and structure
- Changes in wildlife diversity
- Human needs and uses (i.e., ecosystem services)

Characteristics of a properly restored ecosystem include:

- Reduction of unnatural levels of insect and diseases
- Enhanced native plant and animal diversity
- Maintain habitat essential for the survival and recovery of threatened and endangered species
- Improved watershed function
- Decreased invasive species
- Natural fire regimes maintained
- Significant reduction of unnatural crown fires
- Sustainable forest vegetative structure and ecosystem function
- Provides a wide range of ecosystem services
- Historical disturbance regimes (e.g. fire, wind, insects, disease) return to their natural role within the ecosystem.

Priority areas

Focus areas for Ecosystem Health are identified in the *Assessment* and mapped in Figure 5. These focus areas will be used as the initial priority areas for this issue. The following considerations should be used to refine priority area designations:

- Most forested ecosystems in Arizona are experiencing critical levels of habitat decline and some ecosystems have been destroyed from impacts such as stand-replacing wildfire. We must be expedient in implementing ecological restoration in order to protect remaining ecosystems.
- Critical forest ecosystems at elevations above 4,000 feet are at risk and must be prioritized using strong, science-based ecological restoration principles. This will enable critical ecosystems to receive priority treatment.
- Forest ecosystems below 3,000 feet and urban forests statewide must be evaluated using the best available science to enable proper treatment.
- Protecting aspen stands and riparian habitat, and promoting their regeneration.
- All forested ecosystems in Arizona that are adjacent to communities and are within the WUI have issues from potential wildfire impacts and recreational uses of the forest.

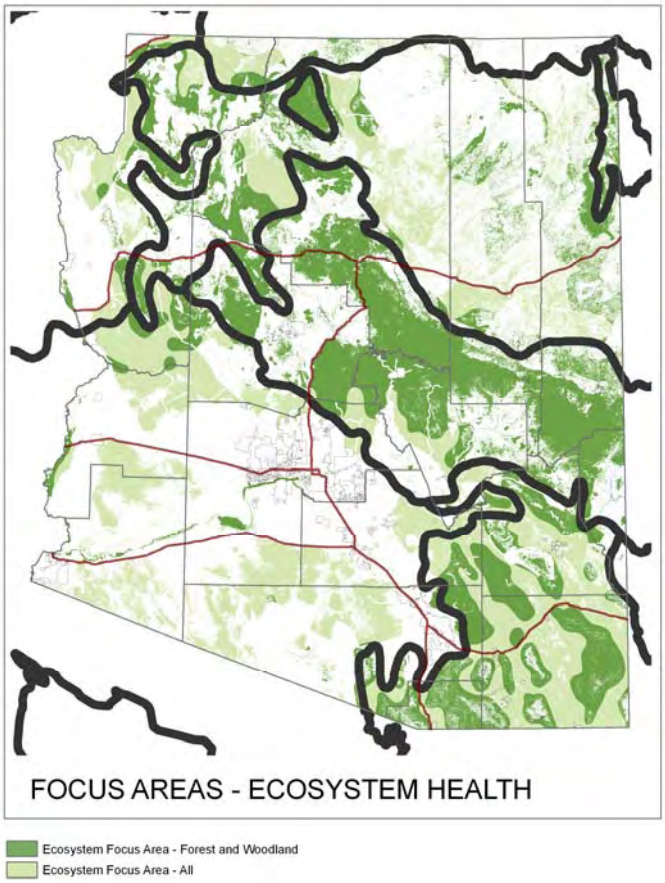

Figure 5.

- Several threatened, endangered, and sensitive species rely on healthy forests as important habitat.
- Management of game species (elk, deer, etc) at sustainable levels.
- Forested landscapes with a vegetative structure and characteristics that are conducive to stand-replacing crown fire must receive priority consideration for treatment.
- Land-use patterns and policies that increase fragmented ownership and constraints to ecological restoration and health must receive priority for revision.
- Priority areas for treatment are those where previous treatment effects are still viable. Capture the investment where possible and where restoration objectives can be achieved or maintained.

Goals, Objectives, and Actions

The Strategy Team identified three goals, eight objectives and 36 actions to address the Ecosystem Health issue (see Ecosystem Health Strategies Matrix). The goals are general in nature because they must be applicable in most, if not all, ecosystems statewide. Objectives provide a clear assessment of measurable outcomes focused on restoring or maintaining the health, resiliency, and sustainability of forest ecosystems.

To ensure accurate assessment of ecosystem health has been determined, land managers must first evaluate historic trends to determine the natural range of variability, establish and monitor reference conditions, determine appropriate treatment prescriptions, and work to mitigate potential factors or influences (wildfire, insect and disease, invasive/exotic species, etc.) that may preclude successful management decisions. Effective monitoring and adaptive management strategies are essential to ensure ecosystems-at-risk can be restored.

Specific actions in achieving healthy, resilient, and sustainable ecosystems include the following objectives:

1) Continue to develop strong collaborative support for focused management practices across integrated landscapes, such as forest restoration, fuel reduction, wildlife habitat and population management, and treatments to control exotic pests and invasive plants
2) Protect, conserve, and enhance wildlife and fish habitat; improve habitat for selected species
3) Identify and conserve unique high-priority ecosystems and landscapes
4) Identify and monitor threats to forests and ecosystem health
5) Protect forests and other high priority ecosystems from fragmentation and conversion
6) Restore ecologically unhealthy forests, deserts, and grasslands impacted by disrupted fire regimes, forest pest outbreaks, land management practices/uses, and exotic invasive species
7) Restore frequent-fire regimes as part of forest restoration measures
8) Integrate collaborative, science-based planning processes and public education into restoration programs and projects
9) Allow natural agents of ecological change to operate freely in wilderness, such as allowing lightning-caused wildfire to play a more natural role. All other uses allowed in wilderness will be managed to preserve wilderness character and value.

Resources – Existing and Needed

Existing Resources

- Use existing agency plans and assessments to determine resource management options.
- Strong collaborative support for focused management practices across integrated landscapes, such as forest restoration, fuel reduction, wildlife habitat and population management, and treatments to control exotic pests and invasive plants.

Resource Needs

- Develop and implement effective training, education, and outreach programs to inform landowners, government officials, and the general public about the benefits of resilient ecosystems.
- Develop and use the well-educated cadre of forest management professionals in Arizona to address forest threats across all lands in the state.
- Provide adequate levels of funding to vegetation management and fuel treatments.
- Develop and implement collaborative action plans to address needs of unique, high-priority Arizona ecosystems that are interrelated with Arizona forest resource issues and programs. These ecosystems include: riparian areas, urban and community forest systems, deserts and

grasslands adjacent to forests, areas threatened with type conversion by invasive plants, and other mixed-vegetation systems.

- Integrate federal, state, university, and other diagnostic/research resources to support surveillance and detection efforts focused on delineating priority treatment areas and identifying science-based treatment needs.
- Develop a contingency plan for the potential ecological impacts of climate change.
- Reduce hazardous fuels and reduce stand densities of unsustainable, post-settlement trees.
- Develop and implement integrated landscape-scale restoration, community protection, wildlife habitat and population management, and fire management strategies for forests across jurisdictional boundaries.
- Federal and state land management agencies should collaboratively develop an integrated process to design and strategically place treatments in order to increase efficiency, maximize benefits, and limit the negative impacts of wildfire.
- Adequately restore forest structures through mechanical or prescribed fire treatments to ensure landscapes are compatible with frequent-fire regimes.
- Implement forest management activities that will allow for reestablishment of frequent, low-severity fire as a key process in forested ecosystems, including increased use of prescribed fire following mechanical thinning and increased management of wildland fires for restoration objectives on appropriate lands.
- Develop and use a collaborative science-based, multi-entity process to help make decisions about properly designing and implementing restoration projects within the social and political framework.
- Develop funding mechanisms for the successful implementation of all aspects of ecosystem restoration activities and education projects.

Key Partners/Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Collaborative organizations involved with ecological restoration
- State universities, research organizations, Southwest Ecological Restoration Institutes (SWERI), NGOs, local government officials
- USDA Forest Service

Ecosystem Health

Goal 1:	Resilient and diverse forest ecosystem structures, processes, and functions.	
	Objectives	*Arizona Actions*
	Objective 1: Protect, conserve and enhance ecological integrity, in order to maintain sustainable forest ecosystems, preserve ecosystem services and avoid public safety hazards associated with large scale catastrophic events.	Continue to develop strong collaborative support for focused management practices, such as forest restoration, fuel reduction, wildlife habitat and population management, and treatments to control exotic pests and invasive plants, across integrated landscapes.
		Develop and implement effective training, education and outreach programs to inform landowners, government officials and the general public about the benefits of resilient ecosystem process and functions. Develop and utilize a well educated cadre of natural resource professionals in Arizona, to address forest threats across all lands in the state.
		Provide adequate levels of funding allocated to vegetation and fuel treatments.
	Objective 2: Protect, conserve, and enhance wildlife and fish habitat	Coordinate with the Arizona Game and Fish Department, US Fish and Wildlife Service, and others to identify and implement best management practices related to wildlife and fish habitat.
		Encourage adoption of collaborative Wildlife Principals developed by the Arizona Forest Health Council for integrating wildlife habitat and biodiversity conservation with restoration, community protection, and fire management activities. (see SS 2.5.1)
		Support implementation of Arizona's State Wildlife Action Plan wherever possible.
	Objective 3: Identify and conserve unique high priority ecosystems and landscapes.	Identify and refine understanding of unique high priority Arizona ecosystems that are interrelated with Arizona forest resource issues and programs. These include aquatic systems, urban and community forest systems, deserts, grasslands, areas threatened by conversion by invasive plants, and other mixed-vegetation systems .
		Identify and encourage collaborative partnerships between agencies and organizations with overlapping or coincident responsibilities and interests.
		Develop and implement collaborative action plans to address needs of unique high priority Arizona ecosystems.
		Support implementation of action plans to address unique high priority ecosystems.
		Develop and implement practices to limit the spread of exotic invasive species such as Buffelgrass and others.
	Objective 4: Identify and monitor threats to forests and ecosystem health.	Support development and maintenance of ongoing inventory, monitoring, and detection efforts on all Arizona forestlands and other high priority ecosystems.
		Integrate federal, state, university and other diagnostic/research resources to support surveillance, and detection efforts focused on delineating priority treatment areas and identifying science based treatment needs.
		Develop a contingency plan for the potential ecological impacts of climate change.
	Objective 5: Protect forests and other high priority ecosystems from fragmentation and conversion.	Identify and utilize resources to work with state and local governments on policy development and program implementation to protect ecosystems from fragmentation.
		Identify opportunities for Land exchanges with federal agencies and other groups.
		Identify/develop and disseminate developmental guidelines/ policies for forested areas.
		Work with non-traditional partners to identify policy needs and bridge identified gaps.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Ecosystem Health

Goal 2:	Progress toward landscape scale outcomes, restoration of unhealthy ecosystems, and enhanced sustainability with limited negative impacts	
	Objectives	*Arizona Actions*
	Objective 1: Restore ecologically unhealthy forest, desert and grasslands impacted by current fire regimes, insect & disease outbreaks, land management practices/uses, and exotic invasive species.	Use science-based approaches to evaluate, understand and protect against the negative impacts of existing and emerging threats such as climate change, insect and disease outbreaks or land use changes on forest health and public safety, including the build up of hazardous fuel conditions and resulting fire behavior.
		Reduce hazardous fuels and reduce stand densities of unsustainable post-settlement trees, to prevent catastrophic losses from bark beetles and wildfire.
		Encourage adoption of collaborative Wildlife Principals developed by the Arizona Forest Health Council for integrating wildlife habitat and biodiversity conservation with restoration, community protection, and fire management activities. (see SS 2.5.1)
		Develop and implement integrated landscape-scale restoration, community protection, wildlife habitat, population management, and fire management strategies for forests across the state.
		Develop land-use policies and practices that support restoration, community protection, and fire management efforts.
		Federal and state land management agencies should collaboratively develop an integrated process to design and strategically place treatments in order to increase efficiency, maximize benefits and limit negative impacts of insect & disease outbreaks, invasive plants & wildfire.
		Best Management practices should be implemented to limit the spread of exotic invasive species during restoration and fire management activities.
		Develop incentives and an ethic of personal safety to support sustainable maintenance of fuel treatments.
		Increase coordination of forest restoration, fire management, and community protection planning and implementation across jurisdictional boundaries.
		Encourage development of integrated long-term restoration, wildlife management, and fire management plans for all federal, state, and tribal lands. (see SS 2.2.8)
	Objective 2: Restore frequent fire regimes as part of forest restoration measures.	Adequately restore forest structures through mechanical or prescribed fire treatments to ensure landscapes are compatible with frequent fire
		Implement forest management activities that will allow for reestablishment of frequent, low-severity fire as a key process in forested ecosystems, including increased use of prescribed fire following mechanical thinning and increased management of wildland fires for restoration objectives on appropriate lands
		Planners should work with developers to incorporate appropriate buffer zones, based on anticipated fire hazard, public safety, and wildlife habitats into the design of new developments to allow for maintaining of conditions in adjacent forests and grasslands where natural or prescribed fires may continue or be introduced. (see SS 2.2.4)
		Utilize state and local codes, planning options, laws and regulations, and Growing Smarter legislation to address fire risk at the landscape scale. (see SS 2.2.7)
	Objective 3: Integrate collaborative, science based, planning processes and public education into restoration treatments	Develop and utilize a collaborative, science-based, multi-entity process to facilitate decisions on properly designing and implementing restoration projects within the social and political framework.
		Facilitate the sharing of all data and analyses from all ownerships to assist natural resource agencies, county and city managers, and stake holders in planning and implementation of forest restoration activities. Development of a central repository or clearinghouse of information should be investigated
		Undertake educational and outreach activities to increase awareness and understanding of the benefits of addressing forest health issues.
		Develop funding mechanisms for the successful implementation of all aspects of ecosystem restoration activities and education projects.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

5.3 WATER & AIR

Critical Issue Description

Water is arguably Arizona's most precious resource. Because forested watersheds produce a large proportion of the state's water supplies, proper forest management is essential to protect the quantity and quality of water supply for municipal, industrial, and agricultural uses as well as for riparian ecosystems that provide habitat for the broadest diversity of species in Arizona. Natural climate variability and global climate change have resulted in persistent drought for the past decade. Temperature increases have led to earlier spring runoff and loss of water storage. The challenge of forest management going into the future will be the wise use of practices that lessen the impacts of climate change through watershed management strategies that help to ensure adequate, good-quality water supplies for agriculture, industry, people, and the environment.

Clean air, often taken for granted, is another precious resource. Arizona's forest lands play an important role in maintaining and enhancing air quality. Trees modify the atmosphere by absorbing carbon dioxide and producing oxygen; clear the air by filtering dust, ash, pollen, and smoke; intercept wind; provide shade; and moderate air temperature. However, forest management activities and fires can have negative effects on air quality by producing excessive smoke and releasing other particulates into the atmosphere. Careful planning and coordination are needed to improve forest management activities to limit smoke impacts and improve air quality.

Introduction

Compared to most of the nation, water is scarce in Arizona. Average annual precipitation during the past 30 years has ranged from less than 3 inches in the driest deserts to as high as 25-40 inches at higher elevations, with half the state receiving less than 10 inches and ponderosa pine forests receiving between 20 and 30 inches. Not only is average precipitation lower than most other parts of the country, the timing and amount of precipitation received annually is highly variable. In this setting, watershed protection, enhancement, and conservation are extremely important. Forests enhance watershed conditions and, in turn, water quality by stabilizing soils and reducing erosion. Trees bind the soil; absorb or deflect the downward fall of rain, snow, sleet, and hail; filter toxins from water; and reduce runoff, flooding, and sediment deposit after storms. A dependable supply of clean water is imperative for Arizona's agricultural uses as well as for the state's six million citizens and millions of visitors.

Arizona's forests also enhance air quality in several ways. Trees modify the atmosphere by absorbing carbon dioxide (providing a sink for carbon) and producing oxygen, and clear the air by filtering dust, ash, and smoke (especially in urban areas). They also intercept wind, provide shade, and moderate air temperature. Conversely, Arizona's forests contribute to reduced air quality when smoke is produced by wildfires and other management activities, especially prescribed burning.

Priority Areas

Focus areas for Water are identified in the *Assessment* and mapped in Figure 6. These focus areas were used as the initial priority areas for this issue. They include impaired waters/critical focus areas (8-digit hydrologic units), focus basins (4-digit hydrologic units), and priority landscapes. Additional criteria that will be used to refine priority areas, or identify additional priority areas, include:

- Presence of threatened, endangered, or sensitive aquatic, wetland, or riparian species
- Occurrence of springs, wet meadows, riparian areas, lakes, or perennial stream flow
- Soil properties and susceptibility to erosion
- Slope and aspect effects on evapotranspiration and snow sublimation.

Focus areas for Air are identified in the *Assessment* and mapped in Figure 7. These focus areas were used as the initial priority areas for this issue. They include areas of concern (Class 1 Areas, populated areas with high sensitivity, and PM-10 Non-Attainment Areas), focus airsheds, and priority landscapes within each airshed.

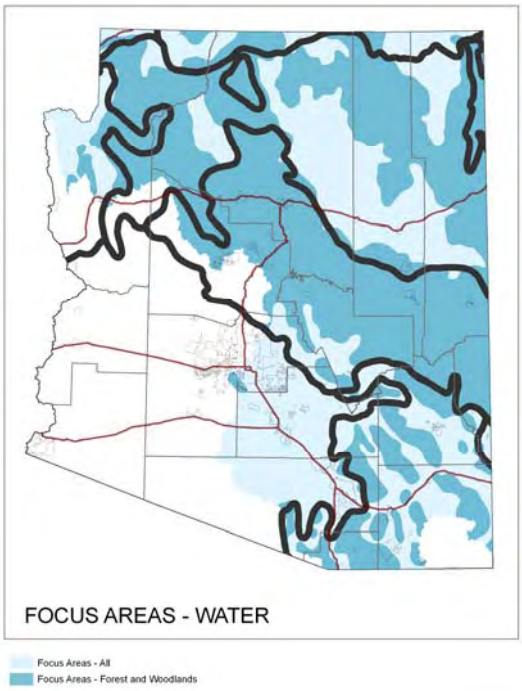

Figure 6.

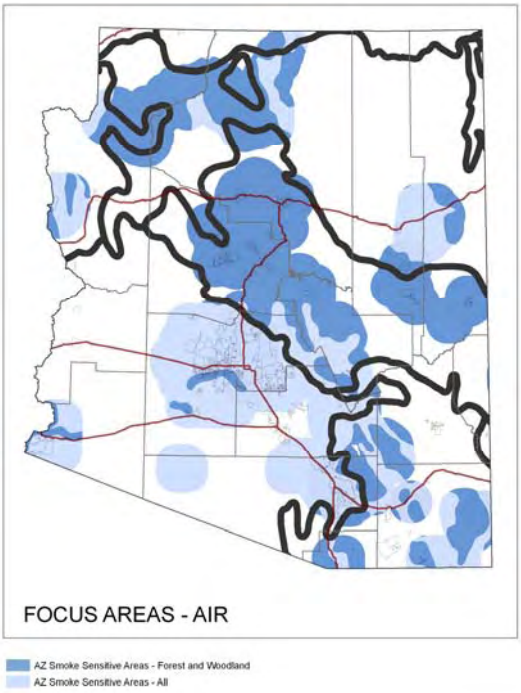

Figure7.

Goals, Objectives, and Actions

The Strategy Team identified three goals, six objectives, and 18 actions for Water (see Water Strategies Matrix). The basic approach is to improve water quality and quantity, improve the health of wetland ecosystems, and increase public understanding of water quality issues. This will be accomplished through a variety of measures, such as:

- Development of restoration and fire management strategies
- Application of Best Management Practices (BMPs)
- Rigorous monitoring to evaluate the efficacy of forest restoration practices
- Coordinating implementation of management plans to insure protection of sensitive aquatic habitat
- Locating or re-locating infrastructure away from critical aquatic systems and wetlands
- Protecting native vegetation and supplementing it through plantings
- Developing education and outreach materials and programs to communicate with community groups and leaders, schools, and the general public about water issues
- Engaging citizens, community groups, and non-profit organizations in watershed and riparian activities.

The Strategy Team identified two goals, five objectives, and 18 actions for Air (see Air Strategies Matrix). The basic approach is to improve air quality and increase public understanding of the effects of fire on air quality. This will be accomplished through a variety of measures, such as:

- Coordinating large-scale forest treatments statewide
- Designing fire management and implementation activities to effectively manage and monitor the intensity and duration of smoke impacts
- Developing integrated planning efforts to achieve desired outcomes from fire treatment
- Developing and coordinating the use of educational and outreach materials that describe the benefits of prescribed fire and its relationship to air quality as well as the smoke impacts from wildfire in untreated forests.

Resources – Existing and Needed

Existing Resources

Federal, State and Tribal agencies that have existing staff dedicated to the management of forest, water and air resources:

- Arizona Department of Water Resources
- Arizona Department of Environmental Quality

Private organizations that participate in water- and air-related resource issues, for example:

- Arizona Hydrological Society
- Friends of the San Pedro River
- Friends of the Santa Cruz River
- Friends of the Rio de Flag
- Oak Creek Watershed Council
- Salt River Project
- Show Low Creek Watershed Enhancement Partnership
- Trout Unlimited
- Verde Watershed Association

Resource Needs:

- Identity and fund lead organizations to carry out riparian, spring, and wet meadow restoration projects.
- Identify and dedicate resources for an organized, collaborative program for water and air outreach, education, and volunteer recruitment and direction.
- Review and update Tribal, State and National Forest System policies to support forest restoration goals and objectives for protection and enhancement of water and air resources.
- Consistent with policy, develop guidance documents for practices (BMPs) to protect water and air resources and oversight mechanisms should be established to ensure the application of best management practices.
- Engage significant water users, such as ranchers and forest recreationists, in the stakeholder process.
- Organize and fund regional consultants in watershed processes, aquatic ecology, hydrogeology, soil science, air quality, prescribed fires, etc. Forest managers could consult with these experts when planning forest management prescriptions.

Key Partners/Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Arizona Department of Water Resources
- Arizona Department of Environmental Quality

Water (Water & Air)

Goal 1:	Improved water quality and quantity from forested watershed	
	Objectives	*Arizona Actions*
	Objective 1: Collaboratively protect and enhance water quality and quantity of forested watersheds.	Work collaboratively to identify and develop restoration and fire management strategies for watersheds of critical importance across the state. (see SS 3.1.6)
		Collaboratively identify or develop best management guidelines (BMG) .
	Objective 2: Maximize positive impacts of forest treatments on water quality.	Maintain or improve Soil Quality through use of best management practices: properly design, place, build and retire forest roads, use appropriate fire practices to remove duff and reestablish vegetative ground cover.
		Maintain or improve Hydrologic Function and Watershed Health by designing forest thinning prescriptions to optimize snow pack accumulation and runoff and by managing understory vegetation through periodic burning.
		Support State, Federal, and other programs that provide funding for treatment within watersheds; encourage additional funding to address watershed health.
		Appropriately monitor activities within watersheds.
	Objective 3: Minimize negative impacts from wildfire in watersheds of concern.	Develop and implement fire management strategies within watersheds of concern to minimize negative impacts

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Water (Water & Air)

Goal 2:	Improved health and resiliency of forested aquatic systems (riparian areas, springs, and wet meadows.)	
	Objectives	*Arizona Actions*
	Objective 1: Manage impacts of forest management activities within aquatic systems.	Utilize best management practices and guidelines within aquatic systems.
	Objective 2: Restore aquatic systems, and improve water availability.	Coordinate implementation of management plans to insure protection of aquatic systems.
		Use Best Management Practices for the location, construction, operation and maintenance of transporation systems within aquatic systems.
		Encourage and protect existing native vegetation and supplement with native vegetation plantings where appropriate.
		Use Best Management Practices for the location, construction, operation and maintenance of water improvements within aquatic systems.
		Restore natural spring discharge by removing outdated improvements where possible.
		Coordinate with agencies and lessees that manage water improvement projects.

Goal 3:	Increased public understanding of the importance of forests to Arizona's water quality.	
	Objectives	*Arizona Actions*
	Objective 1: Collaboratively develop information and education materials on watershed and riparian issues.	Develop education materials such as brochures and public service announcements about watershed and riparian issues.
		Collaboratively develop common watershed and riparian messaging for use by all agencies.
	Objective 2: Collaboratively develop and implement outreach and education programs on watershed and riparian issues.	Develop outreach programs to communicate with community groups and leaders, schools, and the general public.
		Identify appropriate funding support to implement outreach and education programs.
	Objective 3: Encourage Public involvement	Develop and implement programs to engage non profit organizations in watershed and riparian cleanup and planting activities.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Air (Water & Air)

Goal 1:	Improved air quality.	
	Objectives	*Arizona Actions*
	Objective 1: Enhance urban and community forests (See People & Forests Strategy)	(See People & Forests Actions)
	Objective 2: Maintain or Improve health of existing forest lands (See Ecosystem Health Strategy)	Coordinate large scale forest treatments.
	Objective 3: Improve coordination of smoke management related to wildland fire and forest restoration treatments. (Arizona Enhanced Smoke Management Program)	Develop GIS map data of smoke sensitive airsheds and areas for use by land managers, fire mgt organizations, and the national Wildland Fire Decision Support System (WFDSS).
		Develop improved *Smoke Management Program* monitoring capabilities including the use of technology such as particulate monitors and real-time cameras.
		Develop and utilize improved fuel modeling to better predict fire behavior and inform emission calculations.
		Support the Arizona Interagency Coordination Group in improving communication and coordination between land management agencies in regards to air quality issues.
		Assist ADEQ and other partners in reviewing and updating smoke management program as needed.
		Improve smoke monitoring processes, communication, and coordination on resource management activities including wildland and resource
		Continue to improve smoke management database and technologies.
		Seek various funding, information, training, and technology alternatives to assist agencies in addressing urgent smoke impacts.
	Objective 4: Reduce negative impacts of forest treatments on air quality.	Pursue strategies to utilize wood fiber, where practical, prior to burning on site. (See FIRE Strategy)
		Work with interagency partners to design and implement reintroduction of fire adjacent to communities (to manage intensity, duration and timing of smoke emissions from fire management activities.)
		Design fire management and implementation activities to effectively manage the intensity and duration of smoke impacts.
		Develop integrated planning efforts to achieve desired outcomes from fire, utilizing CWPP's, and fire and land management plans considering private landowner and community objectives.

Goal 2:	Increased public understanding of the importance and effects of fire on Arizona's air quality.	
	Objectives	*Arizona Actions*
	Objective 1: Enhance public outreach & education regarding fire management and air quality.	Develop interagency educational materials for distribution on the benefits of prescribed fire and its role in the ecosystem and good management practices in regards to air quality.
		Provide interagency public service announcements in regards to wildland and prescribed fire and their relationship to air quality issues.
		Coordinate key messages with other cooperators and stakeholders to ensure timely and effective messages are provided.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

5.4 FIRE

Critical Issue Description

Fire in Arizona is a complex issue. Recent trends show increasing size and severity of wildland fire occurrence, and increasing costs in fighting and managing these fires. Although fire is necessary in many forest types, it can occur as desirable fire, undesirable fire, or as a managed tool for achieving and sustaining desired ecological conditions. Fire is a key process in many forest ecosystems, but reestablishing natural fire regimes where appropriate remains an ongoing challenge. At the same time, protecting the safety of citizens and other important values--communities, infrastructure, and habitat for imperiled species--are critical concerns. A fundamental challenge facing Arizona is maximizing the many benefits of fire while reducing its significant costs.

Introduction

Fire is an essential natural process that helps maintain forest ecosystem health. Land managers use fire because it is a cost-efficient resource tool. They apply fire through either prescribed burning (planned ignitions) or by managing wildland fires (along with appropriate suppression) for resource benefit. However, uncontrolled fire creates a significant threat to both human and biological communities. Moreover, wildland fires (unplanned ignitions) cost land management agencies hundreds of millions of dollars annually to suppress.

Smoke is often an unwelcome byproduct of fires—planned or unplanned. Wildfires produce significant amounts of particulates and gasses to the atmosphere. While wildfire smoke is often difficult to manage, smoke management for all prescribed burning events and some multiple-resource-objective wildfires is a primary factor in determining how much, when, and where such fire is allowed. In addition to temporarily reducing air quality, prescribed burning and wildfires can also decrease visibility and contribute to negative impacts on individuals with respiratory conditions or certain health concerns. Given that there are significant differences in the amount and quality of emissions from wildfires and from second or third re-entry maintenance burns for ecosystem health, land managers would prefer to create smoke under optimum conditions to maximize dispersal and minimize impacts.

National and state land managers are constantly assessing the potential for catastrophic fire and planning how to prepare for and manage it. By implementing appropriate steps to reduce the fuel hazard around communities and other values at risk, they reduce the threat. By developing and implementing community wildfire protection plans, local governments have been doing their part to reduce risk and prepare citizens and infrastructure. Many citizens have also protected private property by adopting FireWise building standards and creating defensible space around their homes. Because we have chosen to live and recreate in fire-dependent ecosystems, preparation and protection at all levels is essential.

Priority Areas

The focus areas for Fire are identified in the *Assessment* and mapped in Figure 8. These focus areas were used as the initial priority areas for this issue. Criteria used to refine priority areas or identify additional priority areas include:

- Fire-dependent landscapes where the natural fire regime has been greatly disrupted = Fire Regime Condition Class of 2 and 3
- Forested landscapes that are at high risk of catastrophic wildfire = Wildfire Hazard Severity of Extreme
- Communities and critical infrastructure at risk from wildfire = Communities at Risk.

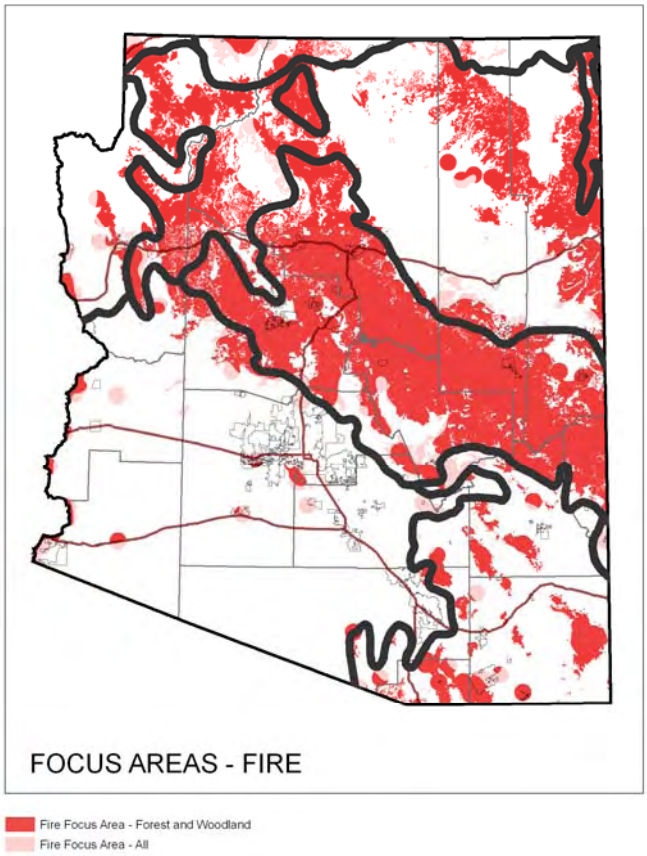

Figure 8.

Goal, Objectives and Actions

The Strategy Team identified four goals, 10 objectives, and 37 actions for the Fire issue (see Fire Strategies Matrix). The four identified goals were developed to:

- Bring attention to ecosystems that are no longer functioning in a healthy state due to historic fire suppression strategies
- Assist communities that are at risk from catastrophic wildfire
- Establish additional fire response capacities within agencies that have responsibility for wildfire suppression
- Provide adequate information and education to the public and government officials on fire management and suppression.

Resources – Existing and Needed

Existing Resources

- Land management and other fire suppression agencies that have staff and resources to suppress wildfires.
- Community wildfire protection plans have been developed for most areas with communities at risk.
- Federal grant funds continue to be available for fuels treatment and plan development for state and private land.
- Cooperative efforts among a broad spectrum of stakeholders have been successful in leveraging limited resources for fire suppression and management.

Resource Needs

- Agency budgets need to be stabilized to allow land management agencies to be proactive in approaching planning and land treatments.
- More personnel and resources to work with private landowners.
- More personnel and resources to provide adequate wildfire suppression response.
- Additional training for wildland firefighters.
- Continuing support for the Arizona Wildfire and Incident Management Academy.
- Continuing support of research for wildfire and prescribed fire effects.
- Development of additional industrial capacity to utilize biomass from treatment areas.
- Smoke and poor air quality from prescribed burning must be addressed by working with ADEQ to stay within the state's identified requirements.
- Use prescribed natural fire and/or planned ignitions help restore natural habitat diversity and for other resource benefits.
- Provide fire management with the support services necessary to sustain resource yields while protecting improvements and investments, and providing for public safety.
- Return fire to its natural role in the ecosystem, where possible.
- Improve the awareness and education of private property owners that the combustibility of their property is their responsibility; thousands of private property owners should be provided site-specific recommendations on reducing combustibility.
- Establish and maintain fire-safe zones around critical infrastructure.
- Promote life safety.
- Continue to accomplish work in high fuel and fire hazard areas.

Key Partners and Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Organizations like the Ponderosa Fire Advisory Council, Rural Communities Fire Management Partnership
- Fire departments, fire districts, and fire management organizations
- Arizona Interagency Coordination Group
- All federal agencies involved in fire management – USDA Forest Service, Bureau of Land Management, National Park Service, Bureau of Indian Affairs, US Fish and Wildlife Service.

Fire

Goal 1:	Wildland ecosystems where appropriate fire regimes maintain health and resiliency of natural vegetation	
	Objectives	*Arizona Actions*
	Objective 1: Manage forest structure to restore fire regimes and minimize negative impacts from unwanted wildfire (recognizing the diversity of federal, tribal, state and private landownership in Arizona).	Fuel reduction treatments. Reduce excessive fuel loading to prepare fire adapted landscapes for historic fire regimes through fuel treatment activities.
		Strategic placement of treatments. Design fuels treatments strategically on the landscape to effectively reduce fire risk.
		Encourage collaborative long-term forest restoration and fire management planning by all land managers. (see SS 2.2.8)
		Provide adequate resources for planning & resource support during implementation of fire management strategies.
		Restore impaired ecosystems through mechanical treatments and use of fire to achieve desired effects and sustained natural fire regimes.
	Objective 2: Use appropriate application of fire to meet resource and community protection objectives	Develop integrated planning efforts to achieve desired outcomes from fire, utilizing CWPP's, and fire and land management plans considering private landowner and community objectives.
		Utilize fire in fire adapted ecosystems, ensuring acceptable intensities, timing and duration of treatments.
		Avoid management use of fire in areas where it will establish or encourage unwanted invasive species.
	Objective 3: Use best available science to define appropriate levels (acceptance) of fire for different ecosystems or vegetation types:	Conduct research to define appropriate timing and acceptable fire intensities in various ecosystems.
		Conduct research to define requirements for post fire re-habilitation.
		Conduct research to Identify appropriate use of fire and other management actions in areas populated with invasive species.
		Support Firescape and similar programs to Increase all lands fire management knowledge and expertise.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Goal 2:	"Fire Adapted Communities" that provide shared stakeholder responsibility for healthy landscapes and wildfire prepared communities.	
	Objectives	*Arizona Actions*
	Objective 1: Assist communities in planning for and reducing wildfire risks.	Encourage development and implementation of CWPP's or equivalent plans in areas at high risk of wildfire. (see SS 2.4.1 & SS 3.1.7)
		Build leadership capacity and support dedicated personnel to sustain implementation of CWPPs and other community wildfire planning.
		Design and implement effective restoration and fuel treatment activities in the Wildland Urban Interface to meet community protection objectives.
		Integrated and collaborative development of implementation plans (CWPPs, FMP's, etc) for an all-lands approach should be considered wherever appropriate. (see SS 2.3.1)
		Develop consistent fire hazard classifications for all developed and undeveloped lands using standard assessment methods. (see SS 2.2.1)
	Objective 2: Design and implement effective smoke management strategies and protocols. (see AIR Strategy)	(See AIR Strategy Actions)
	Objective 3: Develop additional fire adapted communities that meet Firewise standards and support increased local scale implementation.	Support adoption of Wildland/Urban Interface development codes by Counties and communities. (see SS 2.2.2 & SS 2.2.3)
		Promote and implement Firewise USA Communities and Ready-Set-Go Programs to increase public awareness and encourage local level responsibility. (see SS 5.2.1)
		Provide GIS and WUI assessment training, equipment, and support to local communities to build local capacity.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Goal 3: Enhanced wildland fire management capacity in Arizona		
	Objectives	*Arizona Actions*
	Objective 1: Increase Firefighting Response Capabilities and Efficiencies	Provide adequate fire preparedness and suppression funding to maintain firefighter and public safety and provide for private property and natural resource protection .
		Collaborate with Federal, State, local and private partners to study and implement most efficient utilization of existing firefighting and fuel treatment resources.
		Build additional initial and extended attack fire suppression and fuel treatment capacity.
		Develop more accurate statewide wildfire reporting/statistical cause database
		Utilize new technologies in firefighting and dispatch systems to increase efficiencies.
	Objective 2: Assure adequate Wildland and Prescribed Fire Training is provided to all necessary personnel.	Develop and maintain statewide wildland training needs database.
		Develop NWCG qualified firefighting and prescribed burn personnel within the Arizona fire departments and various state and local agencies, through formal training and on-the-job task book completion.
		Provide adequate financial support for wildland fire training opportunities within the State (Arizona Wildfire Academy, weekend workshops, community colleges)
		Develop processes and methodology for local firefighting agencies to gain OJT wildland experience to improve skills.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Goal 4:	An Arizona public and government leadership that is well informed about wildland fire management, science, and prevention issues.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and deliver Arizona specific educational information and tools to increase citizens and community awareness of wildland fire issues and preparedness.	Collaboratively develop and maintain Arizona specific information, educational materials , and common messages about wildland fire to help residents of forest and other communities understand the risks inherent in living in fire-prone areas, and to educate developers and the community about steps that can be undertaken to reduce exposure to fire hazard and to improve forest health. (see SS 2.3.1 & SS 5.1.1)
		Collaboratively develop and maintain programs and methodologies for delivery of information about wildland fire issues and activities. (see SS 2.3.1 & SS 5.1.1)
		Use current technology to provide up to date educational information (social networking sites, websites etc).
		Collaboratively develop and maintain an organized cadre of trained individuals to provide educational opportunities to communities and the general public.
		Identify adequate resources (fiscal and other) to support ongoing fire education materials and programs.
	Objective 2: Increase government leadership awareness of wildland fire preparedness and appropriate actions.	Develop and maintain specific wildland fire materials for outreach to federal, state, county, and local government officials.
		Develop and implement a plan to inform federal, state, county, and local officials on Arizona wildland fire preparedness and other fire issues.
		Provide adequate funding to support government leadership outreach materials and program maintenance.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

5.5 ECONOMICS

Critical Issue Description

Forests have always contributed to Arizona's economy and quality of life. Historically, forests provided an abundance of natural resources--forage for cattle and sheep, trees for lumber, firewood, mine timbers and railroad ties, game for consumption, and water for irrigation and municipal uses. Arizona's forests sustained a timber industry that helped fuel a century of rural development. Although tourism, watershed protection, and evolving forest management goals have more recently provided new challenges for rural and state economies, the importance of forests to Arizona's economy has not changed. Forests remain the economic and aesthetic foundation of many rural communities. Today, Arizonans demand more goods and services from our forests than ever before, and balancing these demands presents ongoing management challenges as we strive to ensure long-term forest sustainability.

Introduction

Arizona forests sustained a timber industry that helped support a century of rural development. In the 1990s, changes in economic conditions, environmental concerns, an overall reduction of large trees, and a shift to recycled paper at the last pulp mill caused a sharp decline in the logging industry. The low value of non-commercial timber has required government agencies to pay loggers for thinning small-diameter trees and removing woody biomass (hazardous fuel reduction).

Tourism, second home development, watershed protection, and evolving forest management goals have recently provided new challenges and opportunities for local and regional economies. The primary importance of forests to Arizona's economy is shifting from logging and resource extraction to amenity-based values. Forests remain the economic and aesthetic foundation of many rural communities. Declining ecosystem health has adversely affected economic conditions, primarily from threats associated with wildland fire activity. The importance of developing infrastructure, sustained employment opportunities and markets for the by-products of forest restoration is critical in maintaining forest-based economic sustainability.

Priority Areas

The focus areas for Economics are identified in the *Assessment* and mapped in Figure 9. These focus areas were used as the initial priority areas for this issue. Additional criteria that will be used to refine priority areas, or identify additional priority areas, include:

- Forest resources that are most beneficial (nearest, least cost, etc.) to the operation of existing sawmills and biomass utilization facilities
- Forest landscapes that would be most beneficial to the development of new, large-scale wood products industry--one that could address the costs to federal agencies for ramping up to landscape-scale restoration
- Areas that contribute to the economic recovery and/or support of local communities and/or regional entities
- Forest landscapes that can contribute to future economic challenges and opportunities: renewable energy production, displacement of fossil fuels, energy conservation, reduced/increased carbon sequestration, climate change

- Forest land affected by the socio-economic threats to working forests from the loss of private forest lands to residential, commercial, and industrial development
- Areas of greatest recreational use
- A combination of overlays that show areas of critical resource values, forest health issues, fire risk, areas where private land conversion would most likely contribute to significant fragmentation issues, etc
- Mapping urban forest areas, communities engaged in Tree City USA, or other urban forestry work. This would be combined with analysis that ranks needs for urban forestry: heat sinks, air pollution, and energy consumption. Use computer models (American Forest's CityGreen; USDA Forest Service's UFORE and STRATUM) to evaluate the functional value of trees in cities

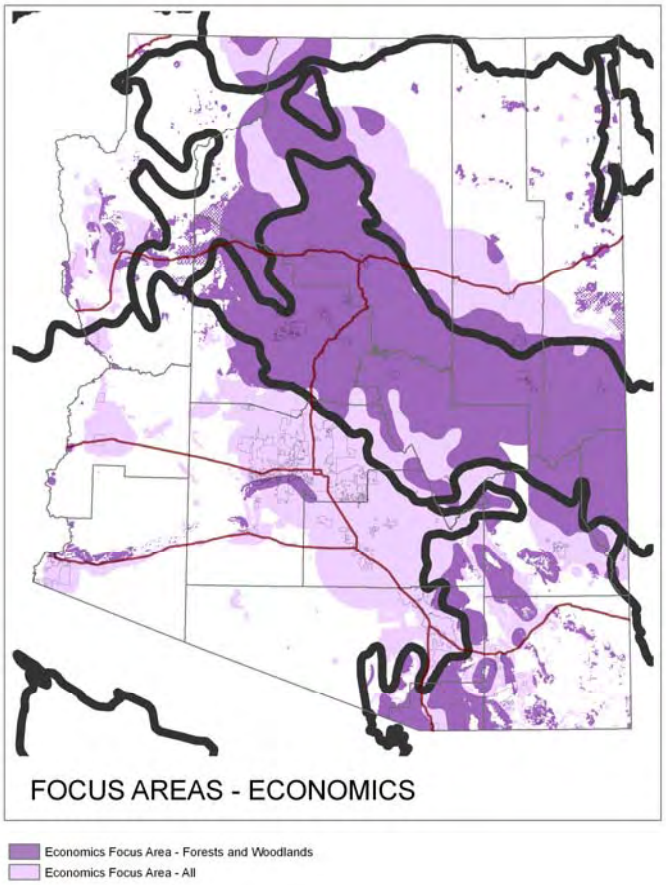

Figure 9.

Goals, Objectives, and Actions

The Strategy Team identified three goals, 11 objectives, and 39 action items for Economics (see Economics Strategies Matrix). The main goals were focused on:

- Realizing the long-term potential of developing sustainable forest products/bioenergy industries
- Protecting those areas with economic development potential related to ecosystem services
- Expanding community recognition about the importance of establishing and protecting healthy ecosystems.

The main objectives were designed to:

- Develop innovative, appropriately scaled, and sustainable industries that will facilitate economically feasible (i.e., reduce costs and increase income) forest restoration efforts and provide economic support in the form of jobs, increased tax base, and multiplier effects to communities
- Expand and support the continuation of multi-agency, collaborative projects that will be conducive to the development and support of a sustainable wood products industry

- Implement industry-supported, landscape-level forest treatments to maintain healthy forest conditions while sustaining and promoting economic benefits currently derived from these forested landscapes. Find ways to develop and support a rural green economy (ecosystem services)
- Develop, prioritize, and focus programs in communities that will experience significant urban growth to enable them to expand, improve, and protect their communities while integrating the important economic contributions made by forest ecosystems and natural areas that will be impacted
- Recognize the diversity of federal, tribal, and private landownership in Arizona and the need to collaboratively work together with other partners to address resource threats (wildfire, insect / disease, land conversion) that threaten and negatively impact critical forest landscapes that are economically important to all Arizonans
- Continue to address economic issues through urban forestry
- Address the economic issues associated with private land management and the associated transfer of private in-holdings for development
- Provide comprehensive program leadership, data and information for a variety of programs to address land management issues associated with the economic contributions, including ecosystem services, of forested landscapes across the state
- Recognize and promote the economic benefits of "avoided costs" on state and local budgets by enhancing ecosystem health and community and urban forests.

Resources – Existing and Needed

Existing Resources

- Arizona non-governmental economic development organizations like the Northern Arizona Wood Products Association and Southwest Sustainable Forests Partnership.
- State universities and institutes that provide science-based support and other resources.
- Natural Resource Conservation Districts that provide technical assistance and funding for practices.
- Forest products and logging industries.

Resource Needs

- An expanded forest products industry is essential to achieve forest management goals and objectives.
- Direction for biomass industries. Outstanding questions include: Ethanol vs. pellets vs. direct power generation vs. cogeneration? Will future policies, incentives, and regulations impact the industries and/or promote biomass utilization?
- Economic data about the potential for carbon markets and other ecosystem services. We need the data to show the valuation of these services so they can be promoted and included in land management planning decisions.
- Data and accurate information about the economic benefits of forest-based recreation and tourism.
- Information about urban forestry: tree inventory, assessment of community tree health, economic data associated with urban forestry benefits (use computer models like USDA Forest Service's UFORE).
- Additional information about forest product options and a potential wood products industry within the state (an expanded wood supply study).

- Economic analysis data about what it would take to develop expand and maintain a sustainable wood products industry that would facilitate forest management goals and objectives across the state.

Key Partners / Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Forest products and logging industries
- Nurseries
- USDA Forest Service

Economics

Goal 1:	Realized long-term economic potential of sustainable forest products and bioenergy (while achieving Ecosystem Health goals).	
	Objectives	*Arizona Actions*
	Objective 1: Develop policies, plans and incentives to encourage the development and perpetuation of forest products businesses that will diversify the economy and facilitate forest restoration activities.	Continue to identify appropriate programs and policies that will encourage the development and perpetuation of forest products businesses, by coordinating with county and local governments, and state and federal agencies.
		Develop and maintain data about current and potential Arizona economic activity related to wood product industries.
		Convene a biomass working group to coordinate and lead a statewide approach to developing markets, infrastructure, and connecting treatment by-projects to markets.
		Fund staff capacity to assist rural communities convene, recruit and support forest products and bioenergy enterprises.
		Ensure that wood utilization opportunities and challenges are clearly identified in CWPPs and other local and regional planning efforts.
		Encourage land management planning efforts that support a sustainable wood products industry.
		Develop land-use policies and practices that support forest restoration, community protection, fire management efforts and ecosystem services.
		Work collaboratively and strategically to design and place forest management treatments to help facilitate the development of a wood products industry.
		Maintain or increase funding to federal, tribal, and state land management agencies to furnish the capacity essential for collaboratively planning, implementing and monitoring restoration treatments that will support the development and continuance of a wood products industry.
		Develop and support incentive programs that encourage the use of restoration-generated materials by businesses across the state. (see SS 4.2.4)
		Explore federal contracting authorities, permitting policies and other support opportunities to attract and keep viable and appropriate fiber utilization industries that meet multi-level collaborative goals and plans.
	Objective 2: Federal, state, and local units of government should identify and enhance the use of small-diameter wood and biomass generated from forest treatments wherever possible.	Federal, state, and local government entities should use forest restoration treatment-generated material whenever and wherever possible. This includes use of renewable energy sources in new buildings, retrofitting of existing heating systems, and use of treatment by-products for transportation applications such as guard rails, etc. (see SS 4.2.2, SS 4.2.3, SS 4.2.5)
		Data about use of forest restoration treatment-generated material by federal, state, and local governments should be reported, collated, and shared.
	Objective 3: Expand and support the coordination of multi agency, collaborative, large landscape scale forest treatment projects that will be conducive to the development and support of a wood products industry.	Land managers should work with stakeholders to clarify the amount, availability, and location of wood and biomass across the State.
		Identify and enhance opportunities for utilizing small-diameter wood and biomass generated from landscape scale forest treatments.
		Develop presentation materials and information to facilitate funding support for landscape-scale restoration work.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Economics

Goal 2:	Protection of areas with economic development potential related to ecosystem services.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and maintain land use change and ecosystem services data for Arizona	Develop a cooperative multi-agency (natural resource) working group that can share data and prioritize opportunities to jointly focus program delivery to the highest priority landscapes.
		Collect, assess, and maintain data about land use changes across the state - utilizing GIS and/or other technologies.
		Collect, assess, and maintain data about realized and potential ecosystem services throughout Arizona - utilizing GIS and/or other technologies.
	Objective 2: Focus and prioritize programs into communities that will experience significant urban growth, to assist local leaders in devising effective ways to grow, develop, and protect their communities while also integrating important economic contributions made by forest ecosystems and natural areas to be impacted.	Develop and maintain a natural resource assistance network. The network of local, state, federal, public, and private organizations will assist community leaders and landowners with the development and integration of valuable proactive management tools and technical support systems to manage growth and development to conserve, protect, and enhance important natural resources in advance of impending population growth and development.
		Network with community leaders to promote, coordinate, and deliver information that will help community leaders, planners, and emergency response organizations address growth and the preservation of resource areas that are critical from an economic ecosystem services standpoint.
		Increase understanding of the economical value of recreational use of our forests.
	Objective 3: Prioritize / focus program delivery and agency resources into high priority landscapes where resource threats (wildfire, insect / diseases, land conversion) will most likely threaten / negatively impact critical forest landscapes across Arizona.	Develop and maintain data on current and expected resource threats.
		Work collaboratively and strategically to design and place treatments in order to increase efficiency and maximize benefits on these priority landscapes.
	Objective 4: Recognizing the diversity of federal, tribal, state and private landownership in Arizona, maintain and enhance the economic benefits and values of natural resources	Support the development of other emerging voluntary markets including water, habitat and green tourism.
		Promote an understanding of the costs and benefits of all encompassing (watershed and other) property management to provide ecosystem services.
		Encourage relevant ecosystem services capabilities expansion on private land.
		Encourage landowners to use restoration management techniques that result in socially accepted desired future conditons.
		Develop and maintain a natural resource assistance network. This network of local, state, public, and private organizations can assist community leaders and private land owners with the development and integration of valuable proactive management tools and technical support systems needed to address the economic benefits of "working" landscapes.
		Implement research to identify and quantify current and long-term key drivers, barriers and opportunities, for the supply and demand sides of both the forest products and range industries in Arizona.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Economics

Goal 3:	Community recognition of the economic importance to protecting healthy natural systems.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and maintain information about available programs, suitability of lands, and recommendations for greatest benefits and efficiencies.	Continue to monitor stewardship, conservation and resource protection programs and activities, and collaboratively maintain information about priority areas and opportunities.
	Objective 2: Promote economic value of urban and community forests and provide capacity to develop sustainable leadership and programs.	Encourage local and regional collaborative groups to coordinate activities in communities and watersheds at risk.
		Develop Arizona specific guides, tools and plans to assist local and community leaders plan for green infrastructure to increase energy efficiency, consumer patronage and commercial occupancy rates in Arizona's cities and towns.
	Objective 3: Provide comprehensive program leadership, for a variety of programs to address land management issues associated with the high priority landscapes.	Develop a website which incorporates available GIS-based resource data, hazard maps, agency contacts and other pertinent resource management information into a centralized system designed to address land management issues in Arizona. The Initiative would include stewardship, forest health, and wildfire prevention (public awareness and hazard mitigation) guidelines as well as contact information for fire suppression, land management, and other natural resource agencies in the region.
		Develop and distribute fire management, forest restoration, and wildlife habitat and conservation protection Training Modules to educate the public and landowners. These modules could include videos, presentation materials, and brochures on fire prevention, invasive native and non-native plants, and other forest health problems, stewardship, reforestation, wildlife management, ecosystem services, etc.
		Promote employment of professional staff to address local stewardship and resource protection needs in high priority communities and regions.
		Provide training sessions and public workshops (i.e., Resource Management Expos) with a variety of stakeholders to promote forest stewardship, forest health, and wildfire management.
	Objective 4: Recognize and promote the economic benefits of "avoided costs" on state and local budgets through enhancing ecosystem health and community and urban forests.	Build sustainable urban and community forestry programs that are a part of the core infrastructure of a community - benefiting air quality, heating and cooling cost and improved water quality.
		Promote personal and community investment in Fire Adapted communities resilient to wildfires.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

5.7 CLIMATE CHANGE

Critical Issue Description

Arizona's climate has experienced wide swings in temperature and precipitation for thousands of years. A naturally variable climate has given rise to changes in fire frequency, wide variation in flood and drought severity, and has influenced native population shifts throughout the region. Recent changes in temperature and precipitation over several decades, caused in part by human activity, have increased the severity of forest insect outbreaks and have contributed to some of the largest wildfires in Arizona's history. While climate has always been variable over time, rapid climate change creates cascading effects of tree mortality, increased disturbance frequency and severity, and shifting zones of suitable habitat that could dramatically alter Arizona's forested landscapes.

Introduction

Arizona is characterized by a rich climatological record that scientists have been able to extract from tree rings and river and lake sediments. This high-quality temperature and precipitation timeline extends back almost 1,000 years. This long-term record indicates that precipitation and temperature have varied widely through time, and have influenced vegetation, rivers, and the use of this landscape by humans.

It is now widely accepted that the interior western United States has recently experienced higher temperatures than other parts of North America, and Arizona is consistently warmer than many other areas when comparing the last decades' average temperatures to the past 100-year average. While the global average temperature has risen one degree Fahrenheit over the past 150 years, Arizona and other parts of the Southwest have risen more than 2°F.

The impact of this temperature rise has been documented in several areas important to the structure and function of forested ecosystems. With rising temperatures, wildfires have become more frequent, have started earlier in the spring, have lasted longer, and have become more resistant to control. Also, spring snowmelt has started earlier, with streams running earlier than historic records.

Priority Areas

The focus areas for Climate Change are identified in the *Assessment* and mapped in Figure 10. These focus areas were used as the initial priority areas for this issue. Additional criteria that will be used to refine priority areas, or identify additional priority areas, include:

- Areas experiencing significant long-term change in temperature or precipitation
- Areas experiencing significant biotic changes linked to long-term changes in precipitation or temperature
- Areas where computer modeling or other scientific information indicates future long-term changes in temperature, precipitation, and vulnerable species or communities.

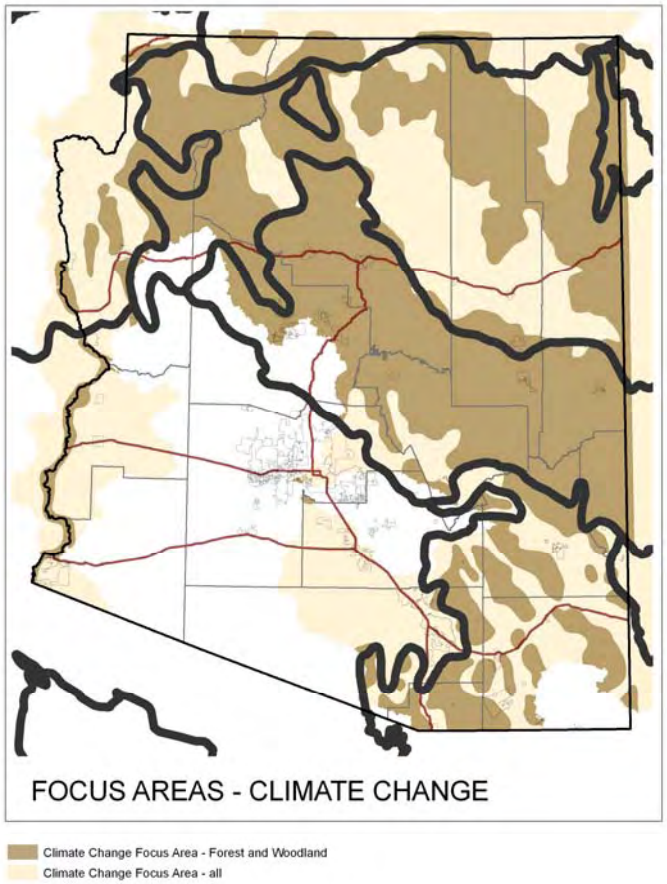

Figure 10.

Goals, Objectives, and Actions

The Strategy Team identified three goals, eight objectives, and 17 action items for Climate Change (see Climate Change Strategies Matrix).

The three major goals address helping Arizona's forests cope with climate change. They focus on:

- **Activities that land and water managers can do to increase the resilience of forests to climate change.** Reducing the impacts of existing threats or impacts is the first step toward improving the ability of Arizona's forested ecosystems to respond favorably to anticipated climate changes. Ongoing assessments of existing forest conditions and factors that impact forest conditions will identify threats where they occur and assist landowners and managers in identifying strategies that will reduce threats and improve forest conditions across all lands. Adaptation plans use condition-and-threat assessments along with empirical studies and experts' opinions to develop adaptive strategies that have the greatest likelihood of improving conditions for ecosystems that require assistance.
- **Forests have the capacity to absorb carbon dioxide or sequester carbon through the process of photosynthesis, and humans have the opportunity to reduce the rate of carbon release and improve the rate of carbon sequestration by plant species through management activities.** Loss of carbon through the uncontrolled or uncharacteristic burning of forests by wildfire can be

mitigated or reduced through forest thinning activities and controlled burning in fire-adapted ecosystems, and through fire suppression in systems that are not fire-adapted. Carbon sequestration can be increased through management activities that increase growth rates of plants, for example by thinning coniferous forests, and maintaining adequate water in riparian forests to optimize growth and reproduction. Biomass utilization is also considered a viable mitigation strategy when sustainable sources of biomass are used, because using a renewable source of energy can replace a non-renewable or fossil source of energy such as coal or petroleum. Thus, the amount of petroleum that is replaced by the equivalent amount of renewable biomass is *offset* by or mitigates that amount of carbon that would have been emitted by the non-renewable source.

- **Citizens of Arizona will need to understand the relationship between climate and environment, and that changes in the climate have impacts on Arizona's forests.** The Southwest is fortunate to have an abundance of solid, long-term research conducted by credible scientists. This body of knowledge is available to many people, but not all of the data and results are readily available in a non-technical format understandable by Arizonans. It will be increasingly important for the long-term health of Arizona's forests for scientists to provide well-documented reports about how a changing climate affects forests, and what people can do about it. It is also important to realize that there is uncertainty surrounding climate research, and related uncertainty about what should be done. However, this uncertainty provides an opportunity to keep vigilant and track ecological change through focused research and monitoring of the results of our management efforts. It is also important to draw parallels between climate effects on ecosystems, and climate effects on human communities and infrastructure.

Resources – Existing and Needed

Existing Resources:

- AGFD, USFS, NPS, USFWS and other agencies have mandates to incorporate climate change into their plans and activities.
- Report of the Governor's Climate Change Advisory Council.
- The Nature Conservancy is addressing climate change by:
  - Reducing emissions from deforestation
  - Helping natural areas adapt to the impacts of climate change
  - Supporting policies to reduce emissions.

Resource Needs:

- Develop assessment tools, guidelines, benchmarks for determining what constitutes healthy or desirable forest conditions.
- Methods to evaluate the impacts of climate change on forest ecosystems, and their response.
- Outreach programs to increase public awareness of climate change and its implications.
- Funding to conduct monitoring for benchmark establishment and assessment of observed change

Key Partners/Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Arizona Department of Environmental Quality
- Arizona Department of Water Resources
- Arizona Department of Agriculture
- Arizona Game & Fish Department
- U.S. Environmental Protection Agency
- U.S. Department of Energy
- NOAA National Weather Service
- U.S. Forest Service
- U.S. Geological Survey
- National Park Service
- Fish & Wildlife Service
- Bureau of Land Management
- The Nature Conservancy
- University of Arizona-Tree Ring Lab
- CLIMAS-Climate Assessment of the Southwest-University of Arizona

Climate Change

Goal 1:	Increased resilience of ecosystems to climate change.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and maintain threats analysis for Arizona's forests and other high priority ecosystems using the best available scientific information,	Develop threats assessment information on current and expected effects of climate change to Arizona forests and other ecosystems . Place focus on potential negative impacts to ecosystem health, impacts to water quality and quantity, and changing wildland fire behavior.
		Maintain up-to-date threat assessment and impact information.
		Identify and secure resources to support development and maintenance of ongoing assessment work.
	Objective 2: Develop adaptation plans for Arizona's forests and other high priority ecosystems to increase resilience to climate change.	Encourage an all lands approach to land, water, and fire management through effective and efficient collaboration.
		Collaboratively develop statewide adaptation plan utilizing best information available.
		Identify resources to facilitate high priority statewide management actions.
	Objective 3: Manage and restore trees, forests, and high priority ecosystems to mitigate effects and adapt to global climate change.	Implement identified collaborative statewide actions.
	Objective 4: Support urban and community forestry programs to increase resiliency to climate change.. (see People and Forests Strategies)	(See People & Forests Actions)

Goal 2:	Reduced rate of future climate change through maximized carbon sequestration in Arizona forests and trees.	
	Objectives	*Arizona Actions*
	Objective 1: Support landowners and land management practices which implement high quality mitigation practices that reduce carbon loss.	Increase opportunities for biomass and other wood product utilization.
		Improve opportunities for certification of carbon sequestration and wood products on all lands.
	Objective 2: Support achievement of appropriate fire regimes to maintain health and resiliency of natural vegetation (See Fire Strategies)	(See Fire Actions)
	Objective 3: Support continued research to understand the effects of forest management on sequestration.	Identify and pursue opportunities to improve understanding of climate change science.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Climate Change

Goal 3:	Broad public and community understanding of climate change science - Arizona's variable climate and current and future impacts.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and maintain science based reports and materials specific to Arizona that document the state of knowledge for climate exposure; species, community and watershed vulnerability; forest adaptation strategies and their effectiveness, as well as effectiveness of strategies focused on increasing carbon sequestration.	Develop and maintain materials to address recent climate change and how it affects ecological systems and human infrastructure.
		Develop and maintain materials to address the relationship between water and riparian forests, and conifer forest watersheds and water yield to rivers, creeks, and reservoirs.
		Provide scenario analysis of both plausible climate changes, and potential outcomes for riparian areas, grasslands, and forests. Use scenarios to describe potential management effects, e.g. measurable effects to riparian systems based on increased or decreased water consumption scenarios.
	Objective 2: Develop outreach and education programs to disseminate information about climate change science to the public and community leaders.	Identify collaborative partner agencies and organizations.
		Collaboratively develop a statewide outreach and education plan.
		Identify appropriate resources to implement outreach and education activities.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

5.8 CULTURE

Critical Issue Description

Human cultures and Arizona's forests have been interdependent for more than 10,000 years. During this time, forests have provided human cultures with a variety of resources including shelter, building materials, wild game, water, seasonal fruits and seeds, ceremonial plants, medicines, minerals, land for farming and grazing, and a place of spiritual renewal. Human interaction with, and dependence on, forests will continue to be influenced by the specific set of values, norms, and beliefs held by different cultural groups. While there are many shared beliefs, values and uses across cultural groups, there are also distinct differences that require a balance among competing interests. While challenging, the integration of an array of cultural values in the management of our forests represents a more holistic approach and helps increase the interaction and collaboration between groups.

Introduction

Merriam-Webster defines culture as "*a: the integrated pattern of human knowledge, belief, and behavior that depends upon the capacity for learning and transmitting knowledge to succeeding generations, and b: the customary beliefs, social forms, and material traits of a racial, religious, or social group*."

Restoration and sustainable management of our forested ecosystems go beyond integrating the best available biophysical science into planning activities. Rather, they necessitate an acknowledgment that a) humans are inextricably connected to the natural world, b) values and perceptions associated with forests vary across location and cultural group, and c) when a cultural group develops an emotional attachment--a sense of place--to a specific location, they are more likely to have an opinion and concern for a given management action in that area.

It is important to recognize that there are always variances in individual and group behavior and cultural norms. There are many groups (Native American, Hispanic, Asian, Afro-American, Pacific Islander, etc.) that should be considered when developing forest management policies and activities. No single analysis can provide a comprehensive review of all variables associated with the formation and expression of cultural attributes.

Priority Areas

The focus areas for Culture are identified in the *Assessment* and mapped in Figure 11. These focus areas were used as the initial priority areas for this issue. Criteria that were used or can be used to define priority areas, or identify additional priority areas, include:

- Areas within Tribal boundaries (reservations).
- Any areas of forest and woodland where cultural resources exist
- Landscapes where various cultural groups indicate a specific attachment or desire to be consulted on management issues and actions
- Areas defined by the mapping of Terrestrial Ecoregions Level III – Arizona, where scientific information indicates high-priority ecosystems

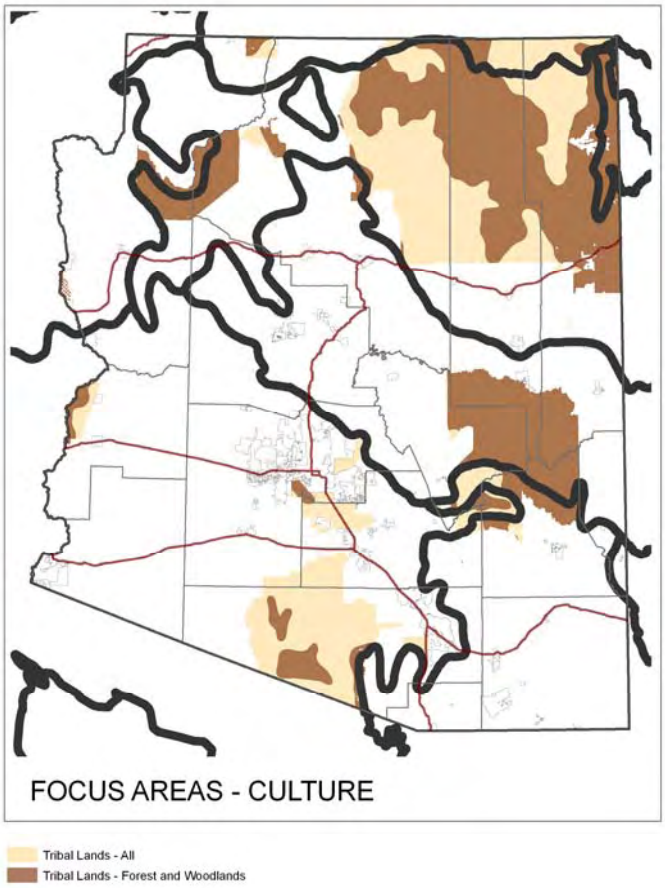

Figure11.

Goals, Objectives, and Actions

The Strategy Team identified two goals, five objectives, and 13 action items were identified for Culture (see Culture Strategies Matrix). The goals were designed to:

- Improve communication between all land management agencies, indigenous tribes, and other cultural groups
- Develop effective collaborative mechanisms for sharing resources, priorities, policies, and management strategies.

The objectives were designed to:

- Build trust, communication networks, and problem-solving strategies between land management agencies and cultural groups
- Improve and develop a broader understanding of various cultures perspectives as they relate to natural resource issues and land management decisions
- Educate all the people involved in land management activities about the role and importance of cultural perspectives in the planning and decisionmaking process
- Where appropriate, share data and implementation strategies to leverage successful outcomes
- Improve information sharing about available resources to address the needs of indigenous tribes and other cultural groups in Arizona.

Resources – Existing and Needed

Existing Resources

- Tribes have staff that can help define and address this issue.
- Federal and State land management agencies have existing staff dedicated to the management of cultural resources.
- Arizona State Historical Preservation Office (SHPO)
- Other resources, such as the Arizona Commission of Indian Affairs and Commerce Department
- Bureau of Indian Affairs

Resource Needs

- Appropriate human resources within the Arizona State Forestry Division, such as a Tribal Liaison position.
- Data from multiple entities about management needs and strategies to address and preserve those culturally significant values associated with forested landscapes across the state.
- Better information and education from multiple entities about the various cultural values and their relationships with forest management activities.

Key Partners / Stakeholders

Many of the partners and stakeholders listed in section 5.1 have a potential role in supporting implementation of this strategy. A few entities stand out as being critical to success:

- Tribes within Arizona
- Representatives for other key cultural groups
- Key state agencies (i.e., State Historic Preservation Office, Commission of Indian Affairs)

Culture

Goal 1:	Improved communication between all land management agencies, indigenous tribes, and other cultural groups about varying perspectives and beliefs related to forests, trees, and other natural resources.	
	Objectives	*Arizona Actions*
	Objective 1: Build trust, communication networks, and problem solving strategies between land management agencies, communities, and stakeholders about the diverse cultural perspectives of forest users and Indigenous Tribes,	Develop adequate tribal liaison staffing within the state and federal natural resource agencies to facilitate the ability to address the cultural perspectives associated with the management and protection of forest resources.
		Facilitate the development of appropriately structured work groups to share information and develop strategies to identify, protect and address cultural issues associated with forested lands and their management.
		Develop a monitoring system to ascertain the effectiveness of strategies developed above. Utilize adaptive management to ensure forest management policy and planning integrates the needs of the state's changing demographics.
	Objective 2: Improve broader understanding of various cultural perspectives as they relate to forest resources, fire management, and other natural resource issues.	Encourage and facilitate improved information sharing by indigenous tribes and diverse cultural groups to inform others about varying natural resource perspectives.
		Expand research on how various cultural groups perceive and interact with the state's forests, trees, and other natural resources.
	Objective 3: Educate the public, government officials, and community leaders about the role and importance of cultural perspectives in restoration, sustainable forest and wood products businesses, fire management, and community protection needs and responsibilities.	Develop and implement an education program for local, state and federal government decision makers, schools, and others about the importance of culture in the forested environment.
		Identify appropriate human and fiscal resources to effectively accomplish public outreach.

Goal 2:	Effective collaboration mechanisms for sharing of information about resources, priorities, policies, and management strategies between Tribes and non-Tribal organizations.	
	Objectives	*Arizona Actions*
	Objective 1: Where appropriate, share data and implementation strategies to leverage successful outcomes on tribal and adjacent lands with similar management objectives.	Enhance collaborative approaches to collection and sharing of data, utilizing existing planning models, leveraging funding sources, and sharing implementation opportunities.
		Recognize or encourage BIA and Tribal management plans and implementation strategies that take an all-lands or collaborative approach.
		Promote development of management plans that are sensitive to culturally significant areas, traditional uses and accessibility to diverse groups (public lands, lands with conservation easements, etc)
		Recognize and communicate tribal implementation of NEPA processes when undertaking forest land management and integrated resource planning.
	Objective 2: Improve information sharing about available resources to address needs of indigenous tribes and other cultural groups in Arizona.	Coordinate collaborative outreach efforts to share information about federal and state resources and programs available to tribes and varying cultural groups.
		Evaluate the need for non-traditional materials and other strategies to improve communication and message delivery.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

6.0 Arizona State Forestry Implementation Strategy

6.1 Introduction to ASFD Strategy

As previously mentioned, an important aspect of the *Assessment* and *Strategy* is the "all-lands" approach; that is, they have been conducted in a collaborative fashion without regard for jurisdiction or management and protection responsibilities. In fact, this approach is critical for successful near- and long-term outcomes on the landscape. Arizona's forests and, in turn, the issues and opportunities associated with them, span jurisdictional boundaries. For a strategy to effectively address those issues and opportunities requires a collaborative approach between agencies, organizations, tribes, and other stakeholders.

Within the framework of State and Private Forestry programs (see section 6.2 ASFD Program Overview below), federal guidance calls for a description of how the state's proposed activities will accomplish national program objectives and respond to specified performance measures and indicators. This ASFD Implementation Strategy identifies actions to be implemented through State and Private Forestry programs to address the same goals and objectives that were articulated in the "all-lands" strategy. Measures to quantify the results of these actions are listed as well.

6.2 ASFD Program Overview

Fire Programs

The ASFD has statutory authority for the prevention and suppression of wildfires on approximately 22 million acres of state and private land. To meet this significant responsibility, the ASFD has developed fire management program partnerships with federal, state, and local agencies. For example, the ASFD builds local fire suppression capacity by providing wildland fire training and equipment to rural fire departments and districts. In turn, the same rural fire departments are capable of providing initial attack services on nearby state and federal jurisdiction lands. The ASFD also supports and builds community partnerships by funding wildland/urban interface grants and by providing Firewise training to local homeowners groups to plan and develop fire-adaptive communities. Listed below are current state and federal fire management programs administered by the ASFD.

Fire Management

State funded, fire-related programs include the following elements:

ASFD Fire Preparedness: Annual pre-season preparedness for wildfires includes developing a statewide fuel condition assessment and fire season outlook, providing wildland fire training, positioning ground and aerial firefighting resources, maintaining state incident management team readiness, and maintaining dispatch/communications support.

Inmate Fire Crew Program: ASFD maintains 12 full-time, 20-person, Type 2, Fire-and-Fuels crews in cooperation with the Arizona Department of Corrections. Crews participate in firefighting and natural resource management work on all lands in Arizona, including federal lands.

Arizona Interagency Dispatch Center: ASFD maintains an interagency fire dispatch center in north Phoenix that provides statewide dispatching for ASFD and local fire department resources, and regional dispatching for the Bureau of Land Management, U.S. Fish and Wildlife Service, and the Bureau of Indian Affairs.

General Fire Management: ASFD staff work in all aspects of fire management efforts, such as interagency coordination and operating agreements, fire response, fire prevention, fuels mitigation, community Firewise, fire training, aircraft, communications, and planning.

Cooperative Fire Programs

Federally funded, fire-related grants administered by the ASFD include:

State Fire Assistance Program: Provides cost-share funding to address critical preparedness needs for firefighter safety, increased initial attack capability, and training. Emphasis is in areas that have developed or are developing Community Wildfire Protection plans. Additional emphasis is placed on improving fire planning, adopting National Incident Management System (NIMS), and developing coordinated responses to wildfires.

Volunteer Fire Assistance and National Fire Plan Volunteer Assistance programs: Provides cost-share assistance to increase the firefighting capacity of rural communities and fire departments. Program emphasizes providing federal excess property firefighting apparatus; purchasing, maintaining, and rehabbing fire equipment; establishment of new fire departments; expansion of current fire departments; and wildland fire training.

National Fire Plan Western Fire Manager Wildland/Urban Interface Grant Program: Provides cost-share funding to address critical hazard mitigation needs in the wildland/urban interface for communities at risk.

Hazardous Fuel Treatments on Non-federal Lands Program: The Hazardous Fuel Treatment on Non-federal Land Program addresses mitigation needs on non-federal lands that link to adjacent U.S. Forest Service mitigation projects to promote landscape-scale treatments. Emphasis is given to areas with an approved Community Wildfire Protection Plan.

Cooperative Forestry Programs

The ASFD is also responsible for implementation of several programs focused on providing assistance to private and other non-federal forest landowners.

Forest Legacy: Protects "working forests," that is, those forests that protect water quality, provide wildlife habitat, forest products, opportunities for recreation, and other public benefits. The program provides protection to working forests by purchasing development rights to the property.

Forest Health Protection: Protects and improves the health of America's rural, wildland, and urban forests through two program areas:

- *Forest Health Management* – Directs and implements measures to prevent, slow, or suppress unwanted native and nonnative insects, pathogens, and plants affecting trees and forests.
- *Forest Health Monitoring* – Studies the forests of Arizona to identify detrimental changes or improvements to forest health.

Western Bark Beetle: Provides cost-share funding for projects that suppress and prevent damage caused to forests by bark beetles.

Invasive Plants: Provides cost-share funding for the control and prevention of invasive plant populations.

Urban and Community Forestry: Focuses on the stewardship of urban natural resources; this consists of partnering with the Arizona Community Tree Council to provide grants to assist towns, cities, and counties to protect and enhance the health of their urban forests. In addition, this program assists communities to improve education and awareness of our urban forests through activities, such as Arbor Day celebrations, Tree City USA recognition, Tree Line USA recognition, and tree care workshops.

Forest Stewardship: Improves and protects private, state and tribal forest lands in Arizona by providing educational and technical assistance to landowners. The program is implemented by service foresters who are available throughout the state to educate landowners and assist them with managing their forest resources to meet their objectives and improve forest health.

Arizona FIRE Map: The Arizona Fuels, Information, Restoration, and Education Mapping and Assessment Program (AZ FIRE Map) is a project being developed by the State Foresters Office and includes a number of potential tools to help track, plan, and prioritize fuel treatment and other forest activities throughout Arizona.

Trust Land Forest Management: Manages 28,000 acres of ponderosa pine forest and hundreds of thousands of acres of woodlands on State Trust lands. This is done in cooperation with the State Land Department, their lessees, and various other state and federal agencies. The primary focus of the program is to implement and maintain treatments that will provide and enhance healthy forest ecosystems.

Western Competitive Grants: Program grants specifically limited to state forestry organizations to focus funding on projects that are a priority to each state within the Federal Cooperative programs. The grant projects must address the State and Private Forestry Redesign national themes:

- Conserve Working Forest Landscapes
- Protect Forests From Harm
- Enhance Public Benefits From Trees and Forests.

Currently the State of Arizona has three active grants within this program. The *Assessment* and *Strategy* will help direct what areas and programs will have a priority in future grant applications.

6.3 ASFD Implementation Discussion and Matrix

The following pages contain brief summaries and detailed ASFD implementation matrixes for each of the 7 Arizona critical forest issues.

People and Forests

The ASFD's role in this strategy issue is in support, collaboration, education, and implementation of cooperative programs that provide benefits to people and communities from trees and forests, and to minimize negative human impacts to trees and forests. Current programs that AFD may use to deliver action items listed in the matrix include Urban and Community Forestry, Tree City USA, Forest Health, Forest Legacy, Forest Stewardship, Western Competitive grants, and Cooperative Fire. The ASFD strategies are to assist communities, local governments, tree councils, forest landowners, and the private sector build capacity in areas such as environmental education, urban tree management, tree planting, energy conservation, tree ordinance development, private forest land management, and promotion of Forest Legacy conservation easements.

People and Forests

Goal 1: People and communities receive maximum benefits from Forests and Trees.

Objectives	*Arizona Actions*
Objective 1: Connect people to trees & forests and improve their understanding of the benefits provided by Arizona's forests.	Develop and implement educational programs for county and community leaders, schools, and civic groups to increase public awareness regarding the benefits of sustainable trees and forest ecosystems, and impacts of urban heat islands, impervious surfaces, and other forest resource issues.
	Improve access to forests and trees for recreation, education, and other uses.
	Develop and maintain data such as street-tree & canopy-cover inventories, as well as research on the interaction of people with forests, to improve knowledge of the benefits provided by forests and trees.
	Expand collaborative efforts with academic organizations and schools to strengthen environmental education of Arizona youth.
Objective 2: Enhance urban and community forests	Maintain and update the Urban & Community Forestry one- and five-year plans to increase benefits from urban forests.
	Engage communities, tree organizations, conservation groups, and green industry groups to identify local community needs and build local capacity.
	Identify, fund, and encourage partnerships to facilitate stewardship in urban tree protection and planting programs.
	Promote and support Tree City USA , Tree Campus USA, Tree Line USA and similar programs.
	Encourage and conduct educational outreach that empowers communities and schools to sustain and enhance forests and urban canopy programs.
	Educate community leaders on urban forest issues, including tree ordinances, development standards, and the need to support urban forest infrastructure.
	Work with the Arizona Community Tree Council and communities to plant area-specific, drought-tolerant trees.
Objective 3: Improve energy conservation through tree planting and maintenance.	Promote and facilitate development of urban forestry policies, ordinances, development standards, tree canopy standards, and best management practices to protect and maintain valuable tree assets.
	Increase tree planting aimed at energy conservation in accordance with the American Forests tree canopy recommendations.
	Promote Tree City USA and similar programs to communities and continue to expand collaborative efforts with groups like Arizona Community Tree Council to educate communities on the energy benefits that trees provide.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Maintain a well-trained and knowledgeable staff that is apprised of current issues, and of techniques, programs and resources available to address these issues.	Forest Health Forest Legacy Forest Stewardship Urban & Community Forestry Cooperative Fire	# of natural resource professionals on staff # person-days of continuing education obtained
Present environmental education programs to community groups & schools to increase understanding of forests and the benefits they provide.	Forest Health Forest Legacy Forest Stewardship Urban & Community Forestry Cooperative Fire	# programs presented
Conduct outreach efforts through informational forums, workshops, and surveys.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Urban & Community Forestry	# forums held # workshops conducted # surveys completed
Provide input to public land planning efforts to balance recreational access with ecosystem health.	Forest Stewardship	# inputs provided
Encourage & assist communities to complete urban forest inventories, and conduct outreach to determine people's understanding and appreciation for urban and rural forests.	Urban & Community Forestry Western Competitive Grants	# community assists # urban forest inventories completed #surveys conducted
Assemble and share available statewide data and research results. Identify gaps and pursue opportunities to improve datasets.	Urban & Community Forestry	Statewide data assembled and shared, Gaps identified, opportunities pursued.
Develop and/or deliver outdoor education programs (e.g. Project Wild & Wild Aquatic, Project Learning Tree, Water Education for Teachers, Wonders of Wetlands, etc.) to increase public knowledge and appreciation of the benefits provided by Arizona's forests.	Forest Stewardship Urban & Community Forestry Western Competitive Grants	# programs developed # presentations # person-hours of training
Implement actions as set forth in the Urban & Community Forestry One-Year and Five-Year Plans. Monitor implementation of Plans and revise as needed / required.	Urban & Community Forestry	Timeliness & documentation of monitoring & revision
Sponsor & facilitate community events & forums to build momentum & focus toward enhancement of urban forest amenities.	Urban & Community Forestry	# events sponsored # forums held # projects designed
Promote the Urban & Community Forestry Challenge Grant program to communities and organizations and encourage them to form partnerships and sustainable capacity .	Urban & Community Forestry	# grants awarded # dollars awarded # projects completed # projects in priority landscapes
Provide potential participants with information on achieving the designations. Provide assistance in achieving the program goals.	Urban & Community Forestry	# of entities enrolled in each program # goals developed / achieved
Deliver educational opportunities to communities & schools to develop their abilities to implement an urban forestry / urban canopy program as set forth by American Forests.	Urban & Community Forestry	# workshops held # person-days training provided # informational news releases & publications # urban canopy projects
Provide information and make presentations to community leaders on urban forest issues, placing emphasis on areas experiencing highest rates of population growth and development.	Urban & Community Forestry	Information provided, Presentations made
Participate in tree planting programs and assemble data on the number and types of trees planted.	Urban & Community Forestry	# trees planted (by type / species)
Provide templates and guidance to communities for development of ordinances, plans, and policies.	Urban & Community Forestry	# of communities assisted # templates provided
Work with ACTC and set yearly tree planting goals. Encourage communities to complete urban tree canopy inventories and work toward planting trees to achieve 25% canopy coverage.	Urban & Community Forestry	# trees planted # acres planted % increase in canopy coverage
Provide communities with information on achieving Tree City USA certification and work with the Arizona Community Tree Council and other organizations to educate community leaders on the energy benefits trees provide.	Forest Health Urban & Community Forestry	# newly certified Tree City USA communities # presentations # workshops held

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

People and Forests

Goal 2: Minimized negative human impacts to trees and forests.

Objectives	*Arizona Actions*
Objective 1: Increase awareness of threats to Arizona's forests - and awareness of available tools to mitigate those threats.	Engage state and federal agencies, land trusts, and other conservation partners to increase awareness about threats to Arizona forests and trees.
	Develop and maintain education materials, programs, and outreach to increase awareness of available tools to address forest threats.
	(See Ecosystem Health Strategies)
Objective 2: Engage people in environmental stewardship activities.	Increase awareness, coordination, and landowner participation in technical & financial assistance programs.
	Implement reforestation, afforestation, and forest health improvement projects to enhance forested ecosystems.
Objective 3: Manage recreation impacts on forests	Participate in and support public land travel management planning and implementation and other efforts to manage impacts of outdoor recreation.
	Strengthen Off-Highway Vehicle (OHV) education and enforcement efforts.
Objective 4: Minimize forest fragmentation from development.	Work with state and local governments on policy development and program implementation to protect forest ecosystems from fragmentation.
	Utilize land exchange, conservation easements and fee title purchase programs (i.e. Land & Water Conservation Fund, Wetlands Reserve Program, Farm & Ranchlands Protection Program, Forest Legacy Program, etc.) to consolidate ownership and prevent fragmentation of forest lands.
	(See Ecosystem Health Strategy - Goal 1, Objective 5)

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Promote participation in the Forest Legacy Program with informational mailings to conservation non-governmental organizations.	Forest Legacy Western Competitive Grants	# informational mailings
Expand Forest Legacy pages of the Arizona State Forestry Division website to be more informative and helpful to those interested in the program.	Forest Legacy Western Competitive Grants	# website improvements # "hits" on Forest Legacy Program webpages
(See Ecosystem Health Actions)		
Strengthen outreach to private forest landowners regarding opportunities for assistance through State & Private Forestry Programs	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# website improvements # fact sheets produced / disseminated # presentations
Expand outreach to Native American tribes with face-to-face contact, interaction, and community assists.	Forest Stewardship Urban & Community Forestry Western Competitive Grants	# face-to-face contacts # community assists
Work with the USDA Natural Resources Conservation Service (NRCS) to improve technical & financial assistance opportunities through NRCS programs (e.g. Environmental Quality Incentives Program, Wildlife Habitat Incentives Program, Wetlands Reserve Program, Conservation Stewardship Program).	Forest Stewardship Western Competitive Grants Forest Health	# assistance opportunities created # landowner assists
Prescribe monitoring activities in Landowner Forest Stewardship Plans, other management plans, and project plans.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# monitoring inputs to Landowner Forest Stewardship Plans, other management plans, and project plans.
Monitor projects & management activities in accordance with monitoring plans & prescriptions.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# projects monitored # acres monitored
Attend public forums and provide comment on public recreation planning efforts.	Forest Stewardship Western Competitive Grants	# efforts commented on
Participate in collaborative initiatives to reduce adverse impacts of recreational use on state & private lands.	Cooperative Fire Forest Stewardship Western Competitive Grants	# initiatives participated in # collaborative projects implemented
Provide input and encourage the incorporation of Urban & Community Forestry elements into comprehensive state, county, and municipal plans that address open space, development, and forest amenities.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Urban & Community Forestry Western Competitive Grants	# planning inputs
Assist with and provide templates for development of ordinances, plans, policies and guidelines	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Urban & Community Forestry Western Competitive Grants	# of assists
Implement the Forest Legacy Program to prevent fragmentation of working forest lands in Forest Legacy Areas in accordance with the Forest Legacy Program Assessment of Need.	Forest Legacy Forest Stewardship Western Competitive Grants	# acres protected # projects completed # conservation strategies advanced
(See Ecosystem Health Strategy: Goal 1, Obj. 5)		

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Ecosystem Health

The ASFD's role in ecosystem health is leveraging all currently available U.S. Forest Service Cooperative Forestry programs with partner agencies and groups to promote restoration, protection, and maintenance of ecosystem health on State and private lands. The ASFD assists in the management of approximately 9 million acres of State Trust Land and also is able to provide technical natural resource management assistance to private and tribal landowners. The ASFD provides this assistance through in-house natural resource expertise, and partnerships and grants. The Forest Stewardship Program, the Forest Health Program, which encompasses the Western Bark Beetle Initiative and Invasive Plants, the Urban and Community Forestry programs, and the Cooperative Fire programs all provide ASFD with potential tools and funding to address ecosystem health action items listed in the attached matrix. Action items will:

- Promote ecosystem health by providing technical assistance to landowners in development and implementation of appropriate land management plans;
- Promote collaboration and funding to landowners, agencies, and natural resource management groups to provide insect and disease assessment, monitoring, education, and treatments;
- Provide opportunities to protect the ecosystem from invasive plant species;
- Promote ecosystem health in our communities through proper management of our urban trees;
- Provide tools and funding to address fire regime restoration, fire adapted communities, planning, and education.

Ecosystem Health

Ecosystem Health

Goal 1: Resilient and diverse forest ecosystem structures, processes, and functions.

Arizona State Forestry Division - Implementation

Objectives	*Arizona Actions*	*ASFD actions*	*Related program(s)*	*Measures*
Objective 1: Protect, conserve and enhance ecological integrity, in order to maintain sustainable forest ecosystems, preserve ecosystem services and avoid public safety hazards associated with large scale catastrophic events.	Continue to develop strong collaborative support for focused management practices, such as forest restoration, fuel reduction, wildlife habitat and population management, and treatments to control exotic pests and invasive plants, across integrated landscapes.	Work with resource management agencies to insure coordinated land management treatments. Management plans should consider other agencies and other landowner management goals.	Western Bark Beetle Initiative & Invasive Plants grants. NFP WUI , Competitive & Stimulus grants, Forest Stewardship	Acres surveyed, treated, monitored and restored.
	Develop and implement effective training, education and outreach programs to inform landowners, government officials and the general public about the benefits of resilient ecosystem process and functions. Develop and utilize a well educated cadre of natural resource professionals in Arizona, to address forest threats across all lands in the state.	Work closely with resource management agencies and educational institutions to provide up to date information on ecosystems to inform the public and governmental agencies	Cooperative Forest Health, Urban & Community Forestry	Training sessions, educational materials, public presentations
	Provide adequate levels of funding allocated to vegetation and fuel treatments.	Work with state and federal agencies to identify funding shortfalls	USFS Forest Health Protection special funding, Western Competitive grants	Grants approved, budgets increased
Objective 2: Protect, conserve, and enhance wildlife and fish habitat	Coordinate with the Arizona Game and Fish Department, US Fish and Wildlife Service, and others to identify and implement best management practices related to wildlife and fish habitat.	Integrate wildlife best manaement practicies (BMP) into state and private resource management plans	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	Plans written
	Encourage adoption of collaborative Wildlife Principals developed by the Arizona Forest Health Council for integrating wildlife habitat and biodiversity conservation with restoration, community protection, and fire management activities. (see SS 2.5.1)	Continue to Integrate wildlife principals into state and private resource management plans	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	Plans written
	Support implementation of Arizona's State Wildlife Action Plan wherever possible.	Work with AZ Game and Fish and other partners to implement State Wildlife Action Plan	Stewardship, Forest Health, Timber mgmt, Coop Grant	BMP's written
Objective 3: Identify and conserve unique high priority ecosystems and landscapes.	Identify and refine understanding of unique high priority Arizona ecosystems that are interrelated with Arizona forest resource issues and programs. These include aquatic systems, urban and community forest systems, deserts, grasslands, areas threatened by conversion by invasive plants, and other mixed-vegetation systems .	Identify priority ecosystems on State and private land. Educate ASFD staff and private landowners on effective ecosystem management.	Cooperative Forest Health, Urban & Community Forestry , Fire and Forest Management	Technical assistance provided, staff trained
	Identify and encourage collaborative partnerships between agencies and organizations with overlapping or coincident responsibilities and interests.	Work closely with Federal, State, Universities, and Environmental organizations involved in ecosystem management.	USFS Forest Health Protection, Forest Stewardship,	
	Develop and implement collaborative action plans to address needs of unique high priority Arizona ecosystems.	Work closely with Federal, State, Universities, and Environmental organizations involved in ecosystem management.	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	
	Support implementation of action plans to address unique high priority ecosystems.	Implement land management plans on State and private land that address ecosystem management	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	Plans written
	Develop and implement practices to limit the spread of exotic invasive species such as Buffelgrass and others.	Implement land management plans on State and private land that address limiting the spread of exotic and invasive species	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Plans written
Objective 4: Identify and monitor threats to forests and ecosystem health.	Support development and maintenance of ongoing inventory, monitoring, and detection efforts on all Arizona forestlands and other high priority ecosystems.	Continue forest Insect and disease monitoring, aerial detection surveys, insect trapping programs and landowner education. Continue efforts with Az FIRE map and initiate efforts on modeling wildfire risk determination.	Cooperative Forest Health, Urban & Community Forestry, Az FIRE map	Acres surveyed, traps deployed & landowner assists, treatments mapped.
	Integrate federal, state, university and other diagnostic/research resources to support surveillance, and detection efforts focused on delineating priority treatment areas and identifying science based treatment needs.	Collaborate with organizations involved in landscape level analysis and treatment recommendations.	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	Workshops attended/reviewed, risk maps incorporated.
	Develop a contingency plan for the potential ecological impacts of climate change.	Collaborate with organizations, programs involved with contingency plans for climate change.	Cooperative Forest Health	Contingency plan inputs.
Objective 5: Protect forests and other high priority ecosystems from fragmentation and conversion.	Identify and utilize resources to work with state and local governments on policy development and program implementation to protect ecosystems from fragmentation.	Work with agencies, govt bodies and organizations to identify ecosystems that may be theartened by fragmentation.		
	Identify opportunities for Land exchanges with federal agencies and other groups.			
	Identify/develop and disseminate developmental guidelines/ policies for forested areas.	Provide technical assistance to landowners, local government bodies and developer groups involved with planning, management, or development of forest environments.	Cooperative Forest Health, Urban & Community Forestry	Assists provided
	Work with non-traditional partners to identify policy needs and bridge identified gaps.	Work with all stakeholders to address the fragmentation and conversion issue		

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Ecosystem Health

Goal 2: Progress toward landscape scale outcomes, restoration of unhealthy ecosystems, and enhanced sustainability with limited negative impacts

Objectives	*Arizona Actions*
Objective 1: Restore ecologically unhealthy forest, desert and grasslands impacted by current fire regimes, insect & disease outbreaks, land management practices/uses, and exotic invasive species.	Use science-based approaches to evaluate, understand and protect against the negative impacts of existing and emerging threats such as climate change, insect and disease outbreaks or land use changes on forest health and public safety, including the build up of hazardous fuel conditions and resulting fire behavior.
	Reduce hazardous fuels and reduce stand densities of unsustainable post-settlement trees, to prevent catastrophic losses from bark beetles and wildfire.
	Encourage adoption of collaborative Wildlife Principals developed by the Arizona Forest Health Council for integrating wildlife habitat and biodiversity conservation with restoration, community protection, and fire management activities. (see SS 2.5.1)
	Develop and implement integrated landscape-scale restoration, community protection, wildlife habitat, population management, and fire management strategies for forests across the state.
	Develop land-use policies and practices that support restoration, community protection, and fire management efforts.
	Federal and state land management agencies should collaboratively develop an integrated process to design and strategically place treatments in order to increase efficiency, maximize benefits and limit negative impacts of insect & disease outbreaks, invasive plants & wildfire.
	Best Management practices should be implemented to limit the spread of exotic invasive species during restoration and fire management activities.
	Develop incentives and an ethic of personal safety to support sustainable maintenance of fuel treatments.
	Increase coordination of forest restoration, fire management, and community protection planning and implementation across jurisdictional boundaries.
	Encourage development of integrated long-term restoration, wildlife management, and fire management plans for all federal, state, and tribal lands. (see SS 2.2.8)
Objective 2: Restore frequent fire regimes as part of forest restoration measures.	Adequately restore forest structures through mechanical or prescribed fire treatments to ensure landscapes are compatible with frequent fire
	Implement forest management activities that will allow for reestablishment of frequent, low-severity fire as a key process in forested ecosystems, including increased use of prescribed fire following mechanical thinning and increased management of wildland fires for restoration objectives on
	Planners should work with developers to incorporate appropriate buffer zones, based on anticipated fire hazard, public safety, and wildlife habitats into the design of new developments to allow for maintaining of conditions in adjacent forests and grasslands where natural or prescribed fires may continue or be introduced. (see SS 2.2.4)
	Utilize state and local codes, planning options, laws and regulations, and Growing Smarter legislation to address fire risk at the landscape scale. (see SS 2.2.7)
Objective 3: Integrate collaborative, science based, planning processes and public education into restoration treatments	Develop and utilize a collaborative, science-based, multi-entity process to facilitate decisions on properly designing and implementing restoration projects within the social and political framework.
	Facilitate the sharing of all data and analyses from all ownerships to assist natural resource agencies, county and city managers, and stake holders in planning and implementation of forest restoration activities. Development of a central repository or clearinghouse of information
	Undertake educational and outreach activities to increase awareness and understanding of the benefits of addressing forest health issues.
	Develop funding mechanisms for the successful implementation of all aspects of ecosystem restoration activities and education projects.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
State and private mangement plans should integrate science based approaches to restoring healthy ecosystems.	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	Plans written
Continue to reduce hazardous fuels on State and private lands	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Acres treated
Continue to Integrate wildlife principals into state and private resource management plans	Stewardship, Forest Health, Timber mgmt, Coop Grant programs	Plans written
Work closely with all stakeholders to implement science based ecosystem restoration principles	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Acres treated
Work with government bodies to address detrimental land use policies and practices	Fire Mgmt, Firewise, CWPP's	
Collaborate with all land management agencies involved in restoration of unhealthy ecosystems.	Western Competitive, Stimulus & Western Bark Beetle Initiative & Invasive species grants. Stewardship, Timber mgmt. Fire mgmt.	Revised plans/projects, acres treated
Develop, review, revise management practices on state and private lands.	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Management plans developed, reviewed and revised.
Continue to maintain high standards of safety in all types of treatments	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	
Continue to work with communities to develop CWPP's as necessary and assist communities in becoming Recognized Firewise Communities	Fire Mgmt, Firewise, CWPP's	Plans written, Communities recognized
Continue to work with all stakeholders to insure that management plans consider shared long term goals	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Plans written
Continue to implement mechanical and prescribed fire treatments	Stewardship, Forest Health, Timber mgmt, Coop Grant	Acres treated
Continue to implement mechanical and prescribed fire treatments	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Acres treated
Assist communities to adopt wildland urban interface codes and become Recognized Firewise Communities	Fire Mgmt, Firewise, CWPP's	Codes adopted, Communities recognized
Assist communities to adopt wildland urban interface codes and become Recognized Firewise Communities	Fire Mgmt, Firewise, CWPP's	Codes adopted, Communities recognized
Continue to work with all stakeholders to insure that implemetation of all restoration projects meet social and political objectives	Stewardship, Forest Health, Timber mgmt, Coop Grant programs, Fire Mgmt	Acres treated
Provide data to assist in a coordinated approach to ecosystem restoration	All programs	Data collected and provided
Cooperate with federal, state, university and environmental organizations involved in addressing forest health issues to provide stakeholders with up to date information on forest health issues.	Cooperative Forest Health, Coop Grant programs	Educational materials developed public presentations.
Identify shortfalls in funding to take advantage of new or continuing funding opportunities	All programs	Additional grants and budgets increased

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Water and Air

The ASFD's role in water-related issues is to implement watershed quantity and quality actions as well as public education into appropriate State & Private Forestry (S&PF) programs. The ASFD will adopt the listed matrix actions into current S&PF program implementation, develop Best Management Guidelines for those program areas that are lacking these guidelines, and identify other funding/grant opportunities for landowners that complement watershed activities. Staff from the ASFD will incorporate these actions into private landowner contacts and projects affecting State Trust lands and those projects that are adjacent to other agency lands. They will also make sure that wildfire suppression actions incorporate strategies and tactics to minimize impact to sensitive/priority watersheds and seek ways to fund Burned Area Emergency Rehabilitation. Finally, the ASFD will participate in local delivery of various established public education programs that support the importance of watersheds, and encourage/participate with non-profit and non-governmental groups to develop and implement watershed restoration projects.

The ASFD's role in air quality is to promote an increased awareness and the lessening of particulates through leadership and assistance provided within its various fire and forestry programs. These efforts include:

- Provisional support and leadership in collaborative forest management across broad landscapes through the procurement of varies grants
- Working collectively with the Arizona Department of Environmental Quality and other fire management organizations represented by the Arizona Enhanced Smoke Management Program by using Cooperative Fire Grant Program funds to meet overall goals and objectives
- Collaborating with other agencies, private sector companies, and contractors to develop alternative uses for woody materials, and to create and expand markets through leadership and procurement of grant funds
- Reduction in the risk of wildfire, thus lowering the airborne particulate matter
- Leadership and development of educational material in conjunction with the Extension Service by providing grants
- Provisional support and leadership through various committees and organizations to promote proper prescribed fire programs and education of proper techniques for a wide range of landowners.

Water (Water & Air)

Goal 1: Improved water quality and quantity from forested watershed

Objectives	Arizona Actions
Objective 1: Collaboratively protect and enhance water quality and quantity of forested watersheds.	Work collaboratively to identify and develop restoration and fire management strategies for watersheds of critical importance across the state. (see SS 3.1.6)
	Collaboratively identify or develop best management guidelines (BMG) .
Objective 2: Maximize positive impacts of forest treatments on water quality.	Maintain or improve Soil Quality through use of best management practices: properly design, place, build and retire forest roads, use appropriate fire practices to remove duff and reestablish vegetative ground cover.
	Maintain or improve Hydrologic Function and Watershed Health by designing forest thinning prescriptions to optimize snow pack accumulation and runoff and by managing understory vegetation through periodic burning.
	Support State, Federal, and other programs that provide funding for treatment within watersheds; encourage additional funding to address watershed health.
	Appropriately monitor activities within watersheds.
Objective 3: Minimize negative impacts from wildfire in watersheds of concern.	Develop and implement fire management strategies within watersheds of concern to minimize negative impacts

Arizona State Forestry Division - Implementation

ASFD actions	Related program(s)	Measures
Plan & implement treatments on state & private forest lands in Priority Landscapes to complement watershed management on adjacent federal land	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# plans developed # projects implemented in Priority Landscapes # acres treated in Priority Landscapes
Include collaboratively-developed restoration & fire management strategies in Landowner Forest Stewardship Plans (Plans).	Cooperative Fire Forest Health Forest Legacy Forest Stewardship	# restoration inputs # fire management inputs # new / revised Plans completed in Priority Landscapes
Develop and/or adopt Best Management Guidelines for state & private forest lands.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship	Development and/or adoption of Best Management Guidelines completed
Apply Best Management Guidelines in management activities on state & private forest lands.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship	# Best Management Guideline inputs to Forest Stewardship Plans # applications of Best Management Guidelines
Incorporate & implement practices in Landowner Forest Stewardship Plans (Plans) to benefit hydrological function and watershed health.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship	# hydrological inputs to Plans # practices implemented to benefit watershed health in Priority Landscapes
Utilize the Arizona Forest Stewardship Committee as an informational clearinghouse to identify pertinent programs and available funding for treatments that benefit watershed health	Forest Stewardship	# referrals
Help private forest landowners to access financial incentives programs for treatments that benefit watershed health (e.g. Environmental Quality Incentives Program, Wildlife Habitat Incentives Program, Wetlands Reserve Program, Partners for Fish & Wildlife, Arizona Water Protection Fund, Water Quality Improvement Program, etc.)	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# referrals # sign-ups $ cost-share utilized # projects implemented in Priority Landscapes # acres treated in Priority Landscapes
Prescribe monitoring activities in Landowner Forest Stewardship Plans, other management plans, and project plans to improve watershed health.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# monitoring inputs to Landowner Forest Stewardship Plans, other management plans, and project plans.
Monitor projects & management activities in accordance with monitoring plans & prescriptions as a basis for adaptive management to improve watershed health.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship Western Competitive Grants	# projects monitored # acres monitored
Explore the adoption of fire management strategies to maintain or enhance watershed health.	Cooperative Fire	# fire maanagement strategies explored
Coordinate with state & federal agencies to fund burned area rehabilitation on state & private forest lands in Priority Landscapes.	Cooperative Fire Forest Stewardship Western Competitive Grants	# rehabilitation projects completed in Priority Landscapes # acres rehabilitated in Priority Landscapes

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Water (Water & Air)

Goal 2: Improved health and resiliency of forested aquatic systems (riparian areas, springs, and wet meadows.)

Objectives	Arizona Actions
Objective 1: Manage impacts of forest management activities within aquatic systems.	Utilize best management practices and guidelines within aquatic systems.
Objective 2: Restore aquatic systems, and improve water availability.	Coordinate implementation of management plans to insure protection of aquatic systems.
	Use Best Management Practices for the location, construction, operation and maintenance of transporation systems within aquatic systems.
	Encourage and protect existing native vegetation and supplement with native vegetation plantings where appropriate.
	Use Best Management Practices for the location, construction, operation and maintenance of water improvements within aquatic systems.
	Restore natural spring discharge by removing outdated improvements where possible.
	Coordinate with agencies and lessees that manage water improvement projects.

Arizona State Forestry Division - Implementation

ASFD actions	Related program(s)	Measures
Work with other organizations to adopt, develop, and apply Best Management Guidelines for treatments in or abutting aquatic systems.	Forest Stewardship	# Best Management Guidelines developed, applicaion of best management guidelines.
Apply Best Management Guidelines to benefit native vegetation and aquatic systems on state & private forest lands.	Cooperative Fire Forest Health Forest Legacy Forest Stewardship	# Best Management Guideline inputs to Forest Stewardship Plans # applications of Best Management Guidelines
Control invasive vegetation as an integrated component of management in proximity to aquatic systems.	Forest Health Forest Legacy Forest Stewardship	# invasive species inputs to Forest Stewarship Plans # acres of aquatic systems protected / treated for invasive plants.
Utilize grants (e.g. Livestock & Crop Conservation grants, Environmental Quality Incentives Program, Landowner Incentives Program, Wildlife Habitat Incentives Program, Water Quality Improvement Grant Program, etc.) to facilitate and/or implement best management practices.	Forest Stewardship	# grants received / implemented # outdated improvements removed # water improvements installed # acres of Priority Landscape protected # springs restored
Implement aquatic system restoration and improvement projects to increase water availability on state & private forest lands in Priority Landscapes.	Forest Stewardship Western Competitive Grants	# projects implemented in Priority Landscapes

Goal 3: Increased public understanding of the importance of forests to Arizona's water quality.

Objectives	Arizona Actions
Objective 1: Collaboratively develop information and education materials on watershed and riparian issues.	Develop education materials such as brochures and public service announcements about watershed and riparian issues.
	Collaboratively develop common watershed and riparian messaging for use by all agencies.
Objective 2: Collaboratively develop and implement outreach and education programs on watershed and riparian issues.	Develop outreach programs to communicate with community groups and leaders, schools, and the general public.
	Identify appropriate funding support to implement outreach and education programs.
Objective 3: Encourage Public involvement	Develop and implement programs to engage non profit organizations in watershed and riparian cleanup and planting activities.

Arizona State Forestry Division - Implementation

ASFD actions	Related program(s)	Measures
Work collaboratively with agencies & organizations (e.g. AZ Department of Water Resources, AZ Department of Environmental Quality, Arizona Riparian Council, etc.) to develop brochures, fact sheets, websites, public service announcements, and other educational materials on watersheds and aquatic systems.	Forest Stewardship Western Competitive Grants	# and type of educational materials developed # collaborative partnerships Completion of Guide to Common Messaging & Talking Points
Develop and/or deliver outdoor education programs (e.g. Project Wild & Wild Aquatic, Project Learning Tree, Water Education for Teachers, Wonders of Wetlands, etc.) to increase public knowledge and appreciation of watersheds and aquatic systems.	Forest Stewardship Urban & Community Forestry Western Competitive Grants	# programs developed # presentations # person-hours of training
Develop funding for educational materials & programming by identifying and securing grants (e.g. Foresters Fund, US Environmental Protection Agency, Salt River Project, grants.gov, etc.)	Forest Stewardship Urban & Community Forestry Western Competitive Grants	$ funding secured # grants received
Collaborate with non-governmental organizations & non profit groups to sponsor volunteer cleanup and habitat improvement projects in aquatic environments.	Forest Stewardship Urban & Community Forestry Western Competitive Grants	# projects # volunteer hours

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Air (Water & Air)

Goal 1: Improved air quality.

Objectives	*Arizona Actions*
Objective 1: Enhance urban and community forests (See People & Forests Strategy)	(See People & Forests Actions)
Objective 2: Maintain or Improve health of existing forest lands (See Ecosystem Health Strategy)	Coordinate large scale forest treatments.
Objective 3: Improve coordination of smoke management related to wildland fire and forest restoration treatments. (Arizona Enhanced Smoke Management Program)	Develop GIS map data of smoke sensitive airsheds and areas for use by land managers, fire mgt organizations, and the national Wildland Fire Decision Support System (WFDSS).
	Develop improved *Smoke Management Program* monitoring capabilities including the use of technology such as particulate monitors and real-time cameras.
	Develop and utilize improved fuel modeling to better predict fire behavior and inform emission calculations.
	Support the Arizona Interagency Coordination Group in improving communication and coordination between land management agencies in regards to air quality issues.
	Assist ADEQ and other partners in reviewing and updating smoke management program as needed.
	Improve smoke monitoring processes, communication, and coordination on resource management activities including wildland and resource
	Continue to improve smoke management database and technologies.
	Seek various funding, information, training, and technology alternatives to assist agencies in addressing urgent smoke impacts.
Objective 4: Reduce negative impacts of forest treatments on air quality.	Pursue strategies to utilize wood fiber, where practical, prior to burning on site. (See FIRE Strategy)
	Work with interagency partners to design and implement reintroduction of fire adjacent to communities (to manage intensity, duration and timing of smoke emissions from fire management activities.)
	Design fire management and implementation activities to effectively manage the intensity and duration of smoke impacts.
	Develop integrated planning efforts to achieve desired outcomes from fire, utilizing CWPP's, and fire and land management plans considering private landowner and community objectives.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
(See People & Forests Actions)		
Support & participate in collaborative landscape-level forest improvement projects (e.g. White Mountain Stewardship Project, Four Forests Restoration Initiative, etc.)	Cooperative Fire Forest Health Forest Stewardship Western Competitive Grants	# collaborative inputs
Work collaboratively with agencies involved in smoke & fire management to improve coordination, tools & technology in support of the Arizona Enhanced Smoke Management Program.	Cooperative Fire	Maps and data developed / maintained
		Monitoring capabilities improved / maintained
		Fuel models improved.
		Participation in coordination efforts - AICG, etc
Explore funding options to finish / improve smoke management database.	Cooperative Fire Western Competitive Grants	Funding opportunities identified / pursued. Funding secured.
Work with ADEQ and other agencies to secure funding, training, & technology to enable state employees to address urgent smoke impacts.	Cooperative Fire	# person-hours of training received $ funding obtained
Work with other agencies, private sector companies, and contractors to seek out & identify markets for woody material generated by forest improvement projects on state & private forest lands.	Cooperative Fire Forest Health Forest Stewardship Western Competitive Grants, Utilization & Marketing Specialist	Volume of wood utilized $ saved through utilization Particulate emissions prevented
Support & participate in fuels management in the wildland-urban interface to minimize adverse smoke impacts.	Cooperative Fire	# burns conducted # acres burned
Include intensity & duration of smoke impacts as a key consideration in all prescribed burn planning and implementation.	Cooperative Fire	# smoke management inputs to prescribed burn plans
Consider pertinent Community Wildfire Protection Plans (CWPP) and objectives of nearby landowners & communities in management planning for state & private forest lands.	Cooperative Fire Forest Stewardship Western Competitive Grants	# CWPP inputs to plans

Goal 2: Increased public understanding of the importance and effects of fire on Arizona's air quality.

Objectives	*Arizona Actions*
Objective 1: Enhance public outreach & education regarding fire management and air quality.	Develop interagency educational materials for distribution on the benefits of prescribed fire and its role in the ecosystem and good management practices in regards to air quality.
	Provide interagency public service announcements in regards to wildland and prescribed fire and their relationship to air quality issues.
	Coordinate key messages with other cooperators and stakeholders to ensure timely and effective messages are provided.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Develop, utilize & distribute educational materials that promote wise use of fire for hazardous fuels reduction and ecosystem management.	Cooperative Fire Forest Health Forest Stewardship Urban & Community Forestry	# brochures developed # brochures distributed
Prepare & broadcast public service announcements to promote the use of prescribed fire as a safer, more manageable, and healthier alternative to wildfire.	Cooperative Fire Western Competitive Grants	# public service announcements broadcast
Provide timely & accurate information to the public on prescribed & wildland fire through media outlets and the Internet.	Cooperative Fire	# informational releases # "hits" on websites

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Through Arizona Revised Statutes, the ASFD has fire suppression and prevention authorities for about 22 million acres of state and private lands. The ASFD maintains some in-house firefighting and prevention resources (e.g., 20-person fire crews, initial attack incident commanders, fire trucks, and a statewide dispatch center), but relies significantly on partnerships and cooperation with federal land management agencies and local fire departments to meet its fire protection responsibilities. Primary ASFD fire suppression activities are funded with State monies, but the U.S. Forest Service Cooperative Fire and Forestry programs complement and greatly increase ASFD's abilities to provide a complement of statewide fire management services.

Many of the ASFD action items listed in the attached Fire matrix follow a primary theme of increasing collaboration and building capacity of our community and agency partners. Examples of this include:

- Assisting communities develop Community Wildfire Protection plans and seek implementation grants
- Coordinating with local agencies and communities-at-risk to design and implement effective fuel treatments
- Working with research entities, such as universities and fire consortiums, to make fire treatment areas available for research studies
- Collaborating with government and other partners to educate the public and community leaders about fire management issues
- Developing a web-based, statewide fire reporting system for use by ASFD and local fire departments
- Providing excess property wildland firefighting vehicles to rural fire departments.

Fire

Goal 1:	Wildland ecosystems where appropriate fire regimes maintain health and resiliency of natural vegetation	
	Objectives	*Arizona Actions*
	Objective 1: Manage forest structure to restore fire regimes and minimize negative impacts from unwanted wildfire (recognizing the diversity of federal, tribal, state and private landownership in Arizona).	Fuel reduction treatments. Reduce excessive fuel loading to prepare fire adapted landscapes for historic fire regimes through fuel treatment activities.
		Strategic placement of treatments. Design fuels treatments strategically on the landscape to effectively reduce fire risk.
		Encourage collaborative long-term forest restoration and fire management planning by all land managers. (see SS 2.2.8)
		Provide adequate resources for planning & resource support during implementation of fire management strategies.
		Restore impaired ecosystems through mechanical treatments and use of fire to achieve desired effects and sustained natural fire regimes.
	Objective 2: Use appropriate application of fire to meet resource and community protection objectives	Develop integrated planning efforts to achieve desired outcomes from fire, utilizing CWPP's, and fire and land management plans considering private landowner and community objectives.
		Utilize fire in fire adapted ecosystems, ensuring acceptable intensities, timing and duration of treatments.
		Avoid management use of fire in areas where it will establish or encourage unwanted invasive species.
	Objective 3: Use best available science to define appropriate levels (acceptance) of fire for different ecosystems or vegetation types:	Conduct research to define appropriate timing and acceptable fire intensities in various ecosystems.
		Conduct research to define requirements for post fire re-habilitation.
		Conduct research to Identify appropriate use of fire and other management actions in areas populated with invasive species.
		Support Firescape and similar programs to Increase all lands fire management knowledge and expertise.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Continue fuel treatments on state trust land and assisting private landowners with treatments	Cooperative Fire Protection, NFP WUI & WFHF AFD Inmate Fire/Fuels Crew Program, Timber Mgmt, Forest Health, Seasonal Staff	Acres Treated
On state and private land identify areas of highest need. Work directly with Communities at Risk and Federal Agencies to coordinate seamless fuel treatment efforts across multiple jurisdictions.	USFS Cooperative Fire Protection, NFP WUI & WFHF. Firewise USA, CWPPs, Timber Mgmt, Forest Health	Reduce community fire threat.
Arizona State Forestry Division to review and update existing plans working closely with other state and federal agencies.	AFD Fire and Forestry Management, USFS Cooperative Forestry	Revised Plan
Arizona State Forestry Division to seek additional grants and funding to allow acceleration of implementation of fire management strategies.	USFS Cooperative Fire Protection, NFP WUI & WFHF AFD Fire and Forestry Management	Adequate Planning and Implementation Resources
Where appropriate on state and private lands, use fire as a tool within various ecosystems - supplementing mechanical treatments with complimentary fire treatments.	USFS Cooperative Fire Protection, NFP WUI & WFHF, USFS Cooperative Forestry, AFD Fire and Forestry Management Existing CWPP's	Acres restored
Cooperate and coordinate with state, federal, municipal and private landowners to address shared goals and objectives in the use of fire.	USFS Cooperative Fire Protection, NFP WUI & WFHF AFD Fire and Forestry Management, Firewise USA, CWPP's	Integrated Fire Plans
Where appropriate on state and private lands, use fire as a maintenance tool in ecosystems where it has been successfully reintroduced	AFD Fire Suppression & Management, USFS Cooperative Fire Protection, USFS Cooperative Forest Health, Existing CWPP's	Acres burned in fire adapted ecosystems
Identify & map areas of concern. Aggressively suppress wildfires in areas wildfire or the use of fire will encourage the spread of invasive species.	AFD Fire Suppression and Management, AFD GIS, USFS Cooperative Forest Health	Invasive Management Areas identified and mapped for appropriate fire use.
AFD to work with research entities to make treatment areas or areas impacted by wildfire available for research studies. Coordinate with ASLD to identify suitable trust lands.	Cooperation with Southwest Fire Science Consortium, Arizona Universities, and Rocky Mtn Research Station.	Areas identified
AFD to work with research entities to make treatment areas or areas impacted by wildfire available for research studies.	Cooperation with Southwest Fire Science Consortium, Arizona Universities, and Rocky Mtn Research Station.	Areas identified
AFD to work with research entities to make treatment areas or areas impacted by wildfire available for research studies.	USFS Cooperative Forest Health. Cooperation with Southwest Fire Science Consortium, Arizona Universities, and Rocky Mtn Research Station.	Areas identified
Support and provide technical assistance where applicable.	AFD Fire Suppression and Management. USFS Cooperative Fire Protection	Applicable Firescape Programs

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Goal 2: "Fire Adapted Communities" that provide shared stakeholder responsibility for healthy landscapes and wildfire prepared communities.	
Objectives	*Arizona Actions*
Objective 1: Assist communities in planning for and reducing wildfire risks.	Encourage development and implementation of CWPP's or equivalent plans in areas at high risk of wildfire. (see SS 2.4.1 & SS 3.1.7)
	Build leadership capacity and support dedicated personnel to sustain implementation of CWPPs and other community wildfire planning.
	Design and implement effective restoration and fuel treatment activities in the Wildland Urban Interface to meet community protection objectives.
	Integrated and collaborative development of implementation plans (CWPPs, FMP's, etc) for an all-lands approach should be considered wherever appropriate. (see SS 2.3.1)
	Develop consistent fire hazard classifications for all developed and undeveloped lands using standard assessment methods. (see SS 2.2.1)
Objective 2: Design and implement effective smoke management strategies and protocols. (see AIR Strategy)	(See AIR Strategy Actions)
Objective 3: Develop additional fire adapted communities that meet Firewise standards and support increased local scale implementation.	Support adoption of Wildland/Urban Interface development codes by Counties and communities. (see SS 2.2.2 & SS 2.2.3)
	Promote and implement Firewise USA Communities and Ready-Set-Go Programs to increase public awareness and encourage local level responsibility. (see SS 5.2.1)
	Provide GIS and WUI assessment training, equipment, and support to local communities to build local capacity.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
AFD to assist communities develop CWPP's or equivalents where appropriate. Provide assistance in seeking appropriate grants.	AFD Fire Suppression and Management. NFP WUI Grants, Cooperative Fire	% CWPP Plans Implemented
Assist communities to understand implementation of CWPP's and the necessary personnel to support implementation. Seek Grant Funding .	AFD Fire Suppression and Management. USFS Cooperative Fire Protection, NFP WUI & WFHF, CWPPS	% CWPP Plans Implemented
Coordinate with Federal and local agencies to design and implement effective fuels treatment projects	AFD Fire Suppression and Management. USFS Cooperative Forestry, USFS Cooperative Fire Protection, NFP WUI & WFHF, CWPPS	Acres treated that meet objectives
Coordinate with Federal and local agencies to design and implement effective fuels treatment projects	AFD Fire Suppression and Management. USFS Cooperative Forestry, USFS Cooperative Fire Protection, NFP WUI & WFHF, CWPPS	% CWPP Plans Implemented
Provide needed data to NASF's West Wide Assessment. Provide technical assistance to local governments and fire agencies.	West Wide Assessment, CWPPs, Firewise USA	Statewide assessment completed
Continued partnership with ADEQ and AICG Interagency Wildland Smoke Program	AFD Fire Suppression and Management, USFS Cooperative Fire Protection	Interagency Smoke management process that will continue to allow the use of fire as a resource tool.
Lend support to Counties, Fire Districts, and Incorporated Communities in adopting WUI Codes. Collaborate with Fire Marshal's Office in incorporating WUI Codes in State Fire Code.	AFD Fire Suppression and Management, USFS Cooperative Fire Protection	# of WUI Codes Adopted
Support the AICG Firewise committee and AFD District Personnel to provide leadership in educating communities in Firewise techniques and Firewise programs.	Firewise USA, IAFC Ready Set Go	# of Firewise USA Communities and Initiation of Ready Set Go Program
Provide technical and grant funded assistance to communities to build capacity.	AICG Arizona Firewise Subcommittee, Western Competitive Firewise Grant	# of new Firewise Assessors and Advisors.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Goal 3: Enhanced wildland fire management capacity in Arizona

Objectives	*Arizona Actions*
Objective 1: Increase Firefighting Response Capabilities and Efficiencies	Provide adequate fire preparedness and suppression funding to maintain firefighter and public safety and provide for private property and natural resource protection .
	Collaborate with Federal, State, local and private partners to study and implement most efficient utilization of existing firefighting and fuel treatment resources.
	Build additional initial and extended attack fire suppression and fuel treatment capacity.
	Develop more accurate statewide wildfire reporting/statistical cause database
	Utilize new technologies in firefighting and dispatch systems to increase efficiencies.
Objective 2: Assure adequate Wildland and Prescribed Fire Training is provided to all necessary personnel.	Develop and maintain statewide wildland training needs database.
	Develop NWCG qualified firefighting and prescribed burn personnel within the Arizona fire departments and various state and local agencies, through formal training and on-the-job task book completion.
	Provide adequate financial support for wildland fire training opportunities within the State (Arizona Wildfire Academy, weekend workshops, community colleges)
	Develop processes and methodology for local firefighting agencies to gain OJT wildland experience to improve skills.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Work with Governor's Office and Legislature to develop adequate funding and funding mechanisms for AFD's Fire Suppression/Preparedness Fund. Seek funding to increase availability of tactical aircraft to the State of Arizona. Continue partnership with ADEM for funding State IMT.	State Forester's Office	Public and firefighter safety. Natural resource protection.
Partner with federal, local, and private entities on efficiency studies. Include dispatch systems in study.	AFD Fire Suppression and Management	Increased firefighting efficiencies through better utilization of existing resources.
Continue to support and implement the FEPP, DOD firefighting property, VFA/RFA and GSA programs to build firefighting equipment capacity to State and local agencies. Maintain and where appropriate, increase AFD Inmate Fire Crew/Fuels Program. Utilize and assist in expanding private sector resources to meet work demands. Explore expanding seasonal staff for cost effective work.	Cooperative Fire Protection: FEPP, DOD FPP, VFA, RFA, GSA. AFD Inmate Fire/Fuels Crew Program. AFD Private Contractor Agreements, Seasonal Staff, Western Competitive Grants,	Increased # of resources available for fire and fuels mitigation.
AFD to develop web based fire reporting system for local and state agencies.	AFD Fire Suppression and Management, USFS Cooperative Fire Protection, NASF Fire Reporting	Fill gaps in fire occurrence date by local agencies. Develop more accurate data on cause and wildland damages.
Evaluate new technologies and utilize when they show clear firefighting safety, efficiency, and cost advantages. Explore use of national Wildland Fire Decision Support System (WFDSS) for use on State and private fires in Arizona.	AFD Fire Suppression and Management, USFS Cooperative Fire Protection	Increased firefighting efficiencies through better utilization of existing resources.
Develop strategies in cooperation with various entities to assist in the development of this database	SWCG Training Committee, AZ State Qualification Committee. Cooperative Fire	Increased efficiency of fire training delivery.
Oversee the certification of and continue to train local fire departments and other agency personnel in necessary wildland and prescribed fire courses.	AZ State Qualification Committee, VFA/RFA, Ready Reserve, State IMT, Cooperative Fire	Increased firefighter safety and fire suppression capacity.
Continue to champion funding to various training venues	SWCG Training Committee, VFA/RFA, Ready Reserve, cooperative Fire	Increased firefighter safety and fire suppression capacity.
Seek funding to increase OJT "training platform" firefighting modules. Assist AHIMTs through cooperation with ADEM and fire assignments.	State Fire Preparedness and Suppression, State Forestry IMT, Cooperative Fire	Increased firefighter safety and fire suppression capacity.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Fire

Goal 4: An Arizona public and government leadership that is well informed about wildland fire management, science, and prevention issues.

Objectives	*Arizona Actions*
Objective 1: Develop and deliver Arizona specific educational information and tools to increase citizens and community awareness of wildland fire issues and preparedness.	Collaboratively develop and maintain Arizona specific information, educational materials , and common messages about wildland fire to help residents of forest and other communities understand the risks inherent in living in fire-prone areas, and to educate developers and the community about steps that can be undertaken to reduce exposure to fire hazard and to improve forest health. (see SS 2.3.1 & SS 5.1.1)
	Collaboratively develop and maintain programs and methodologies for delivery of information about wildland fire issues and activities. (see SS 2.3.1 & SS 5.1.1)
	Use current technology to provide up to date educational information (social networking sites, websites etc).
	Collaboratively develop and maintain an organized cadre of trained individuals to provide educational opportunities to communities and the general public.
	Identify adequate resources (fiscal and other) to support ongoing fire education materials and programs.
Objective 2: Increase government leadership awareness of wildland fire preparedness and appropriate actions.	Develop and maintain specific wildland fire materials for outreach to federal, state, county, and local government officials.
	Develop and implement a plan to inform federal, state, county, and local officials on Arizona wildland fire preparedness and other fire issues.
	Provide adequate funding to support government leadership outreach materials and program maintenance.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Engage and collaborate with Universities and other partners to develop wildfire educational materials. Work cooperatively with the various fire management agencies to develop common messaging and wildland fire terminology for distribution to the public.	AFD Fire Management, USFS Cooperative Fire Protection, Firewise USA, Ready Set Go, NFP WUI Grants	Education materials produced, Standard fire messaging and terminology developed
Engage and collaborate with Universities, Fire Management Agencies, and other partners to develop delivery methodologies, Explore incorporating technology based delivery methods - webinars, networking sites, online courses, etc.	AFD Fire Management, USFS Cooperative Fire Protection, Firewise USA, Ready Set Go, NFP WUI Grants	Delivery methodologies and programs developed.
Increase capacity within AFD to utilize current technology	AFD IT and AFD Fire Public Information, NFP WUI Grants	New technology utilized
Work with fire management and other agencies to provide education to the public (SWCG Fire Prevention and Information Committee, Universities, fire dept.)	AFD Fire Management, USFS Cooperative Fire Protection, USFS Cooperative Forestry, and USFS Cooperative Health, NFP WUI Grants	Increased educational outreach to general public and public officials
Pursue grant opportunities and develop/foster partnerships with Federal, State, Local, and Private entities for effective fire education programs.	Western Competitive Grants & FEMA Prevention Grants. AFD Fire Management, USFS Cooperative Fire Protection, USFS Cooperative Forestry, and USFS Cooperative Health, NFP WUI Grants	Adequate Resources for fire education programs.
Engage and collaborate with Universities and other partners to develop wildfire educational materials. Work cooperatively with the various fire management agencies to develop wildland fire materials for government officials.	AFD Fire Management, USFS Cooperative Fire Protection, USFS Cooperative Forestry, and USFS Cooperative Health, NFP WUI Grants	.
Work with fire management and other agencies (SWCG Committee, Universities, fire depts) to collaborate on keeping appropriate Arizona officials informed on wildland fire issues.	AFD Fire Management, USFS Cooperative Fire Protection, USFS Cooperative Forestry, and USFS Cooperative Health	# of Government Officials informed on wildland fire issues.
Pursue grant opportunities and develop partnerships to support government outreach.	Western Competitive Grants & FEMA Prevention Grants. AFD Fire Management, USFS Cooperative Fire Protection, USFS Cooperative Forestry, and USFS Cooperative Health	Adequate resources for public official fire outreach programs.

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Economics

The ASFD places significant importance on the relationship between economics and Arizona's forested ecosystems. The Division works closely with entities such as the Governor's Forest Health Council, Northern Arizona Wood Product Association, Prescott Area Wildland Urban Interface Commission, and other Arizona regional fuel management groups to promote, explore, and develop opportunities for forest-based industries. In 2010, the ASFD will increase its economic assistance capability by hiring a person to focus on biomass- utilization. This position will further help the ASFD identify opportunities and action items to address long-term economic potential.

The *Strategy* addresses the actions provided by the ASFD. These include offering support and expertise through plans and implementation of biomass utilization, providing leadership in terms of bringing multiple agencies together for coordinated efforts, education of various groups and organizations, and the support of these projects through the procurement of grant funds. These goals will be met through the multiple programs offered by the ASFD (e.g., forestry stewardship, forest health, urban and community forestry, and fire management). The ASFD can meet key elements set forth in the *Strategy* by working closely across all levels of government to promote programs, such as Firewise; aid in the creation and implementation of land management plans; and the support of forest products-based industries along with following biomass trends, and to track their economic impacts statewide and nationally.

Economics

Goal 1:	Realized long-term economic potential of sustainable forest products and bioenergy (while achieving Ecosystem Health goals).	
	Objectives	*Arizona Actions*
	Objective 1: Develop policies, plans and incentives to encourage the development and perpetuation of forest products businesses that will diversify the economy and facilitate forest restoration activities.	Continue to identify appropriate programs and policies that will encourage the development and perpetuation of forest products businesses, by coordinating with county and local governments, and state and federal agencies.
		Develop and maintain data about current and potential Arizona economic activity related to wood product industries.
		Convene a biomass working group to coordinate and lead a statewide approach to developing markets, infrastructure, and connecting treatment by-projects to markets.
		Fund staff capacity to assist rural communities convene, recruit and support forest products and bioenergy enterprises.
		Ensure that wood utilization opportunities and challenges are clearly identified in CWPPs and other local and regional planning efforts.
		Encourage land management planning efforts that support a sustainable wood products industry.
		Develop land-use policies and practices that support forest restoration, community protection, fire management efforts and ecosystem services.
		Work collaboratively and strategically to design and place forest management treatments to help facilitate the development of a wood products industry.
		Maintain or increase funding to federal, tribal, and state land management agencies to furnish the capacity essential for collaboratively planning, implementing and monitoring restoration treatments that will support the development and continuance of a wood products industry.
		Develop and support incentive programs that encourage the use of restoration-generated materials by businesses across the state. (see SS 4.2.4)
		Explore federal contracting authorities, permitting policies and other support opportunities to attract and keep viable and appropriate fiber utilization industries that meet multi-level collaborative goals and plans.
	Objective 2: Federal, state, and local units of government should identify and enhance the use of small-diameter wood and biomass generated from forest treatments wherever possible.	Federal, state, and local government entities should use forest restoration treatment-generated material whenever and wherever possible. This includes use of renewable energy sources in new buildings, retrofitting of existing heating systems, and use of treatment by-products for transportation applications such as guard rails, etc. (see SS 4.2.2, SS 4.2.3, SS 4.2.5)
		Data about use of forest restoration treatment-generated material by federal, state, and local governments should be reported, collated, and shared.
	Objective 3: Expand and support the coordination of multi agency, collaborative, large landscape scale forest treatment projects that will be conducive to the development and support of a wood products industry.	Land managers should work with stakeholders to clarify the amount, availability, and location of wood and biomass across the State.
		Identify and enhance opportunities for utilizing small-diameter wood and biomass generated from landscape scale forest treatments.
		Develop presentation materials and information to facilitate funding support for landscape-scale restoration work.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Work closely at all levels of government to promote forest product based industries. Support the Governors Forest Health Council in it's efforts to encourage forest based industries.	Timber Mgmt, Utilization & Marketing Specialist	Additional Industrial Capacity, lower treatment costs per acre due to industry
Work with the Arizona Department of Commerce to track ecomomic impacts from forest based industries	Timber Mgmt, Utilization & Marketing Specialist	Volume of wood sold to industry
Work closely with existing groups on biomass use and if necessary help to organize a biomass working group to encourage development of industry and coordination of efficient biomass use	Timber Mgmt, Utilization & Marketing Specialist	Coordination of biomass treatments and new industry developed
Request funding through grants or agency budget to develop capacity within the ASFD for biomass coordination	Timber Mgmt, Utilization & Marketing Specialist	New staff hired
Support wood utilization opportunities in all planning documents	Stewardship, Forest Health, Urban and Community Forestry, Timber Mgmt	
Support existing and planned wood based indudtry	Stewardship, Forest Health, Urban and Community Forestry, Timber Mgmt	Land management plans with a consideration of wood products
Assist communities to implement firewise practices, encourage government bodies to adopt wildland urban interface codes	Firewise, CWPP, Fire Mgmt.	New Firewise Communities, Government bodies that adopt wildland/urban interface codes
Develop management plans that address state and private landowner objectives that will provide appropriate wood products for industry	Stewardship, Forest Health, Urban and Community Forestry, Timber Mgmt, FIRE Map	Number of plans written
Work closely with federal partners to identify programs in need of additional funding. Work closely with state budgeting officials to identify programs in need of additional funding.		
Work closely with the Az Department of Commerce to develop networking to efficiently use wood generated materials	Timber Mgmt, Utilization & Marketing Specialist	
Work closely with Federal partners to assist in this effort where necessary		
Support industries that use wood from various treatments	Stewardship, U & CF, Timber Mgmt, Utilization & Marketing Specialist	
Provide available data to assist in the collection of treatment generated materials	Stewardship, U & CF, Forest Health, Timber Mgmt	Acres/wood products treated and reported
Assist private landowners in the reporting of biomass generated from treatments	Stewardship, U & CF, Forest Health, Timber Mgmt, FIRE Map	Acres identified as available for treatement
Support efforts to utilize small diameter wood by making small diameter wood available from State and Private treatments	Stewardship, U & CF, Forest Health, Timber Mgmt, FIRE Map, Utilization & Marketing Specialist	Industry developed
Support efforts that provide funding for landscape scale restoration.	Stewardship, Forest Health, U & CR, Timber Mgmt	Materials developed

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Economics

Goal 2: Protection of areas with economic development potential related to ecosystem services.

Objectives	*Arizona Actions*
Objective 1: Develop and maintain land use change and ecosystem services data for Arizona	Develop a cooperative multi-agency (natural resource) working group that can share data and prioritize opportunities to jointly focus program delivery to the highest priority landscapes.
	Collect, assess, and maintain data about land use changes across the state - utilizing GIS and/or other technologies.
	Collect, assess, and maintain data about realized and potential ecosystem services throughout Arizona - utilizing GIS and/or other technologies.
Objective 2: Focus and prioritize programs into communities that will experience significant urban growth, to assist local leaders in devising effective ways to grow, develop, and protect their communities while also integrating important economic contributions made by forest ecosystems and natural areas to be impacted.	Develop and maintain a natural resource assistance network. The network of local, state, federal, public, and private organizations will assist community leaders and landowners with the development and integration of valuable proactive management tools and technical support systems to manage growth and development to conserve, protect, and enhance important natural resources in advance of impending population growth and development.
	Network with community leaders to promote, coordinate, and deliver information that will help community leaders, planners, and emergency response organizations address growth and the preservation of resource areas that are critical from an economic ecosystem services standpoint.
	Increase understanding of the economical value of recreational use of our forests.
Objective 3: Prioritize / focus program delivery and agency resources into high priority landscapes where resource threats (wildfire, insect / diseases, land conversion) will most likely threaten / negatively impact critical forest landscapes across Arizona.	Develop and maintain data on current and expected resource threats.
	Work collaboratively and strategically to design and place treatments in order to increase efficiency and maximize benefits on these priority landscapes.
Objective 4: Recognizing the diversity of federal, tribal, state and private landownership in Arizona, maintain and enhance the economic benefits and values of natural resources	Support the development of other emerging voluntary markets including water, habitat and green tourism.
	Promote an understanding of the costs and benefits of all encompassing (watershed and other) property management to provide ecosystem services.
	Encourage relevant ecosystem services capabilities expansion on private land.
	Encourage landowners to use restoration management techniques that result in socially accepted desired future conditons.
	Develop and maintain a natural resource assistance network. This network of local, state, public, and private organizations can assist community leaders and private land owners with the development and integration of valuable proactive management tools and technical support systems needed to address the economic benefits of "working" landscapes.
	Implement research to identify and quantify current and long-term key drivers, barriers and opportunities, for the supply and demand sides of both the forest products and range industries in Arizona.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Continue to support exchange of information that can prioritize treatments in the highest priority areas	Timber Mgmt, Stewardship, Forest Health, FIRE Map	
Assist in the identification of sources that display land use changes.	Legacy, FIRE Map	Update of SAP map, up to date FIRE Map
Assist in the collection of data on State and Private land showing changes in ecosystem services	FIRE Map	Up to date FIRE Map
Continue to work with communities to assist in their understanding of the importance in protecting the forested lands within Arizona	Stewardship, U & CF, Forest Health, Legacy,	Informational sessions provided
Provide forest management and fire management expertise to help inform community leaders on possible impacts to	Fire Mgmt. U & CF, CWPP's	Informational sessions provided
Encourage wise recreational use of public and State Trust land	Stewardship, Legacy, U & CF	Informational sessions provided
Continue to collect data on threats to forested rescources	Fire Mgmt, Forest Health, CWPP	Aerial surveys, Fire simulations
Continue to develop management plans with cooperators to guarantee a cohesive approach within priority landscapes	Forest Health, Stewardship, U & CF, FIRE Map, Timber Mgmt	Plans developed
Work with the Arizona Department of Commerce to assist in the development of green, wood product industries		Industry developed
Contine to develop land management plans that consider ecosytem services on a landscape scale	Legacy, Forest Stewardship, U & CF, Forest Heatlh, Timber Mgmt	Plans developed
Assist landowners in the understanding of the benefits of healthy ecosystem services.	Stewardship, Forest Health, U & CF	Plans developed, Informational sessions provided
Assist landowners in the understanding of watershed services and effects of management	Stewardship, Forest Health, U & CF	Acres treated
Assist in finding the most efficient means of information exchange among to inform stakeholders of the econmonic benefits of healthy "working " landscapes	Forest Health, Stewardship, U & CF, Timber Mgmt	
Support efforts to identify the needs of Forest Industry in Arizona		

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Economics

Goal 3:	Community recognition of the economic importance to protecting healthy natural systems.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and maintain information about available programs, suitability of lands, and recommendations for greatest benefits and efficiencies.	Continue to monitor stewardship, conservation and resource protection programs and activities, and collaboratively maintain information about priority areas and opportunities.
	Objective 2: Promote economic value of urban and community forests and provide capacity to develop sustainable leadership and programs.	Encourage local and regional collaborative groups to coordinate activities in communities and watersheds at risk.
		Develop Arizona specific guides, tools and plans to assist local and community leaders plan for green infrastructure to increase energy efficiency, consumer patronage and commercial occupancy rates in Arizona's cities and towns.
	Objective 3: Provide comprehensive program leadership, for a variety of programs to address land management issues associated with the high priority landscapes.	Develop a website which incorporates available GIS-based resource data, hazard maps, agency contacts and other pertinent resource management information into a centralized system designed to address land management issues in Arizona. The Initiative would include stewardship, forest health, and wildfire prevention (public awareness and hazard mitigation) guidelines as well as contact information for fire suppression, land management, and other natural resource agencies in the region.
		Develop and distribute fire management, forest restoration, and wildlife habitat and conservation protection Training Modules to educate the public and landowners. These modules could include videos, presentation materials, and brochures on fire prevention, invasive native and non-native plants, and other forest health problems, stewardship, reforestation, wildlife management, ecosystem services, etc.
		Promote employment of professional staff to address local stewardship and resource protection needs in high priority communities and regions.
		Provide training sessions and public workshops (i.e., Resource Management Expos) with a variety of stakeholders to promote forest stewardship, forest health, and wildfire management.
	Objective 4: Recognize and promote the economic benefits of "avoided costs" on state and local budgets through enhancing ecosystem health and community and urban forests.	Build sustainable urban and community forestry programs that are a part of the core infrastructure of a community - benefiting air quality, heating and cooling cost and improved water quality.
		Promote personal and community investment in Fire Adapted communities resilient to wildfires.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Work collaboratively with stakeholders to continually share information about ongoing management activities	FIRE Map, Stewardship, U & CF, Forest Health	
Work collaboratively with stakeholders to continually share information about ongoing management activities	FIRE Map, Stewardship, U & CF, Forest Health, Legacy	
Assist efforts within Arizona to support wood based green industry.	Stewardship, U & CF, Forest Health, Timber Mgmt	Informational material developed
Continue to maintain a current State Forestry web page. Support developing technology that will support up to date information exchange.	FIRE Map, ASFD Web site, GI	Website maintained, additional technology developed
Continue to work with landowners using all available information and technolgy to educate them on forest related issues.	Fire Mgmt, U & CF, Forest Health, ASFD Web site, Firewise	
Continue to pursue and hire qualified staff for State Forestry to guarantee a professional approach to assisting landowners	ALL programs	Additional staff hired
Continue to provide information in various formats to stakeholders to insure that they are well informed on forest issues	Fire Mgmt, U & CF, Forest Health, ASFD Web site, Firewise, Forest Stewardship	Informational sessions provided
Continue to assist communities hrough the Urban and Community Forestry Program.	U & CF, Firewise	Additional Tree City USA's, Plans written
Continue educating communties through the Firewise program and continuing develop ment of Community Wildfire Protection Plans	CWPP, Firewise, U & CF, Stewardship	Additional Firewise Communities, Additional CWPP's

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Climate Change

The ASFD's role in climate change will be in support, collaboration, and implementation roles. Current ASFD cooperative programs that have some ability to address climate change include the Urban Forestry Program and the Cooperative Forest and Fire programs. The Urban Forestry Program is identified as a catalyst to educate and implement climate change components into urban forestry management plans throughout Arizona. The Cooperative Forest and Fire programs are also appropriate for climate change by supporting and implementing sound land management practices that would maintain appropriate fire regimes.

In terms of climate change actions that do not have corresponding programs in the attached matrix, the ASFD will assess the need for new programs, funding sources, and partnerships to meet strategic goals and objectives. These actions listed without current related ASFD programs include the following:

- Working with collaborative groups to identify partners and expertise
- Assessing the statewide threat
- Supporting research programs
- Developing education and outreach materials
- Implementing appropriate climate change practices related to forest and fire management.

Climate Change

Climate Change

Goal 1: Increased resilience of ecosystems to climate change.

Objectives	*Arizona Actions*
Objective 1: Develop and maintain threats analysis for Arizona's forests and other high priority ecosystems using the best available scientific information,	Develop threats assessment information on current and expected effects of climate change to Arizona forests and other ecosystems . Place focus on potential negative impacts to ecosystem health, impacts to water quality and quantity, and changing wildland fire behavior.
	Maintain up-to-date threat assessment and impact information.
	Identify and secure resources to support development and maintenance of ongoing assessment work.
Objective 2: Develop adaptation plans for Arizona's forests and other high priority ecosystems to increase resilience to climate change.	Encourage an all lands approach to land, water, and fire management through effective and efficient collaboration.
	Collaboratively develop statewide adaptation plan utilizing best information available.
	Identify resources to facilitate high priority statewide management actions.
Objective 3: Manage and restore trees, forests, and high priority ecosystems to mitigate effects and adapt to global climate change.	Implement identified collaborative statewide actions.
Objective 4: Support urban and community forestry programs to increase resiliency to climate change.. (see People and Forests Strategies)	(See People & Forests Actions)

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Identify partner/collaborative expertise to keep AFD informed. Work with collaborative group(s) to develop threat assessment information for Arizona.	TBD	Assessment work developed.
Work with collaborative groups to maintain current threat assessment information for Arizona.	TBD	Assessment work maintained
Support development and maintenance of ongoing assessment work where possible.		Resources identified / obtained.
Work with collaborative groups to identify needs and support appropriate actions.	TBD	collaboration activities documented.
		plan developed
		resources pursue / identified
Work with collaborative groups to implement identified actions.	TBD	TBD
Work with collaborative groups such as the Arizona Community Tree Council to share information and implement identified plans.	Urban & Community Forestry	Plans with climate components developed / implemented

Goal 2: Reduced rate of future climate change through maximized carbon sequestration in Arizona forests and trees.

Objectives	*Arizona Actions*
Objective 1: Support landowners and land management practices which implement high quality mitigation practices that reduce carbon loss.	Increase opportunities for biomass and other wood product utilization.
	Improve opportunities for certification of carbon sequestration and wood products on all lands.
Objective 2: Support achievement of appropriate fire regimes to maintain health and resiliency of natural vegetation (See Fire Strategies)	(See Fire Actions)
Objective 3: Support continued research to understand the effects of forest management on sequestration.	Identify and pursue opportunities to improve understanding of climate change science.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Pursue resources through grants or agency budget to develop/maintain capacity within the ASFD for biomass coordination	Utilization & Marketing Specialist	Resources pursued/obtained. Staff employed/maintained.
Work with collaborative groups to identify and communicate processes.	TBD	Carbon sequestration certification / reported. Participation with collaborative groups to identify/communicate needs and processes.
Support and implement actions to maintain appropriate fire regimes through direct and collaborative activities.	Cooperative Fire and Cooperative Forestry	(See Fire Actions/Measures)
Support ongoing research through involvement in collaborative groups. ASFD staff to participate in educational opportunities wherever possible.	TBD	Research conducted and outcomes reported/shared. Participation in educational activities (workshops, classes, briefings, etc)

* Reference SS - refers to alignment with the 2007 Statewide Strategy to Restore Arizona's Forests

Climate Change

Goal 3:	Broad public and community understanding of climate change science - Arizona's variable climate and current and future impacts.	
	Objectives	*Arizona Actions*
	Objective 1: Develop and maintain science based reports and materials specific to Arizona that document the state of knowledge for climate exposure; species, community and watershed vulnerability; forest adaptation strategies and their effectiveness, as well as effectiveness of strategies focused on increasing carbon sequestration.	Develop and maintain materials to address recent climate change and how it affects ecological systems and human infrastructure.
		Develop and maintain materials to address the relationship between water and riparian forests, and conifer forest watersheds and water yield to rivers, creeks, and reservoirs.
		Provide scenario analysis of both plausible climate changes, and potential outcomes for riparian areas, grasslands, and forests. Use scenarios to describe potential management effects, e.g. measurable effects to riparian systems based on increased or decreased water consumption scenarios.
	Objective 2: Develop outreach and education programs to disseminate information about climate change science to the public and community leaders.	Identify collaborative partner agencies and organizations.
		Collaboratively develop a statewide outreach and education plan.
		Identify appropriate resources to implement outreach and education activities.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Work with collaborative groups to develop appropriate materials, support ongoing research, and encourage development of scenario analysis.	TBD	Materials developed
		Materials developed
		Research conducted, scenarios developed, information shared.
Identify or form a collaborative group to facilitate coordination of statewide activities.	TBD	group identified or formed
Work with collaborative groups to develop and implement statewide outreach plan.	TBD	plan developed and implemented
Identify and pursue funding options to support education and outreach.	TBD	Funding possibilities identified/pursued, Funding obtained.

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Culture

Natural resource management and protection are extremely challenging endeavors. On the scientific side, ecosystems are complex and dynamic biological systems where countless organisms and ecological factors function in relationship with one another. On the sociological side, values and perceptions vary widely between different cultures and interest groups. Perhaps the greatest challenge associated with the Culture issue is how to achieve effective communication and understanding between these different groups.

In recognition of the tremendous importance of communicating effectively and fostering understanding between diverse cultures, the “all-lands” and the ASFD matrices are focused entirely on communication, education, and outreach. The ASFD actions identified in the attached matrix will be spearheaded by its tribal liaison position under a 2010 Western Competitive Grant. Focused efforts of the tribal liaison will be complemented by other ASFD personnel through all of the Cooperative Forestry and Fire Management programs.

State and Private Forestry programs are designed and intended to serve all segments of the population, regardless of race, color, national origin, religious or political beliefs, or other personal characteristics or preferences. Toward that end, the ASFD strives to serve all cultures equally. The attached Culture matrix identifies actions that ASFD plans to undertake in support of the goals and objectives that were developed in the “all-lands” strategy; the programs through which those actions will be implemented; and the measures that will be used to gauge the effectiveness and outcomes of those actions.

Culture

Culture

Goal 1: Improved communication between all land management agencies, indigenous tribes, and other cultural groups about varying perspectives and beliefs related to forests, trees, and other natural resources.

Objectives	*Arizona Actions*
Objective 1: Build trust, communication networks, and problem solving strategies between land management agencies, communities, and stakeholders about the diverse cultural perspectives of forest users and Indigenous Tribes,	Develop adequate tribal liaison staffing within the state and federal natural resource agencies to facilitate the ability to address the cultural perspectives associated with the management and protection of forest resources.
	Facilitate the development of appropriately structured work groups to share information and develop strategies to identify, protect and address cultural issues associated with forested lands and their management.
	Develop a monitoring system to ascertain the effectiveness of strategies developed above. Utilize adaptive management to ensure forest management policy and planning integrates the needs of the state's changing demographics.
Objective 2: Improve broader understanding of various cultural perspectives as they relate to forest resources, fire management, and other natural resource issues.	Encourage and facilitate improved information sharing by indigenous tribes and diverse cultural groups to inform others about varying natural resource perspectives.
	Expand research on how various cultural groups perceive and interact with the state's forests, trees, and other natural resources.
Objective 3: Educate the public, government officials, and community leaders about the role and importance of cultural perspectives in restoration, sustainable forest and wood products businesses, fire management, and community protection needs and responsibilities.	Develop and implement an education program for local, state and federal government decision makers, schools, and others about the importance of culture in the forested environment.
	Identify appropriate human and fiscal resources to effectively accomplish public outreach.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Hire ASFD Tribal Liaison and define roles	Western competetive grants,	Staffing in place, plan of work developed
Identify appropriate collaborative group(s) to assist with organizing activities. Conduct outreach through one-on-one activities and organized meetings to share information.	Western competetive grants, All Forestry and Fire programs	Groups identified, formed, or engaged
Work with collaborative group(s) to develop monitoring and feedback mechanisms to inform performance.	Western competetive grants,	Monitoring process identified, implemented. Results reported.
Identify opportunities / venues for sharing of various cultural pespectives with AFD staff and cooperators. Assist with facilitation.	Western competetive grants,)	Materials presented, meetings/workshops held
Identify and engage organizations/groups able to assist with research on various cultural groups in Arizona.	Western competetive grants,	Research groups identified
Work with collaborative group to develop materials supporting cultural issues and viewpoints related to forests.	Western competetive grants,	Materials/programs developed
Explore funding partnerships and opportunities. Apply for grants as available.	Western competetive grants,	Funding options identified/pursued. Grants applied for or received. Funding and/or other resources obtained.

Goal 2: Effective collaboration mechanisms for sharing of information about resources, priorities, policies, and management strategies between Tribes and non-Tribal organizations.

Objectives	*Arizona Actions*
Objective 1: Where appropriate, share data and implementation strategies to leverage successful outcomes on tribal and adjacent lands with similar management objectives.	Enhance collaborative approaches to collection and sharing of data, utilizing existing planning models, leveraging funding sources, and sharing implementation opportunities.
	Recognize or encourage BIA and Tribal management plans and implementation strategies that take an all-lands or collaborative approach.
	Promote development of management plans that are sensitive to culturally significant areas, traditional uses and accessibility to diverse groups (public lands, lands with conservation easements, etc)
	Recognize and communicate tribal implementation of NEPA processes when undertaking forest land management and integrated resource planning.
Objective 2: Improve information sharing about available resources to address needs of indigenous tribes and other cultural groups in Arizona.	Coordinate collaborative outreach efforts to share information about federal and state resources and programs available to tribes and varying cultural groups.
	Evaluate the need for non-traditional materials and other strategies to improve communication and message delivery.

Arizona State Forestry Division - Implementation

ASFD actions	*Related program(s)*	*Measures*
Work with collaborative group(s) to identify/pursue sharing of natural resource program information.	Western competetive grants, All Forestry and Fire programs	Information sharing identified, Materials developed.
Work with collaborative group(s) to communicate benefits of collaborative/all-lands planning and implemenation.	Western competetive grants, All Forestry and Fire programs	# of tribal plans or projects identified with collabortive/all-lands components.
Work with collaborative group(s) to communicate information about cultural sensitivities and encourage inclusion in planning activities.	Western competetive grants,	# of presentations, # of contacts made, # of plans acknowleding cultural sensitivities
Work with collaborative group(s) to communicate information. Develop materials if appropriate.	Western competetive grants,	Information sharing identified, Materials developed.
Conduct outreach about ASFD programs avaialble to tribes and other cultural groups. Identify and work with federal and state partners with similar outreach needs (NRCS, etc.)	Western competetive grants, All Forestry and Fire programs	# of presentations, # of contacts made, # of AFD programs implemeted by tribes and other cultural groups.
Work with tribal liaison, collaborative groups, and other feedback mechanisms to determine the need for non-traditional materials or strategies.	Western competetive grants,	# of options explored, materials developed

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7.0 Conclusion and Next Steps

7.1 Conclusion

While completion of this first edition of *Assessment* and *Strategy* brings the development phase to a close, it signifies the beginning of the implementation phase. The *Assessment* and *Strategy* constitute the road map for diverse stakeholders to collaboratively address issues and opportunities across Arizona's forested landscapes. In the course of the "collaborative journey" to complete the *Assessment* and *Strategy*, strong and productive relationships have been forged. These working relationships constitute the foundation upon which successful implementation of the *Strategy* will occur. For example, efforts will continue through collaboration with tribal leadership. In some instances, relationships were established and the effort will continue to explore and develop goals, objectives, and subsequent actions with tribal interests. Focus areas and priorities will then be aligned with the identified issues.

The *Assessment* and *Strategy* were developed using two parallel and complementary processes. First, a collaborative, multidisciplinary task group was formed that represented the spectrum of entities that have an interest in the forested resources in the state. The *Assessment* was developed from this effort. Then, the ASFD identified State Actions that will be implemented as noted in the *Strategy*. The following strategies will guide and inform implementation and monitoring efforts:

- The state will report to the U.S. Forest Service regarding the implementation of the *Strategy*, as required
- The multidisciplinary advisory group will use outreach to identify and leverage all agency, NGO, tribal, etc. actions
- A variety of affected entities will establish monitoring protocols and produce monitoring data
- Linkages and complementary implementation strategies will be incorporated into the updated *Strategy* plans where appropriate
- Actions will identify, and be coordinated with, interagency actions for inclusion in the *Strategy* where appropriate
- Interagency involvement will be insured by using collaborative processes to develop feedback and adaptive management mechanisms to incorporate acknowledged changes
- Monitoring actions and results will drive revised goals, objectives, and outcomes
- Providing for maintenance strategies and plan updates will be an important aspect of adaptive measures
- Development of an implementation plan for future actions.

7.2 Future Actions

Given the impressive outcomes of this collaborative effort, the State Forester is committed to sustaining it in some fashion. Plans are being formulated for a collaborative group to continue meeting periodically to shepherd the implementation, monitoring, reporting, and adaptation of the *Strategy*.

While the legislative mandate requires a formal revision at five-year intervals or less, the ASFD considers the *Strategy* a dynamic and living document whose implementation will be monitored, assessed, reported, and adapted on a continuing basis. As indicated by the results of monitoring and assessment, the *Assessment* and *Strategy* will be revised to address evolving issues and opportunities. Specific actions will include, but are not limited to:

- Pursue collaborative strategies with federal agencies, state and local governments, tribes, and private sector organizations to address ecosystem and natural resource health issues, and build community capacity to engage in natural resource work
- Work with scientists, landowners, stakeholders, and partners to strategically identify and invest in the most environmentally and socially important landscapes
- Incorporate existing and new land management plans and projects designed to restore degraded land and protect land that is healthy
- Identify strategies that increase financial, technical, and planning assistance to entities to conserve, restore, and protect natural resources, and help them maintain and sustainably manage forest lands
- Invest in urban and community forestry programs to restore urban landscapes and increase open space
- Accelerate research and the development and implementation of tools and conservation practices that provide ecosystem benefits at the landscape scale
- Continue to identify and use best science to guide management practices and decisions
- Monitor how the accomplishment of mutual tasks by all entities contributes to the overall goals and objectives of the *Strategy*
- Charge the multidisciplinary advisory group to respond to updating and implementing the *Assessment* and *Strategy* in a collaborative process. This includes convening forums to include all entities

Appendix A-1: Glossary

additionality	refers to the certainty that a carbon offset results in new carbon fixation, rather than simply subsidizing "business as usual"
afforestation	planting seeds or trees to make a forest on land that is not forested, or which has never been a forest.
airshed	a geographical area within which all of the down-slope air flow has a common exit location
amenity-based services	ecosystem services that include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, flood, disease, wastes, and water quality; cultural services that provide recreational, aesthetic and spiritual benefits; and supporting services such as soils formation, photosynthesis and nutrient cycling
baseline	a set of conditions (e.g. pre-European settlement conditions, quantity of carbon sequestered) against which the conditions at a given point in time can be measured and compared
before present (BP)	more than 12,000 years ago
biomass energy	the energy embodied in organic matter ("biomass") that is released when chemical bonds are broken by microbial digestion, combustion, or decomposition. A wide range of fuels are derived from biomass, including ethanol, biodiesel, biogas, and solid biofuels such as wood, sawdust, grass cuttings, domestic refuse, charcoal, agricultural waste, non-food energy crops, and dried manure.
biodiversity / biological diversity	biological variety of the kind that preserves species and their DNA. R. H. Whittaker categorized it (1972) as alpha, the number of species in an ecosystem; beta, the diversity between ecosystems; and gamma, the diversity of entire regions. Depleted biodiversity leads to population crashes, declines in genetic variability, and extinctions.
biotic integrity	the diversity of species and composition, as well as the overall health and intactness of ecosystems
biotic resilience	the ability of a biological entity, e.g. an ecosystem, to recover quickly from disruption
bosque	areas of gallery forest found along the flood plains of stream and river banks in the southwestern United States – The name is derived from the Spanish word for *woodlands*.
carbon bank or sink	sites that soak up carbon
carbon monoxide	an odorless, very poisonous gas that is a product of incomplete combustion of carbon, which is highly toxic to humans and animals
carbon offset	a financial instrument aimed at a reduction in greenhouse gas emissions. Carbon offsets are measured in metric tons of carbon dioxide-equivalent (CO_2e) and may represent six primary categories of greenhouse gases.[1] One carbon offset represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases through carbon sequestration by, for example, a forest.
carbon sequestration	the process of capturing carbon dioxide from the atmosphere through biological, chemical or physical processes. It has been proposed as a way to mitigate accumulation of greenhouse gases in the atmosphere, which are released by burning fossil fuels.
capacity	the combined resources and ability of an entity to accomplish a specified goal or task – (e.g. restoration and management at a landscape scale, enhancement of an urban forestry program)
chaparral	an evergreen shrub community adapted to dry seasons

Chicago Climate Exchange (CCX)	CCX is North America's only voluntary, legally binding greenhouse gas (GHG) reduction and trading system for emission sources and offset projects in North America and Brazil. CCX employs independent verification, includes six greenhouse gases, and has been trading greenhouse gas emission allowances since 2003. The companies joining the exchange commit to reducing their aggregate emissions by 6% by 2010.
Class I Areas	those areas with the highest sensitivity to air quality . Where air quality is better than the national standards, Class I allows the least increase in pollutants compared to Class II that allows more and Class III that allows the most.
collaborative	***n.*** a group of people with diverse representation from different entities (e.g. agencies, organizations, academia, etc.) that works cooperatively on a common cause. ***adj.*** a method or approach to problem-solving and project development
Communities At Risk	a descriptive label for communities that is based upon their level of risk to uncharacteristic, high-intensity wildfire
community	an assemblage of populations living in a stated area. The extent of a community is limited only by the requirement of a more or less uniform species composition.
Community Wildfire Protection Plans (CWPP)	a plan that evaluates local conditions and risks from wildfire, as well as fire suppression resources, and develops a plan to address all aspects of community protection and wildfire mitigation
dendrochronology	the study of tree rings and how they relate to our environment – oftentimes used to examine climate history
diversity	the relative degree of abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area
ecological forest restoration	the science of restoring an ecosystem to a more stable and sustainable condition in which it previously existed
ecoregion	(sometimes called a bioregion) an ecologically- and geographically-defined, relatively large area of land or water, that contains characteristic, geographically-distinct assemblages of natural communities and species, similar topography, geology, climate, and other environmental factors.
ecosystem	a complete, interacting system or unit of organisms in a space considered together with their environment, e.g., a marsh, a watershed, a lake, etc. A flow of energy leads to clearly-defined food and feeding relationships, biological diversity, and biogeochemical cycles (i.e., exchange of materials between living and nonliving parts) operating as an integrated system.
ecosystem health	the ability of an ecosystem to remain productive, resilient, and stable over time, and to withstand the effects of periodic natural or human-caused stresses such as drought, insect attack, disease, climatic changes, flood, resource management practices, and resource demands
ecosystem integrity	the completeness of an ecosystem that, at multiple geographic and temporal scales, maintains its characteristic diversity of biological and physical components, spatial patterns, structure, and functional processes within its approximate range of historic variability. These processes include disturbance regimes, nutrient cycling, hydrologic functions, vegetation succession, and species adaptation and evolution. Ecosystems with integrity are resilient and capable of self-renewal in the presence of the cumulative effects of human and natural disturbances.
ecosystem services	amenities that are provided by ecosystems, such as food, air, water, wildlife, timber, and fiber; recreational, aesthetic and spiritual benefits; and supporting services such as soils formation, photosynthesis and nutrient cycling

ecotone	the transitional zone between adjacent biotic communities, often with unique nutrients and ecological relationships
endemic	native or confined to a certain region; having a comparatively restricted distribution
epiphytic	of plants that grow on, but are not nourished by, another plant
Farm Bill	the Food, Conservation, and Energy Act of 2008
Fire Regime Condition Class	an interagency, standardized tool for determining the degree of departure from reference condition vegetation, fuels and disturbance regimes - Assessment of FRCC can help guide management objectives and set priorities for treatments
FireWise standards	standards for building materials and structural characteristics, as well as the makeup and arrangement of vegetation and flammable materials that provide an increase in defensible space and resistance to wildfire
forest health	the ability of forest ecosystems to remain productive, resilient, and stable over time and to withstand the effects of periodic natural or human-caused stresses such as drought, insect attack, disease, climatic changes, flood, resource management practices, and resource demands
forest offset	a carbon offset that is provided by a forest
forest restoration	See "ecological forest restoration"
fragmentation	interrupting the continuity of an ecosystem with roads, fences, utility corridors, clearings, and/or land use changes that reduce or compromise its value to wildlife or other uses
global climate change	a change in the statistical distribution of weather over periods of time that range from decades to millions of years. It can be a change in the average weather or a change in the distribution of weather events around an average
green economy	an economy that stems from activities to improve the environment (e.g. solar-powered energy production, wind-powered energy production, recycling, energy conservation, utilization of renewable energy versus fossil fuels, etc.)
green infrastructure	infrastructure that reduces carbon emissions including community forestry, green roofs, and parks and open space
heat island	a metropolis where summertime air temperatures are 3 to 8 degrees Fahrenheit warmer than the temperatures in the surrounding countryside, primarily due to increased heat absorption and storage by structures and paved areas devoid of vegetation – often described as a bubble that gets cooler as you move further from the urban core
impervious surface	a surface that cannot be passed through e.g., by water or air
Incident Command System (ICS)	a standardized, on-scene, all-hazards incident management approach that allows for the integration of facilities, equipment, personnel, procedures, and communications and operates within a common organizational structure and processes
landscape	a large geographical area that may span considerable variation in topography, watersheds, flora and fauna, land use and jurisdictions
landscape ecology	the study of spatial and temporal variety (heterogeneity) in the structure, dynamics, and relations of plants, animals (including people), and landscape elements at a large scale
latillas	small-diameter poles laid on top of vigas (larger diameter logs or poles laid under the latillas at a 90° angle) to form a roof on a building

leakage	a situation where a carbon offset project indirectly causes increased emissions outside the defined boundaries of the project itself - sometimes referred to as secondary effects or displacement
Madrean Archipelago/ Madrean oak woodland	also known as the Sky Islands in the United States, this is a region of basins and ranges with medium to high local relief, typically 1,000 to 1,500 meters. Native vegetation in the region is mostly grama-tobosa shrubsteppe in the basins and oak-juniper woodlands on the ranges, except at higher elevations where ponderosa pine and other conifers are predominant.
Malpai Borderlands	a region along the U.S.-Mexico border and the Arizona-New Mexico state line. The extreme southeast corner of Arizona and the southwest corner of New Mexico describe the general vicinity. It includes areas inside the U.S. states of Arizona and New Mexico as well as the Mexican states of Chihuahua and Sonora.
montane	of or relating to mountains and their ecosystems
nonattainment days	days when air quality does not meet minimum quality standards as required by the Clean Air Act of 1963 as amended, and specified by the US Environmental Protection Agency
Open Space Strategy	a strategy developed by the USDA Forest Service which provides broad concepts for working with communities cooperatively to address open space and potential development issues
pathogenic or saprophytic fungi	pathogenic fungi cause diseases in living organisms while saprophytic fungi decompose non-living tissue
paleoecology	the branch of ecology that deals with the interaction between ancient organisms and their environment
Pleistocene and Holocene epochs	The ***Holocene*** is a geological ***epoch*** which began approximately 12000 years ago and continues to this day. The Pleistocene is the epoch from 2.588 million to 12,000 years before present (BP) covering the world's recent period of repeated glaciations.
PM10	term used to describe airborne particulate matter with an aerodynamic diameter of 10 micrometers or less,
prescribed fire	planned ignition in a predetermined or approved/prepared area - fire ignited by management action under certain, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement
restoration byproducts	products generated by the implementation of an ecosystem restoration project
restoration of natural capital	Natural capital is the extension of the economic notion of capital (manufactured means of production) to goods and services relating to the natural environment. Natural capital is thus the stock of natural ecosystems that yields a flow of valuable ecosystem goods or services into the future. For example, a stock of trees or fish provides a flow of new trees or fish, a flow which can be indefinitely sustainable. Natural capital may also provide services like recycling wastes or water catchment and erosion control. Since the flow of services from ecosystems requires that they function as whole systems, the structure and diversity of the system are important components of natural capital.
riparian	adjacent to a river or stream - Riparian zones exchange organic matter between wet and dry habitats and regulate erosion, sedimentation, temperature, and nutrients.
sedimentation	the movement of sediment into streams and other bodies of water as a result of soil erosion within a watershed
smart growth	a continuous planning process to guide the preservation, development, or redevelopment of a neighborhood, community, or region to promote the goals and ambitions of its residents when facing growth pressure - quality of life, infrastructure, and land use are typically key considerations in the process

Sonoran Joint Venture (SJV)	a partnership involving a diversity of organizations and individuals from throughout the southwestern United States and northwestern Mexico that share a common commitment to the conservation of all bird species and their habitats
species richness	the number of different species in a given area - the fundamental unit in which to assess the homogeneity of an environment
sulfur dioxide	**a** chemical compound with the formula SO_2 that is produced by volcanoes and from the burning of fossil fuels like coal and petroleum products and forms sulfuric acid when combined with precipitation (acid rain)
sustainable	a condition that is stable and resilient and that can maintain itself in the face of disturbance over time
timberland	forestland where tree species such as ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) traditionally used for industrial roundwood products, make up at least 10% of the stocking
traditional cultural properties	places that are formally recognized as physical manifestations of the values and beliefs that give tribal members their identity as a people
tree canopy (urban or rural)	the layer of leaves, branches, and stems of trees that cover the ground when viewed from above
Tree City USA	a national program that provides direction, technical assistance, public attention, and national recognition to communities for their urban and community forestry programs
understory	the trees and other vegetation living below a forest canopy.
urban and community forests	forests in an urban setting - broadly includes trees in urban parks, along streets and landscaped boulevards, in neighborhood parks, on urban private land, at commercial sites, schools and higher education facilities, in public gardens, river corridors and promenades, as well as greenways, wetlands, nature preserves, natural areas, shelter belts of trees and working trees at industrial brown field sites.
vigas	logs or poles that form the support structure for latillas (smaller diameter poles laid on top of the vigas at a 90° angle) to form a roof on a building
water yield	the volume of water runoff from a watershed, including groundwater outflow
Western Forestry Leadership Coalition	a unique partnership between 34 state and federal government forestry leaders across the West to address critical resources issues across ownerships and jurisdictions.
Wildfire Hazard Severity	the severity of a wildfire hazard, determined using a checklist adopted from the wildfire hazard severity analysis developed by the National Fire Protection Association (NFPA) Forest and Rural Fire Protection Technical Committee. NFPA 299 Standard for the Protection of Life and Property from Wildfire, 1997, is the basis for the wildfire hazard severity evaluation.
wildland fire	a fire that is caused by unplanned ignitions of natural or human sources and burns vegetative fuel
woodland	forestland where timber species are not present at the minimum 10% stocking level. Woodland tree species such as pinyon (P. edulis) and juniper (Juniperus spp.) are used primarily for fuelwood, fence posts and in some cases, Christmas trees.

Appendix A-2: Acronym Dictionary

NASF	National Association of State Foresters
TNC	The Nature Conservancy
NEPA	National Environmental Policy Act
OHV	Off Highway Vehicle
ORV	off road vehicle
RMRS	Rocky Mountain Research Station
S&PF	State and Private Forestry
SHPO	State Historic Preservation Office
SWAP	State Wildlife Action Plan
USDA	United States Department of Agriculture
USFS	USDA Forest Service
WHIP	Wildlife Habitat Improvement Program
WMSC	White Mountain Stewardship Contract
WUI	Wildland/Urban Interface
ACTC	Arizona Community Tree Council

Appendix A-3: Comparison Between the Arizona *Strategy* and the USDA Strategic Plan FY 2010-2015

The following chart displays the alignment between the goals in the *Strategy* and the goals in the USDA Strategic Plan (http://www.ocfo.usda.gov/usdasp/sp2010/sp2010.pdf).

Arizona State Forestry Implementation Strategy	USDA Strategic Plan FY 2010-2015
People and Forests	
Goal 1: People and communities receive maximum benefits from forests and trees.	Strategic Goal 1: Assist rural communities to create prosperity so they are self- sustaining, repopulating, and economically thriving.
Goal 2: Minimize negative human impacts to trees and forests.	Strategic Goal 2: Ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources.
Ecosystem Health	
Goal 1: Resilient and diverse forest ecosystem structures, processes, and functions.	Strategic Goal 2
Goal 2: Progress toward landscape-scale outcomes, restoration of unhealthy ecosystems, and enhanced sustainability with limited negative impacts.	Strategic Goals 1 and 2
Water (Water& Air)	
Goal 1: Improved water quality and quantity from forested watershed	Strategic Goals 1 and 2
Goal 2: Improved health and resiliency of forested aquatic systems (riparian areas, springs, and wet meadows.)	Strategic Goal 2
Goal 3: Increased public understanding of the importance of forests to Arizona's water quality.	Strategic Goals 1 and 2
Air (Water& Air)	
Goal 1: Improved air quality	Strategic Goals 1 and 2
Goal 2: Increased public understanding or the importance and effects of fire on Arizona's air quality.	Strategic Goals 1 and 2
Fire	
Goal 1: Wildland ecosystems where appropriate fire regimes maintain health and resiliency of natural vegetation.	Strategic Goal 2
Goal 2: "Fire-adapted communities" that provide shareholder responsibility for healthy landscapes and wildfire-prepared communities.	Strategic Goal 1
Goal 3: Enhanced wildland fire management capacity in Arizona.	Strategic Goals 1 and 2
Goal 4: An Arizona public and government leadership that is well informed about wildland fire management, science, and prevention issues.	Strategic Goals 1 and 2
Economics	
Goal 1: Realized long-term economic potential of	Strategic Goals 1 and 2

sustainable forest products and bioenergy while achieving Ecosystem Health goals.	
Goal 2: Protection of areas with economic development potential related to ecosystem services.	Strategic Goal 1
Goal 3: Community recognition of the economic importance of protecting healthy natural systems.	Strategic Goals 1 and 2
Climate Change	
Goal 1: Increased resilience of ecosystems to climate change.	Strategic Goal 2
Goal 2: Reduced rate of future climate change through maximized carbon sequestration in Arizona forest and trees.	Strategic Goal 2
Goal 3: Broad public and community understanding of climate-change science.	Strategic Goals 1 and 2
Culture	
Goal 1: Improved communication between all land management agencies, indigenous tribes, and other cultural groups about varying perspectives and beliefs related to forests, trees, and other natural resources.	Strategic Goals 1 and 2
Goal 2: Effective collaboration mechanisms for sharing of information about resources, priorities, policies, and management strategies between tribes and non-tribal organizations.	Strategic Goals 1 and 2