



2020 ALASKA FOREST ACTION PLAN

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF FORESTRY



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Cover photo: Paper birch stand in Southcentral.

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Executive Summary: 2020 Alaska Forest Action Plan

Developed by the State of Alaska, Department of Natural Resources, Division of Forestry with assistance from cooperative fire and cooperative forestry program stakeholders, the 2020 Alaska Forest Action Plan is a roadmap to address threats facing forests statewide—threats that know no boundaries, such as wildland fire and forest insects and disease. The 2020 Alaska Forest Action Plan is also a roadmap to make the most of the benefits provided by forests, including clean water, fish and wildlife habitat, subsistence, heating for homes, commercial forest products, local jobs, community well-being, and more. The Division of Forestry works in partnership with the U.S. Department of Agriculture Forest Service State and Private Forestry to deliver the federally funded cooperative programs housed within the Division: Cooperative Fire, Community Forestry, Forest Health, and Forest Stewardship. These programs are geared towards non-federal lands. The programs' national priorities are to conserve and manage working forest landscapes for multiple resources and values, protect forests from threats, and enhance public benefits from trees and forests. The Plan provides strategies to meet these priorities to benefit Alaska's forests and people.

A new State Forest Action Plan is required by the 2008 Farm Bill every 10 years. This Plan replaces the 2010 Plan, which was amended in 2016. The 2020 Alaska Forest Action Plan includes three main components to guide the implementation of the cooperative forestry and fire programs through the next decade.

Alaska Forest Action Plan Components



Forests in Alaska cover 129 million acres and fall into two main forest types: the 15-million-acre coastal temperate rainforest of Southeast and coastal Southcentral, and the 114-million-acre boreal forest of inland Southcentral and the Interior. The coastal forest is made up primarily of western hemlock and Sitka spruce, and is renewed through small gap disturbances created by wind. The boreal forest is made up primarily of paper birch, white spruce, and black spruce. The cycle of succession in the boreal forest is driven by fire, and, particularly in the transitional forest of Southcentral, bark beetle outbreaks. Alaska's forests provide key habitat for all five species of Pacific salmon as well as moose, Sitka black-tailed deer, and other wildlife. These fish and wildlife resources are integral to the subsistence way of life that is economically and culturally vital, especially to rural communities.

Alaska's forest industry has historically been and continues to be focused on the coastal forests of Southeast Alaska where both timber volume and value are greatest. The forest industry of Southeast declined significantly in the 1990s when the region's largest landowner, the Tongass National Forest, ended its long-term timber sale contracts. By 2015, timber harvest volume in Alaska overall had decreased to half of its 2005 level. In Southeast, the forest industry is transitioning to young-growth harvest, but most young-growth stands have not yet reached harvestable size. By volume, timber harvest in the boreal forest makes up just 6%

FOREST BENEFITS

- Ecosystem services
- Fish and wildlife habitat
- Subsistence
- Cultural and spiritual benefits
- Watershed values
- Carbon storage
- Forest products and timber management opportunities
- Energy independence for communities
- Non-timber forest products
- Aesthetic and scenic values
- Community benefits
- Forest Recreation

FOREST THREATS

- Wildland fire
- Forest insects, disease, & abiotic stressors
- Reduced forestry infrastructure
- Climate change
- Invasive species
- Forest conversion and fragmentation

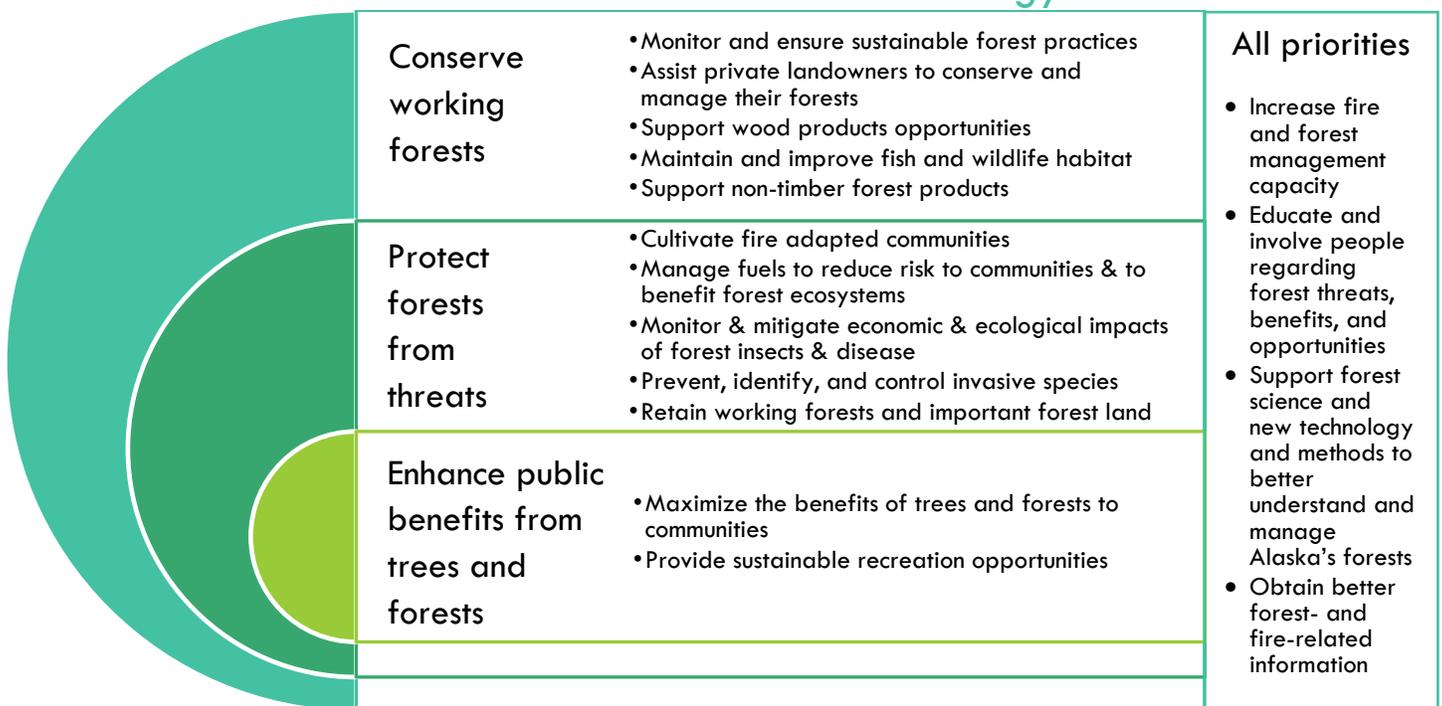
of Alaska’s total, but this harvest provides forest products important for local uses as well as local jobs. Because of high transportation costs, wood harvested in one region stays in that region for processing. Two-thirds of wood products made in Alaska are sold in Alaska. Wood energy has great potential to reduce the extremely high heating costs in rural communities dependent on diesel fuel for heat and power, as well as to add local jobs.

Alaska’s population is growing and so is the wildland-urban interface, where forest fuels are intermixed with homes, recreational cabins, and community infrastructure. Wildland fire is the forest threat of greatest concern to stakeholders, followed by forest insects and disease—particularly the spruce beetle. At the time of this Plan’s release, Southcentral was in the ongoing midst of a spruce beetle outbreak in its fifth year, which covered over 1.1 million acres in 2019 with 2020 impacts still being assessed. Alaska’s forests are also experiencing the impacts of climate change. Alaska’s fire seasons are beginning earlier and lasting longer. Fires are larger and more resistant to control because of hotter, drier weather. There is high need for strategic fuels management to help reduce risk to communities and important infrastructure.

Alaska’s vast intact forest ecosystems provide abundant benefits, but their sheer size also presents challenges to cooperative fire- and forest-management. These challenges are magnified by Alaska’s small population and associated capacity limitations related to workforce, funding, and number and size of available cooperators, such as local governments and non-profit organizations. To make the most of limited resources, the Plan seeks to prioritize areas where forests matter most to Alaska’s people—forest lands and wildland urban interface areas that have been identified through the robust Alaska Interagency Wildland Fire Management Plan as having resources requiring fire protection; private forest lands including Alaska Native corporation lands; and State Forests and State land classified for forestry. The Priority Landscape Area is meant to be targeted enough to shape on-the-ground implementation, but large enough to accommodate the variation in cooperator capacity in different areas over time. Strategies in the plan will help to efficiently provide federal, state, local, and private resources where they can have the most impact.

The Statewide Forest Resource Strategy provides a roadmap to address the threats facing Alaska’s forests and reflects the current implementation of the cooperative programs as well as future needs. To implement the strategy, the State Forester will require resources including the Division of Forestry’s cooperative programs, a variety of federal grant funding sources, and the participation of a wide range of partners, including federal, state, and local government agencies; Alaska Native tribes; Alaska Native corporations; organized land management and scientific partnerships; and other non-governmental organizations. The 2020 Alaska Forest Action Plan brings these resources together for healthy forests and communities into the future.

Statewide Forest Resource Strategy



STATEWIDE FOREST RESOURCE ASSESSMENT

FOREST CONDITIONS AND TRENDS: PAGE 7

THREATS TO FOREST LANDS AND RESOURCES: PAGE 42

PRIORITY LANDSCAPE AREA: PAGE 58

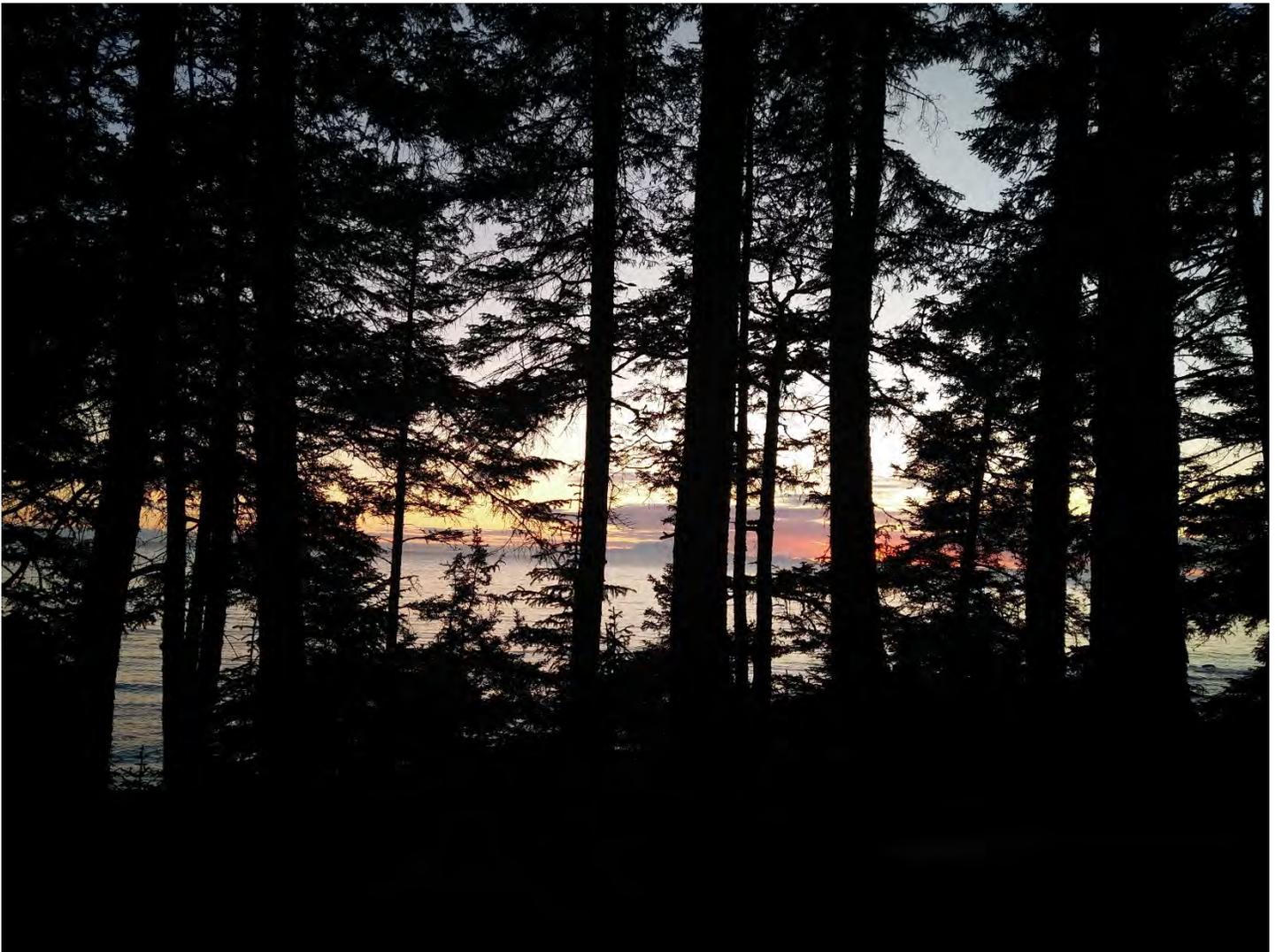


Figure 1. Sunset through a Sitka spruce stand near Seldovia. ©2020 ADOF

Introduction

The 2020 Alaska Forest Action Plan provides a statewide Forest Resource Assessment and Strategy and identifies a Priority Landscape Area. The Forest Resource Assessment evaluates forest resource conditions, trends, issues, threats, and opportunities. The Strategy identifies ways to address the issues, threats, and opportunities.

A new State Forest Action Plan is required every 10 years by the 2008 Farm Bill for states to be eligible for federal funding of cooperative fire and cooperative forestry programs. Alaska's first State Forest Action Plan was completed in 2010 and revised in 2016.

More than ever, an all lands, all hands approach is needed for forest management in Alaska to address cross-boundary threats to forests. The U.S. Department of Agriculture (USDA) Forest Service has a longstanding partnership with the State of Alaska through its State and Private Forestry Programs. While the Alaska Forest Action Plan is



Figure 2. Mountain hemlock, Southcentral. ©2020 ADOF

developed through the State of Alaska, numerous stakeholders were consulted in the Plan's development, and this document reflects the consensus on the greatest issues facing Alaska's forests currently and projected over the next ten years.

As the many problem-oriented workgroups that have developed or reactivated in Alaska over the past ten years suggest, teamwork is crucial to meeting the needs of Alaska's forests today and into the future.

What Does the Plan Do?

Alaska's forests don't stop at property boundaries, and neither do threats to forests like wildland fire and spruce beetle. Similarly, the public benefits reach beyond property boundaries to provide clean water and air, fish and wildlife habitat, outdoor recreation opportunities, healthy communities, and forest products including wood energy. This plan is not a land management plan, but instead recognizes the broad needs of both public land managers and private landowners. This plan seeks to identify the threats facing Alaska's forests and the opportunities to improve the benefits of Alaska's forests, and to put forward a roadmap of strategies that can be used voluntarily by landowners across Alaska.

The overriding purpose of the Alaska Forest Action Plan is to efficiently guide the use of federal, state, local, and private funding to conserve Alaska's forest resources and make the most of the public benefits of Alaska's forests. It is the intent of this plan to be an easy reference guide for anyone looking for ways to maintain and improve Alaska's forests.

National State and Private Forestry Priorities

The national priorities for State and Private Forestry are woven throughout the Forest Action Plan and serve as the Plan's goals.

- Conserve and manage working forest landscapes for multiple values and uses
- Protect forests from threats
- Enhance public benefits from trees and forests

Connections to Other Plans

The Forest Action Plan is meant to serve as a connection between other complementary plans and a means to meet multiple program requirements in one consolidated document. Plans required by the USDA Forest Service to be incorporated into the Forest Action Plan include Community Wildfire Protection Plans; the State Wildlife Action Plan developed by the Alaska Department of Fish and Game; the Statewide Comprehensive Outdoor Recreation Plan developed by the Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation; and the Forest Legacy Program 2002 Assessment of Need developed by the Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation. The Forest Legacy Program Assessment of Need is attached as Appendix B.

The Forest Legacy Program Requirements topics which are updated in this Forest Action Plan are cross-referenced by page number below. In December 2020, the Alaska Division of Forestry assumed the role of lead state agency for the Forest Legacy Program from the Division of Parks and Outdoor Recreation. The applicable eligibility criteria, Forest Legacy Areas, specific goals and objectives to be accomplished by the Forest Legacy Program, and the process to evaluate and prioritize projects to be considered for inclusion in the Forest Legacy Program remain the same as described in the 2002 Assessment of Need, except for the lead agency roles which are now within the Division of Forestry.

Numerous other plans, while not required for incorporation into the Forest Action Plan, are relevant to the Forest Action Plan and should be consulted when considering implementation of the Plan. These plans include the [Kenai Peninsula All Lands All Hands Action Plan 2018](#), municipal and borough plans, National Forest management plans, State Forest management plans, and Forest Stewardship Plans for Alaska Native corporations and individual private landowners.

Forest Legacy Program Requirements

Topic	Page(s)
Required information to be addressed as it relates to the purpose of the Forest Legacy Program:	
a. Forest resources and benefits including:	3-41
• Aesthetic and scenic values,	40
• Fish and wildlife habitat,	30-32
• Public recreation opportunities,	40-41
• Soil productivity,	27-28
• Forest products and timber management opportunities, and	35-39
• Watershed values including water-quality protection.	34-35
b. The present and future threat—as defined by the State—of conversion of forest areas to nonforest uses;	57, Appendix B
c. Historic or traditional uses of forest areas, and trends and projected future uses of forest resources;	12-13
d. Current ownership patterns and size of tracts, and trends and projected future ownership patterns;	14-24
e. Cultural resources that can be effectively protected;	13
f. Outstanding geological features;	27-28
g. Threatened and endangered species;	30-31
h. Other ecological values;	30, 34
i. Mineral resource potential;	27-28
j. Protected land in the State, to the extent practical, including Federal, State, municipal lands, and private conservation organization lands; and	14-24
k. Issues identified by the State Forest Stewardship Coordinating Committee and through the public-involvement process.	103
Using the above information the State Forest Action Plan shall include the following:	
a. Identification of applicable eligibility criteria;	Appendix B
b. Identification of specific Forest Legacy Areas for designation;	Appendix B
c. Specific goals and objectives to be accomplished by the Forest Legacy Program; and	Appendix B
d. Process to be used by the State Lead Agency to evaluate and prioritize projects to be considered for inclusion in the Forest Legacy Program.	Appendix B

State Forest Action Plan Requirements Checklist with Page References

Item	Included	Page
Statewide Forest Resources Assessment		
Conditions and trends of forest resources in the state	Yes	7-41
The threats to forest lands and resources in the state consistent with national priorities	Yes	42-57
Areas or regions of the state that are a priority	Yes	58-59
Any multi-state areas that are a regional priority	Yes	60
Statewide Forest Resource Strategy		
Long-term strategies to address threats to forest resources in the state	Yes	66-83
Description of resources necessary for state forester to address statewide strategy	Yes	84-99
Strategy addresses national priorities for state and private forestry	Yes	100
Stakeholder Groups Coordinated with for the Statewide Assessment and Strategy		
State Forest Stewardship Coordinating Committee	Yes	103-104
State Wildlife Agency	Yes	103-104
State Technical Committee	Yes	103-104
Lead agency for the Forest Legacy Program	Yes	103-104
Applicable Federal land management agencies	Yes	103-104
Military installations	Yes	103-104
Other Plans Incorporated in the Statewide Assessment and Strategy		
Community wildfire protection plans	Yes	74
State wildlife action plans	Yes	67-68
Statewide Comprehensive Outdoor Recreation Plan	Yes	79
Forest Legacy Program Requirements Included	Yes	App. B

Forest Conditions and Trends

Alaska's 129 million acres of forest defy brief description. The goal of this statewide forest resource assessment is to provide an overview of forest conditions and trends to serve as a framework for understanding the strategies we can use to address threats to Alaska's forests in order to conserve working forests, protect forests from threats, and enhance public benefits from trees and forests.

Alaska's Forests

Alaska's 365 million acres stretch over 1,305 miles of latitude and 2,175 miles of longitude from sea level to over 20,000 feet (Viereck & Little 2007). The huge and varied physiography and range of climates provide for great contrast in vegetation types. Alpine tundra flanks all of Alaska's mountain ranges. Flat wet tundra dotted with shallow lakes and ponds stretches across the Arctic coastal plain and the Yukon River deltas. Moist tundra characterized by tussocks covers the Seward and Alaska Peninsulas and lower elevations of the Alaska Range. Dense shrub thickets cover river floodplains and occupy the transition between treeline and alpine tundra and between coastline and forest edge. The vast boreal forest of the Interior contains a range from productive white spruce-hardwood forest to open, low-growing black spruce forests to treeless bogs. The boreal forest transitions into coastal temperate rainforest in Southcentral Alaska, reaching Southeast Alaska where it is some of the most productive forest in the world.

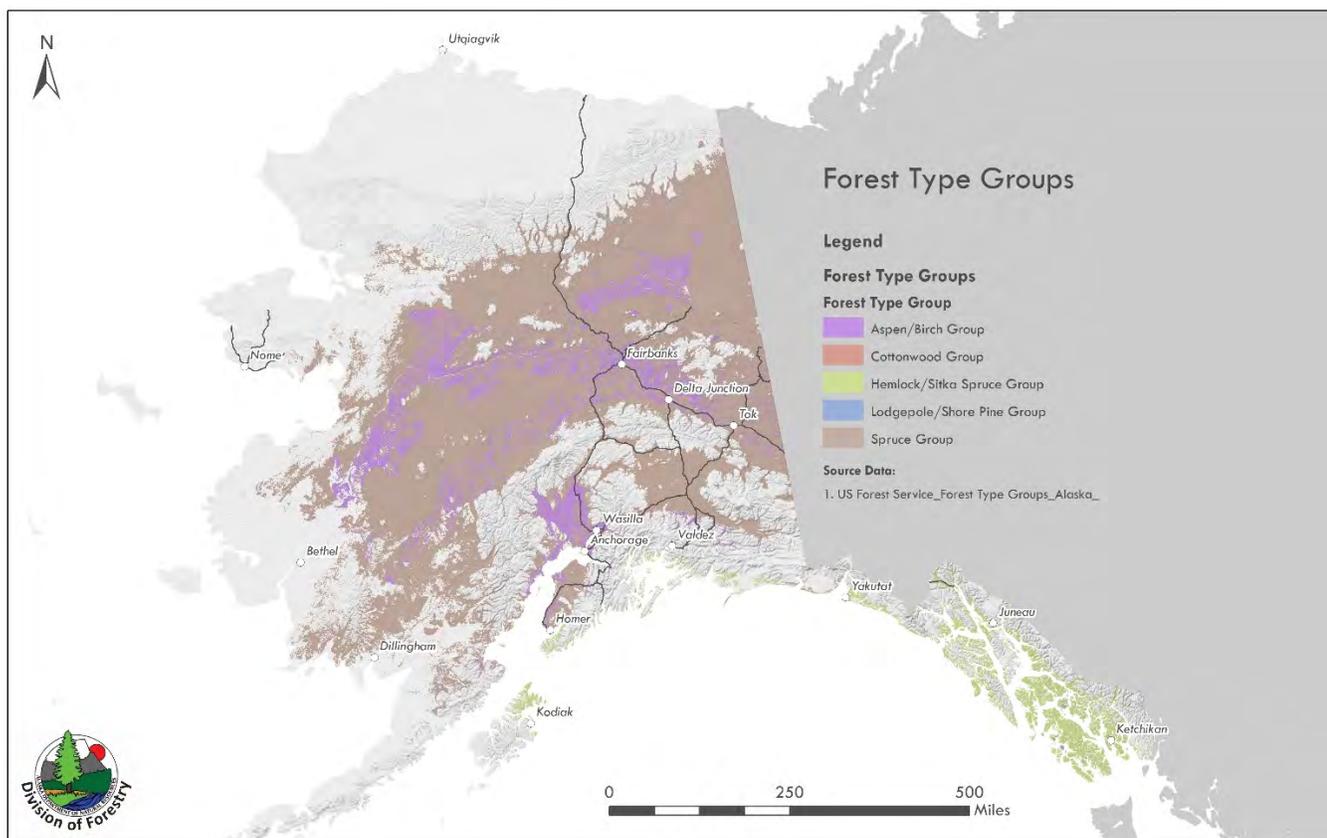


Figure 3. USDA Forest Service Forest Type Groups.

Alaska's forests total 129 million acres, which is 17% of the nation's forest land and 60% of Pacific Coast forest land (Andersen et al. 2019). However, Alaska has the second lowest proportion of timberland of all the states (Marcille et al. 2017a). "Forest land" is land with at least 10% tree cover, with trees being defined as woody plants with a more or less erect stem capable of reaching at least 3 inches diameter at breast height and at least 16.4 feet at maturity (Andersen et al. 2019). "Timberland" is forest land that is capable of producing at least 20 cubic feet per acre per year of commercial roundwood products, not including fuelwood. Alaska's coastal forest covers 15 million acres and stores 1 billion tons of biomass. Alaska's boreal forest covers 110 million acres.

The Alaska Forest Action Plan describes both the forest land base and the timberland base. Describing the timberland base is complicated by nuances of terminology used by varying landowners. Land may meet the biological definition of timberland but be precluded from use as timberland because of administrative or legislative designations which prohibit timber harvest. Because timberland may be based on administrative designations, timberland acreages and volumes may differ greatly over time as a landowner’s goals shift. The Forest Action Plan attempts to reconcile landowners’ varying terminology with the forest land and timberland categories to provide an accurate picture of where forest management for forest products purposes is taking place today.

The 2020 Alaska Forest Action Plan categorizes Alaska’s forest into coastal forest and boreal forest, with the transitional forest in Southcentral categorized as boreal forest. This simplification aligns with the broad perspective of the Forest Action Plan. In contrast, the Alaska Forest Resources and Practices Act (AS 41.17) divides Alaska’s forests into three regions. Region I comprises coastal forests from Southeast Alaska through Prince William Sound, the eastern Kenai Peninsula, the Kodiak Archipelago, and parts of the Alaska Peninsula. Region II is the boreal forest south of the Alaska Range. Region III is the boreal forest in the rest of the state.

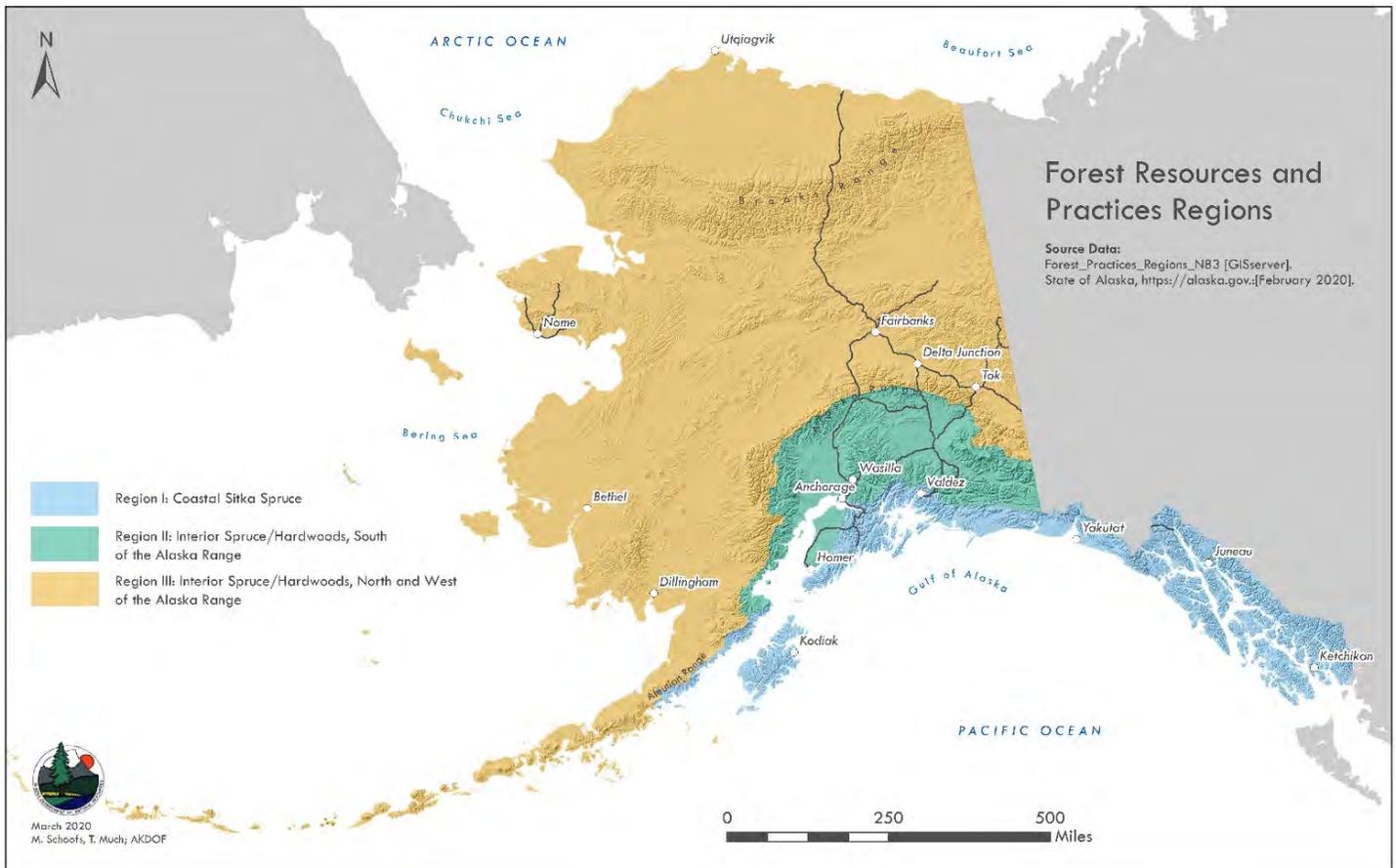


Figure 4. Forest Resources and Practices Act Regions

Coastal forest

Coastal temperate rainforests are rare on the global scale, occurring only at higher latitudes near coastal mountains. The 15-million-acre coastal temperate rainforest of Alaska stretches over 900 miles along the Alaska coast and is comprised primarily of western hemlock and Sitka spruce (Viereck & Little 2007). The southern coastal forest also includes western redcedar and yellow-cedar, and occasionally subalpine fir and Pacific silver fir. Red alder grows along streams, coastlines, and disturbed areas, while black cottonwood is found on the mainland on river floodplains and recently deglaciated areas. Heading north, the forest composition changes. Western redcedar does not extend beyond Frederick Sound, yellow-cedar is not found west or north of Prince William Sound, and western hemlock is not found west or north of Cook Inlet. From Cook Inlet to Kodiak and Afognak Islands, coastal forests are exclusively Sitka spruce. Throughout the coastal forest, muskegs are intermixed with forest where soils are wet at low elevations. The understory of the coastal forest is blanketed in moss, Sitka alder, rusty menziesia, devil's club, salmonberry, various willows, and blueberry.

Treeline in the coastal forest is around 2,000 to 3,300 feet in elevation. Commercial stands grow to about 1,500 feet. The main source of disturbance in the coastal forest is wind blowing over a few trees at a time, creating small gaps in the forest canopy where trees regenerate (ADF&G 2015). Because of this gap-phase dynamic, the coastal forest is long-lived, multi-aged, and features a multi-layered canopy including large trees and abundant understory vegetation. After disturbance or harvest, it takes 200 to 300 years for forests to reach the old-growth stage.



Figure 5. Coastal forest, Cordova. ©2020 ADOF

Boreal forest

The boreal forest covers about one-third of Alaska, or 110 million acres, from the Kenai Peninsula in the south to the Brooks Range in the north and west almost to the Bering Sea (Vioreck & Little 2007). The boreal forest is primarily composed of paper birch, white spruce, and black spruce, but the boreal forest landscape is a patchwork mosaic of vegetation patterns due to fire and the influence of aspect and permafrost on tree growth. Fire is the primary cause of disturbance in the boreal forest.

Succession after fire begins with willows and other shrubs. On south-facing slopes, aspen follow, and then are replaced by white spruce. On east- and west-facing slopes, paper birch follow the shrubs before being replaced by white spruce; paper birch is most often mixed with white spruce, black spruce, or aspen. The most productive stands in the boreal forest are dominated by white spruce and grow on dry south-facing hillsides and on well-drained, permafrost-free sites along rivers. Balsam poplar, or in the Susitna Valley, black cottonwood, grows on river floodplains. Open, low, and slow-growing black spruce stands grow on north-facing slopes, excessively drained drumlins/dunes, elevated terraces, and poorly drained lowlands. Tamarack also grows on these sites. Black spruce stands are the most extensive and flammable stands in the boreal forest. Black spruce stands are self-replacing, with regeneration driven by stand-replacing fires (Wolken et al. 2011). Extensive bogs fill in the patchwork of the boreal forest on wet and low sites (Vioreck & Little 2007).

Common understory vegetation in the boreal forest includes crowberry, red-fruit bearberry, narrow-leaf Labrador tea, American red currant, prickly rose, various willows, buffaloberry, mountain cranberry, bog blueberry, and high-bush cranberry.

White spruce-dominated stands cover about 12.8 million acres. Quaking aspen-dominated stands cover about 2.4 million acres. Paper birch-dominated stands cover about 5 million acres.

In the transitional boreal forest of Southcentral Alaska where the fire return interval is longer, the spruce beetle also plays an important role in disturbance. After a spruce beetle outbreak, dead and decaying trees eventually fall and the increasingly open canopy encourages an increase in understory grasses and shrubs, and eventually a multi-aged spruce forest. In an analysis of pre- and post-outbreak plots on the Kenai (1987-2000), grass increase was documented only in the southwestern portion of the Kenai—other areas had more shrub and seedling increases and no change in grass abundance (Boucher & Mead 2006). A trend which may be a compounding factor for disturbance in Southcentral is an increase in the frequency of significant storms, which may increase the potential to generate frequent and large-scale forest disturbances, including fire and forest pests and disease.



Figure 6. Boreal forest patchwork. ©2020 ADOF

Where to find more information

Describing Alaska's forests is complicated by the lack of a statewide comprehensive forest inventory. Because of this, total acreages and volumes in this forest resource assessment should be compared within the same source material, as sources do not match and use slightly varying definitions. Better information is on the horizon, though—for the first time, a comprehensive forest inventory in Alaska's boreal forest is taking place.

For a more detailed look at Alaska's forests than is provided by the Forest Action Plan, please see the following forest inventories, which are incorporated by reference.

State Forest Inventories are available at <http://forestry.alaska.gov/timber/forestinventories> :

- Haines State Forest Inventory, 2020
- Haines State Forest Inventory, 1994
- Tanana Valley State Forest Inventory, 2013
- Southern Southeast Area Operational Forest Inventory And Annual Allowable Cut Analysis For State Forest And General Use Lands, 2020

Other Special Forest Inventories are available at <http://forestry.alaska.gov/timber/forestinventories> :

- Availability of Biomass Fuels on Ahtna Lands, 2011
- Hazard Fuels Reduction Projects Wood Volume, Fairbanks, 2007
- Assessment of Woody Biomass Energy Resources, Cordova, 2012
- Timber Inventory of State Forest Lands in the Middle Yukon River Area, 2015
- Timber Inventory of State Forest Lands in the Copper River Basin, 2014
- Forest Resources on State Lands in the Kenai Peninsula, 2012
- Forest Resources on State Lands in the Susitna Valley, 2014
- Timber Volume Summary of the Alaska Mental Health Trust Icy Bay Tract, 2014
- Forest Inventory Summary for Mental Health Trust Authority Lands, Fairbanks, 2012

The following U.S. Forest Service Inventories are available:

Pacific Northwest-Forest Inventory and Analysis (PNW-FIA) Interior Alaska Forest Inventory and Analysis Database, at <https://www.fs.usda.gov/pnw/tools/pnw-fia-interior-alaska-database>

Pacific Northwest-Forest Inventory and Analysis (PNW-FIA) Forests of Coastal Alaska, at <https://www.arcgis.com/apps/MapJournal/index.html?appid=d0464406188740fb81e2e4c3d1b48915>

Tongass National Forest Young Growth Story Map, at <https://usfs.maps.arcgis.com/apps/MapJournal/index.html?appid=e748ce92139c4100a65ad8b12510d620>]

Traditional and historic forest use

Alaska's forests are the ancestral home of Alaska Native peoples and have been an integral part of their way of life for thousands of years, since people first crossed from Asia to North America over the Bering Strait during the last Ice Age (Sandberg 2013). Alaska Native peoples are the original stewards of Alaska's forests, which have cultural, spiritual, and subsistence value.

Prior to Western settlement, Alaska Native peoples lived primarily along the coasts and major interior rivers, following semi-nomadic ways of life. The most noticeable forest use was the landscape changes made through Alaska Native peoples' use of fire as a management tool in the boreal forest to maintain wildlife habitat and berry crops and to control insects (Zasada and Packee 1994). The coastal forest prior to Western contact bore more subtle imprints of dispersed use of trees for canoes, housing, fish traps and weirs, fuel for cooking and heat, and household, cultural, and personal items. Tree species of particular use in the coastal forest have included western redcedar, yellow-cedar, Sitka spruce, black cottonwood, and red alder. White spruce have been of particular use in the boreal forest (Deur et al. 2020). Throughout Alaska, past and present, forests provide habitat for the fish and wildlife upon which people depend.

Russian explorers and fur traders first reached Alaska in the mid-1700s (Zasada and Packee 1994). Fewer than 1,000 Russians lived in Alaska at the height of Russian settlement, and their direct impact on forest land was minimal because their focus was on the fur trade rather than settlement and development.

The discovery of gold on the Fortymile River in 1886 led to mining and settlement that significantly altered the boreal forest in the Interior (Zasada and Packee 1994). One of the major effects of the gold rush was the increase in human-caused fires, which burned an average of 1.1 million acres every year until the mid-1950s. The mining settlements used forest products extensively for construction, and every mining camp and settlement had a sawmill. They used wood for heating, to the tune of an estimated 60,000 cords in 1910 to supply Fairbanks and its surrounding mining camps. Wood was used for mine timbers and to thaw permafrost for mining. Riparian forests were harvested to fuel sternwheelers.

In Southeast Alaska, mining also drove early timber use for mining timbers and lumber for construction, with 8 to 9 MMBF harvested in the late 1800s (Brackley et al. 2009). After the purchase of Alaska by the United States in 1867, timber harvest increased in the coastal forest for both domestic use and export. This led to the creation of the Tongass and Chugach National Forests in 1907. Timber harvest from then through World War II focused on high-quality Sitka spruce along the shoreline. Long-term timber sales on the Tongass National Forest from the 1950s through the early 1990s supplied pulp mills at Ketchikan and Sitka. With the termination of the long-term sales, the last pulp mills in Southeast closed in the late 1990s.

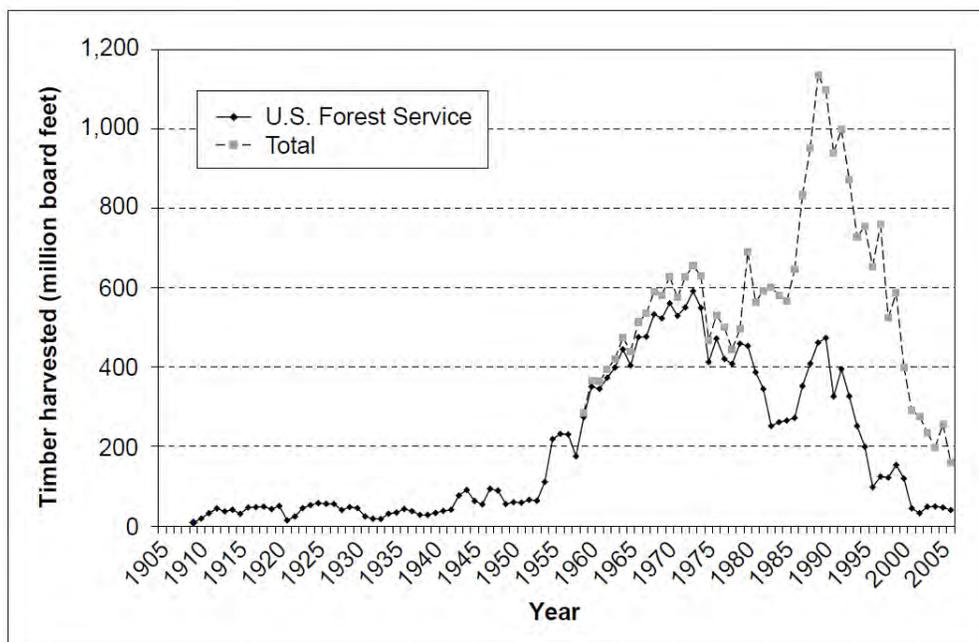


Figure 7. Harvest in Alaska (Brackley et al. 2009)



Figure 8. Remains of an old log cabin in the Brooks Range. ©2020 ADOF

Cultural Resources

Most of Alaska’s forests have not been surveyed for cultural resources. Forests have encroached to replace abandoned seasonal settlements, trapping cabins, canneries, mining sites, corduroy roads and railroads, fox farms, and even the first commercial oil town of Katalla, home to 5,000 people in the early 1900s. Cultural resources in Alaska are cataloged in the Alaska Heritage Resources Survey, which contains information about 45,000 cultural resources (DPOR 2020). These cultural resources include linear features like trails and railroads, large features like mining districts, buildings and structures, and objects. The Alaska State Historic Preservation Office reviews Federal- and State-involved projects with ground disturbing activities for compliance respectively with Section 106 of the National Historic Preservation Act (36 CFR 800) and the Alaska Historic Preservation Act (A.S. 41.35.070).

Culturally Modified Trees

Culturally modified trees are perhaps the most likely cultural resource to be found when walking through Alaska’s forests. Culturally modified trees are trees which people have modified for purposes including harvesting parts of the tree for food and medicine, fuel, materials such as bark, and for marking routes (Deur et al. 2020). Culturally modified trees take a wide variety of forms depending on their use—trees with blazes from hatchets, partially limbed trees for making camps or starting campfires, stumps from firewood or log harvest or trail clearing, topped trees for hunting lookouts, trees with lateral scars from harvesting pitch, or trees with stripped bark for making baskets. For Alaska Native peoples, culturally modified trees may have cultural, spiritual, dietary, or navigational importance. Culturally modified trees are typically not cataloged in the Alaska Heritage Resources Survey unless they occur in large groves and are associated with other well-documented cultural resources.



Figure 9. Scar from birch bark peeled for use in baskets, on Chuliitna Bay, Lark Clark. (Deur et al. 2020 [CC BY 4.0](#))

Forest Land Ownership and Management

Statewide, Alaska's forests total 129 million acres (Andersen et al. 2019).

The coastal forest is 15 million acres in size (Andersen et al. 2019). The Tongass National Forest contains over 550,000 acres of old- and young-growth which are considered timberland available for harvest. The Alaska Division of Forestry manages 951,000 acres of timberland, including 48,472 acres in the highly productive Southeast State Forest and 259,295 acres in the Haines State Forest. Alaska Native corporations own 1.3 million acres of timberland.

The boreal forest is 110 million acres (Andersen et al. 2019) and contains an estimated 22.5 million acres of timberland (Viereck & Little 2007). The Alaska Division of Forestry, Alaska Native corporations, and BLM are the primary managers of boreal timberland.

General Patterns of Land Ownership

An understanding of the general patterns of land ownership is helpful to understand how cooperators can work together to achieve cross-boundary goals. The patterns of land ownership in Alaska reflect the history of land conveyances from the federal government to the State of Alaska and to Alaska Native Corporations.

Both the Tongass and Chugach National Forests were established pre-statehood and encompass the vast majority of coastal forests in Southeast and Southcentral Alaska. Large areas of federal lands were reserved as National Parks and Preserves and National Wildlife Refuges to protect special resources. A very minor amount of federal lands were conveyed directly into private ownership.

At statehood, the State of Alaska received a land entitlement from the federal government. The State selected lands primarily for their settlement, resource, or transportation value. The State retained the vast majority of its lands, but also conveyed lands around communities to municipal governments and to private individuals. With the passage of the Alaska Native Claims Settlement Act, Alaska Native Regional and Village Corporations were created and received land entitlements from the federal government. Generally, Alaska Native Village Corporations selected lands surrounding their communities, and Alaska Native Regional Corporations selected lands for their resource value. Often the communities and surrounding Alaska Native Corporation lands are inholdings within the exterior boundaries of National Parks and Preserves or National Wildlife Refuges, which also envelop smaller Native Allotment inholdings belonging to individuals or a group of individuals. The remaining federal lands continue to be managed by the Bureau of Land Management (BLM), resulting in a scattered pattern of BLM lands across Interior Alaska.

Some land ownership changes in Alaska will be ongoing; the State of Alaska has approximately 5 million acres of its land entitlement from the federal government outstanding. Over time, more state and municipal land is likely to be conveyed into private ownership. However, given the vast area of the state, future conveyances into private ownership will not significantly change land ownership patterns.

Each category of forest land ownership is briefly summarized below in terms of total acreage, forested acreage (if available), forest-related values and uses, and forest-related management. The intent is to provide context about management over the larger landscape for consideration when seeking partners to address cross-boundary issues.

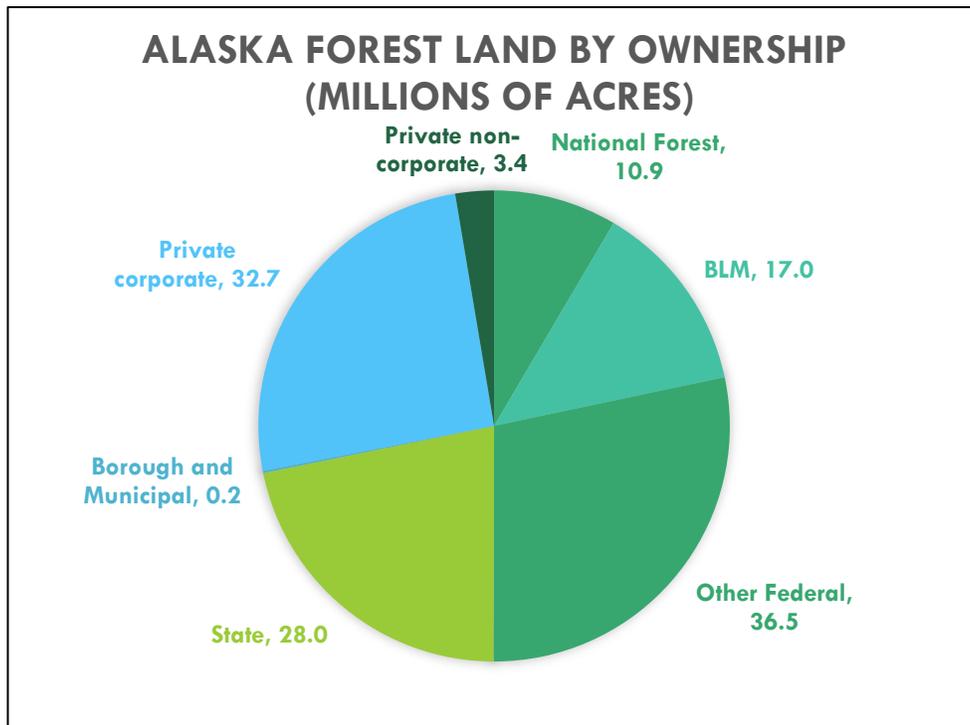


Figure 10. Alaska forest land by ownership (Data from Oswald 2019)

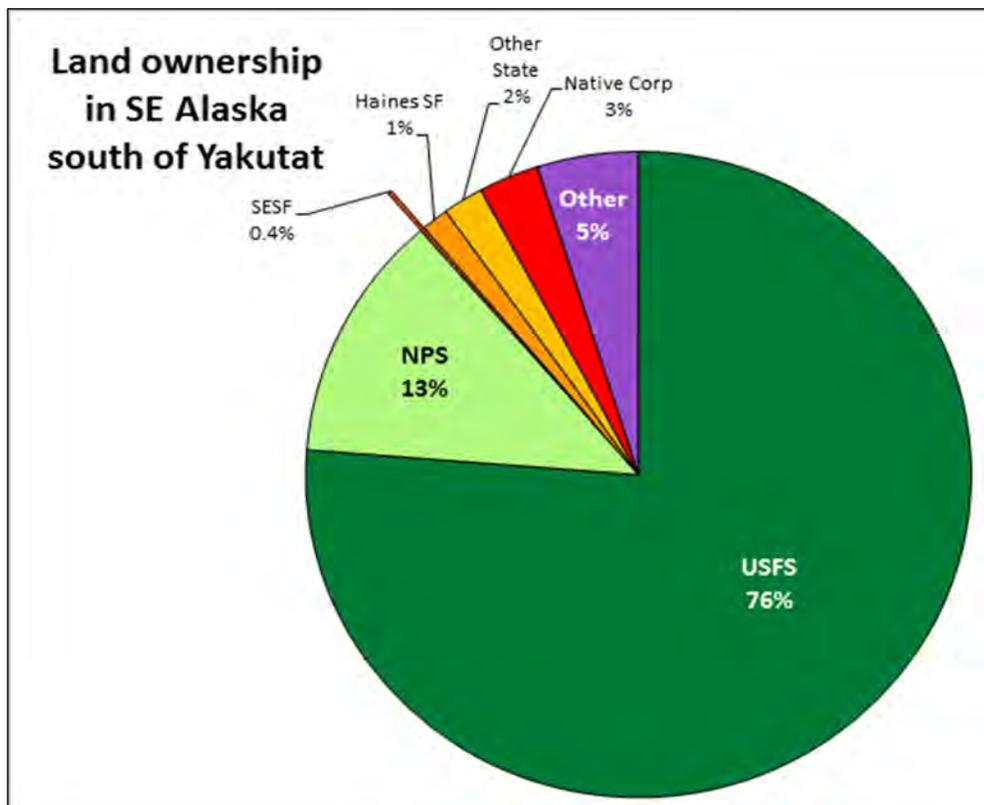


Figure 11. Land ownership in Southeast Alaska south of Yakutat (DOF 2020a)

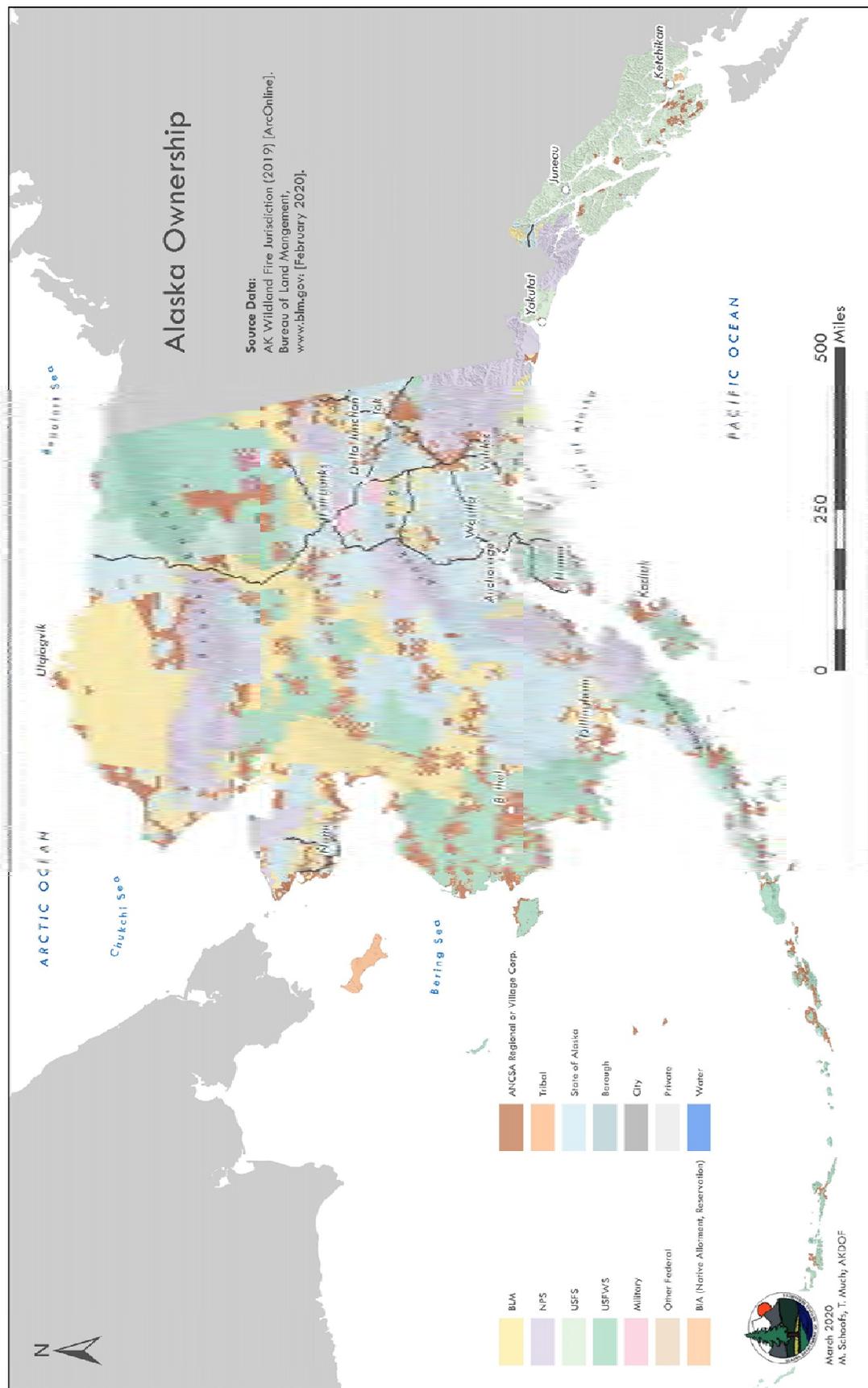


Figure 12. Alaska Ownership.

Federal Public Lands

Federal public lands cover 222 million acres or 60% of Alaska.

Federal lands not including unreserved multiple-use Bureau of Land Management and National Forest System lands

This paragraph is meant to generally differentiate the management of lands reserved for conservation purposes from the multiple-use management on unreserved Bureau of Land Management and National Forest System lands. The majority of federal lands in Alaska are reserved for conservation of natural areas and managed according to each land manager's mission and unit-specific purposes. These lands are located in every vegetation type and include designated Wilderness, Wilderness Study Areas, National Park Units, National Wildlife Refuges, Wild and Scenic Rivers, White Mountains National Recreation Area, and Steese National Conservation Area. Commercial harvest is not allowed, and for the most part, these lands are managed in a largely unmodified state. They encompass large intact boreal forest and coastal forest ecosystems vital to many fish and wildlife species. Fire management on these lands typically seeks to maintain the natural fire regime while protecting values at risk, which include resources, life, and property, such as Alaska Native allotments and Native Corporation inholdings within federal conservation units. Where allowed, vegetation management activities on these lands are done with restraint and for specific purposes, such as to create fuel breaks to protect nearby communities and enable natural fire on large portions of the federal lands, to address invasive plant species, or to manage wildlife habitat. Scientific research and monitoring are an important focus. Most federal conservation system lands provide for subsistence use of forest resources, including firewood, house logs, and non-timber forest products to federally qualified rural residents.

National Parks and Preserves

The National Park Service manages 52.5 million acres of land in 15 national parks, preserves, monuments, and national historical parks in Alaska (CRS 2020). The 15 units are 100 acres to 13 million acres in size, and range over all of Alaska's major vegetation types (Zasada and Packee 1994). The mission of the National Park Service is to preserve unique resources and provide for their enjoyment by the public. The National Park Service has recently completed Fire Management Plans for many of its units in Alaska, enabling the use of natural fire.

National Wildlife Refuges

The U.S. Fish and Wildlife Service manages 76.7 million acres of land in Alaska within 16 national wildlife refuges. Most of these units were established or augmented by the Alaska National Interest Lands Conservation Act of 1980 and provide opportunities for subsistence and compatible recreational hunting and fishing. Alaska refuges range in size from just over 300,000 acres to 19.6 million acres including 21 designated Wilderness areas totaling approximately 18.6 million acres. Landcover types on Alaska refuge lands include boreal forest, coastal forest, as well as non-forested areas. The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

National Forests

The U.S. Department of Agriculture Forest Service manages a total of 22.1 million acres: the 5.4 million-acre Chugach National Forest in Southcentral and the 16.7 million-acre Tongass National Forest in Southeast. The USFS mission is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. The Forest Service provides fire protection services on 28 million acres. The mission of the Forest Service Alaska Region is to manage the Chugach and Tongass National Forests to meet society's needs for a variety of goods, services, and amenities while enhancing the Forests' health and productivity, and to foster similar outcomes for State and private forestland across Alaska. Management of the National Forests is guided by Land Management Plans.

The Tongass is the largest of all national forests and the largest contiguous temperate rainforest in the world. The Tongass encompasses most of Southeast Alaska, extending from the southern edge of Alaska near Ketchikan to Yakutat. Scenic, rugged fjords and lush green islands line the Inside Passage. One-third of the Tongass, or 5.75 million acres, is designated Wilderness. The Tongass' coastal temperate rainforest supports high concentrations of brown bears. The Tongass also supports the largest salmon harvest in Alaska. Old growth timber harvest on the Tongass National Forest has been controversial for decades, and the Tongass National Forest Land and Resource Management Plan was amended in 2016 to accelerate the transition to primarily

young-growth management within 10-15 years in order to provide a more economically, socially, and ecologically sustainable timber program. (USFS 2016). Over 550,000 acres are designated as suitable for timber production across the Tongass using several criteria to protect resources. The Plan Amendment determined 46 MMBF as the Projected Timber Sale Quantity, which matches the projected annual average demand for Tongass timber. The Plan also directs protection of priority watersheds and modified the network of old-growth reserves to maintain their effectiveness.

The Chugach National Forest is the westernmost and northernmost of all national forests. Stretching from the Copper River Delta in the east to the Kenai Peninsula in the west, the Chugach National Forest encompasses tidewater glaciers, icefields, towering coastal spruce-hemlock forests and transitional white spruce-paper birch forests, and abundant salmon streams. The Chugach National Forest is in the backyard of half of the population of Alaska, making recreation and the wildland-urban interface important issues. The Chugach National Forest Management Plan was revised in 2020 and guides management of the Forest (USFS 2020c). Ninety-nine percent of the Chugach National Forest is managed for limited human influence to allow natural ecological processes to occur. Timber production is not a primary use of the Forest because of insufficient suitable acreage to supply a predictable flow of timber; suitable acreage refers to lands which are both capable of timber production and legislatively and administratively suitable for timber production. However, 11,170 acres are suitable for the management of wood products and fuelwood for local communities through small-scale integrated vegetation management activities. Vegetation management on the Forest is designed to restore and enhance wildlife habitat, reduce the risk of wildfire near roads, communities, and infrastructure, and provide fuelwood for community use. The Plan also provides for subsistence, recreation, and special forest products including Christmas trees, mushrooms, bark, ferns, berries, herbs, and wildflowers.

Bureau of Land Management Lands

The Bureau of Land Management (BLM) manages 71.4 million acres in Alaska (CRS 2020). This includes specially designated areas such as the Steese National Conservation Area, the White Mountains National Recreation Area, and Wild and Scenic River corridors, as well as lands managed under a multiple use, sustained yield mandate (CRS 2020). Multiple uses include timber, recreation, mining, oil and gas, and conservation of watersheds and fish and wildlife habitat, among other uses. Most BLM lands are located in the boreal forest or are non-forested (Zasada and Packee 1994). Of its total land area, 20-30 million acres are forested (BLM 2020). While the inaccessibility of most BLM lands limits their suitability for forest products management, BLM lands are located near many communities in remote rural Alaska and have important potential for local woody biomass for wood energy projects. BLM manages forest lands for multiple uses, including ecosystem services such as wildlife habitat and watersheds; forest products including timber, house logs, biomass, and fuel wood; non-timber forest products; recreation; and subsistence.

Department of Defense Military Installations

The Department of Defense manages more than 1.6 million acres in Alaska including lands in co-management with BLM. The military installations with large forested areas are all in the boreal forest. The two large military installations with forestry programs are U.S. Army Garrison Alaska, consisting of several units between Fairbanks and Delta Junction, and Joint Base Elmendorf Richardson (JBER), located adjacent to Anchorage and Eagle River. Eielson Air Force Base near North Pole is forested and is active in community forestry. Clear Air Station south of Nenana is mostly forest which regenerated after a 1959 wildfire. The Sikes Act (16 USC 670 *et. seq.*) provides for natural resource management on Department of Defense lands, including forest management. Installation land, water, air, and natural resources are managed to support the installation's mission and guarantee continued access for military training, and to sustain the long-term ecological integrity of the resources base and the ecosystem services it provides (JBER 2016). The main activities that affect forest resources on the military installations are training, construction, timber sales, wildfires, and insect damage (USAGA 2013). Recreational access is granted to the public by permit when compatible with the installation's mission. JBER is home to the 673rd Civil Engineer Squadron Fire Emergency Services Flight, a taskforce that supports wildland fire management and emergency response across Alaska.

Forest management on Alaska's military installations includes reforestation, timber stand improvement, small commercial sales, prescribed burns, fuels treatments, and providing Christmas trees and personal use timber. Purposes of forest management include maintaining and enhancing training areas, minimizing fire risk from live fire training, managing areas around airfields to minimize wildlife use that interferes with aviation, maintaining wildlife habitat, managing fuels in the wildland urban interface, and mitigating the impacts of forest insects and disease, including the spruce beetle on JBER. The larger military installations provide opportunities for community forestry in their developed, landscaped areas where trees and forest provide quality of life

benefits. Fort Wainwright, Eielson Air Force Base near North Pole, and JBER are Tree Cities USA, and Fort Greely is in the process of becoming a Tree City USA.

Table 1. Forest lands on military installations. (JBER 2016, USAGA 2013, Eielson AFB 2017)

	Total area (acres)	Forest (acres)	Commercial forest (acres)
Joint Base Elmendorf Richardson	73,013	39,053	37,054
U.S. Army Garrison Alaska	1,586,763	604,866	193,158
Eielson Air Force Base	19,700	15,754	-
Clear Air Station	11,438		-

State Public Lands

The State of Alaska owns 105 million acres, located in every major vegetation type. The Alaska Department of Natural Resources, Division of Mining, Land, and Water manages General Use lands for multiple use, sustained yield. General Use lands are often designated for a primary surface use or uses, including forestry. This designation does not preclude other uses unless those other uses are incompatible with the primary use. The Division of Forestry specifically manages the timber resources on the General Use lands.

State Forests

The Alaska Division of Forestry manages forests for multiple uses and the sustained yield of renewable resources on 20 million acres of State land, including forest classified lands and three State Forests totaling more than 2 million acres: Tanana Valley State Forest in the boreal forest, and the Southeast and Haines State Forests in the coastal forest. State Forests are managed for sustained yield of a variety of resources.

- Haines State Forest, established in 1982. 259,295 acres
- Tanana Valley State Forest, established in 1983. 1.81 million acres
- Southeast State Forest, established in 2010. 48,472 acres



Figure 13. Tanana Valley State Forest Clearwater Creek, Tok Management Area. ©2013 ADOF

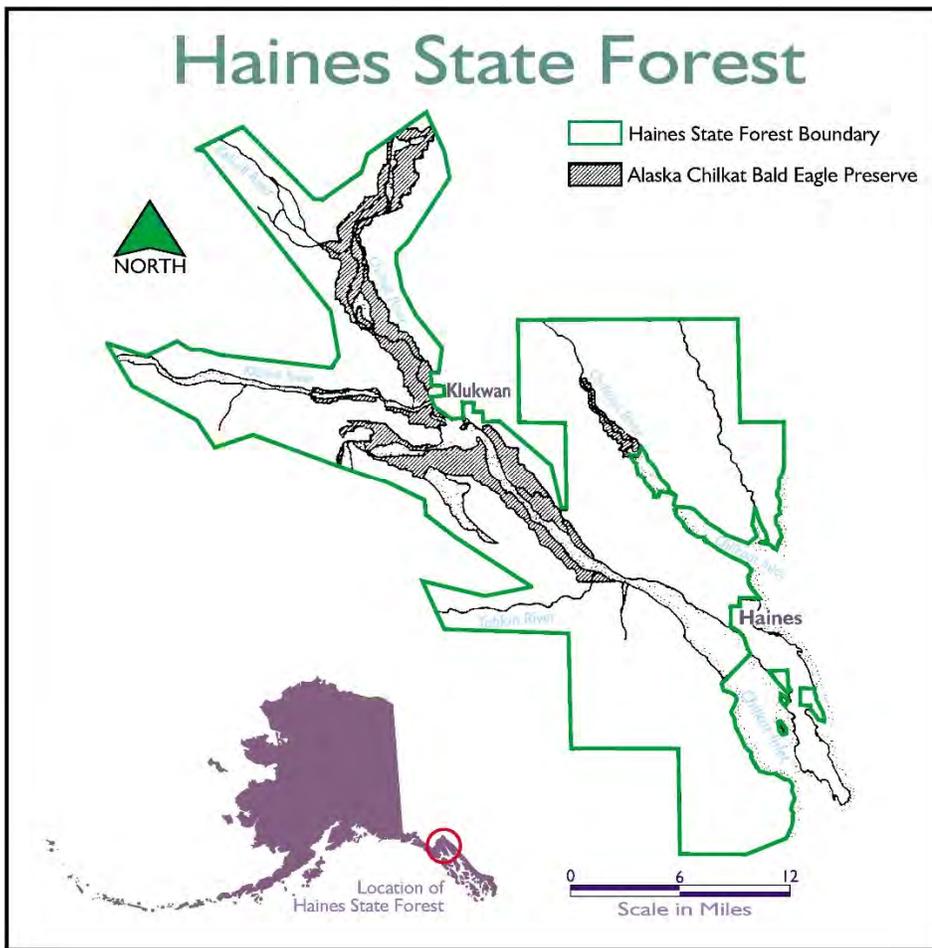


Figure 14. Haines State Forest boundary and vicinity map

The Haines State Forest includes the watersheds of the major tributaries to the Chilkat River. Located in a transition zone between the moderate and wet coastal climate and the dry cold interior, the forest provides suitable conditions for a diversity of vegetations. The rugged topography ranges from sea level to over 7,000 feet. The forest is composed mostly of two forest types, western hemlock/Sitka spruce, and black cottonwood/willow. Lodgepole pine and paper birch occur as minor species throughout the forest. Of the total acreage, 51,842 acres are available for timber harvest. Although natural regeneration occurs readily, all large commercial sales have been replanted since the 1970s. The Haines State Forest Management Plan classifies land to provide general management direction for specific uses. Forestry is one of several classifications including public recreation, resource management and wildlife habitat.

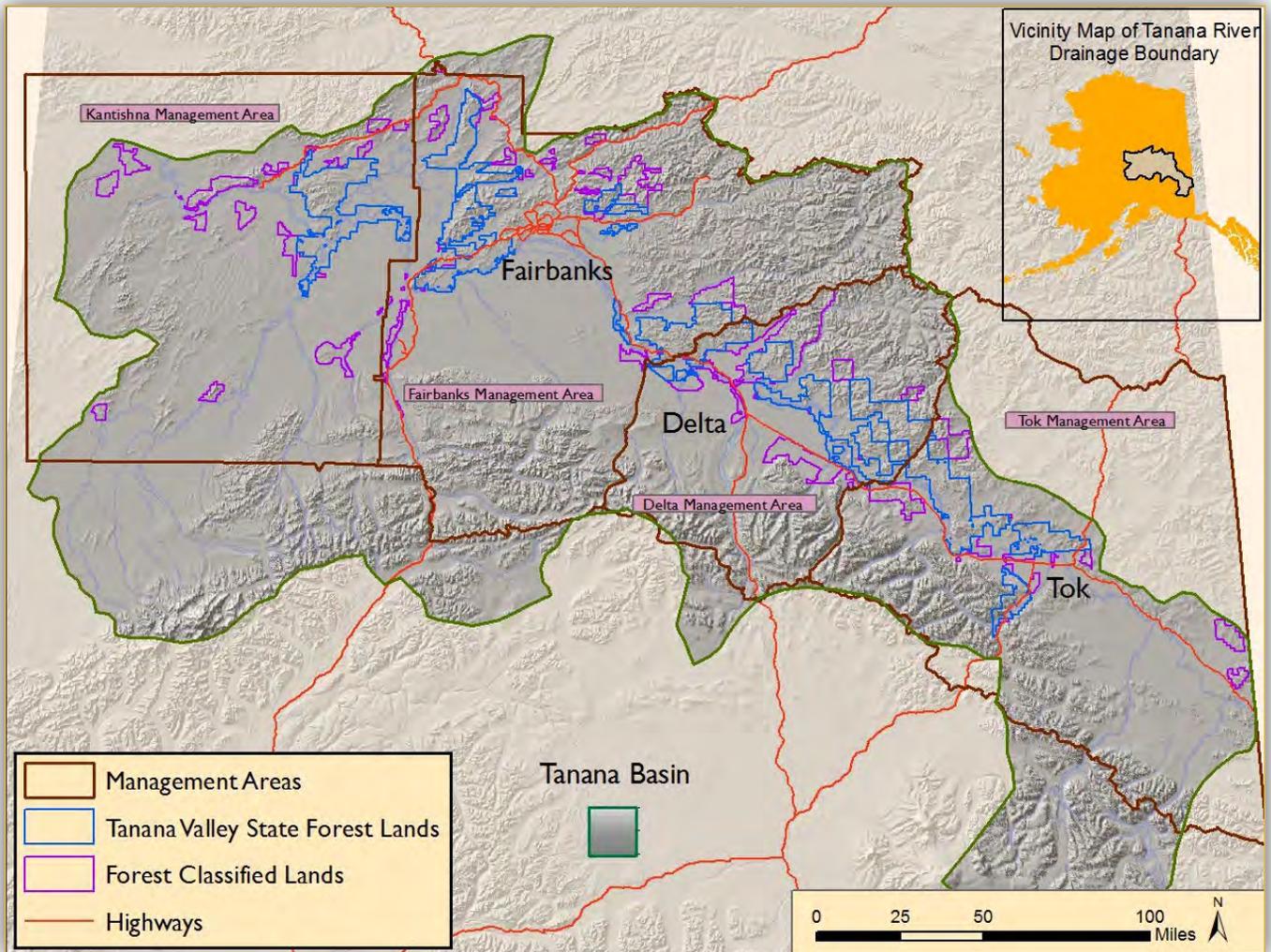


Figure 15. Tanana Valley State Forest boundary and vicinity map

The Tanana Valley State Forest’s 1.81 million acres lie almost entirely within the Tanana River basin, located in the east-central part of the Alaska. The forest extends 265 miles, from near the Canadian border west to Manley Hot Springs. It varies in elevation from 275 feet along the Tanana River to over 5,000 feet in the Alaska Range. The Tanana River flows for 200 miles through the forest. Almost 90% of the State Forest (1.59 million acres) is forested, mostly with paper birch, quaking aspen, balsam poplar, black spruce, white spruce, and tamarack. About half of the Tanana Basin’s productive forest land (1.1 million acres) is located within the State Forest. About 85% of the forest is within 20 miles of a state highway.

Southeast State Forest

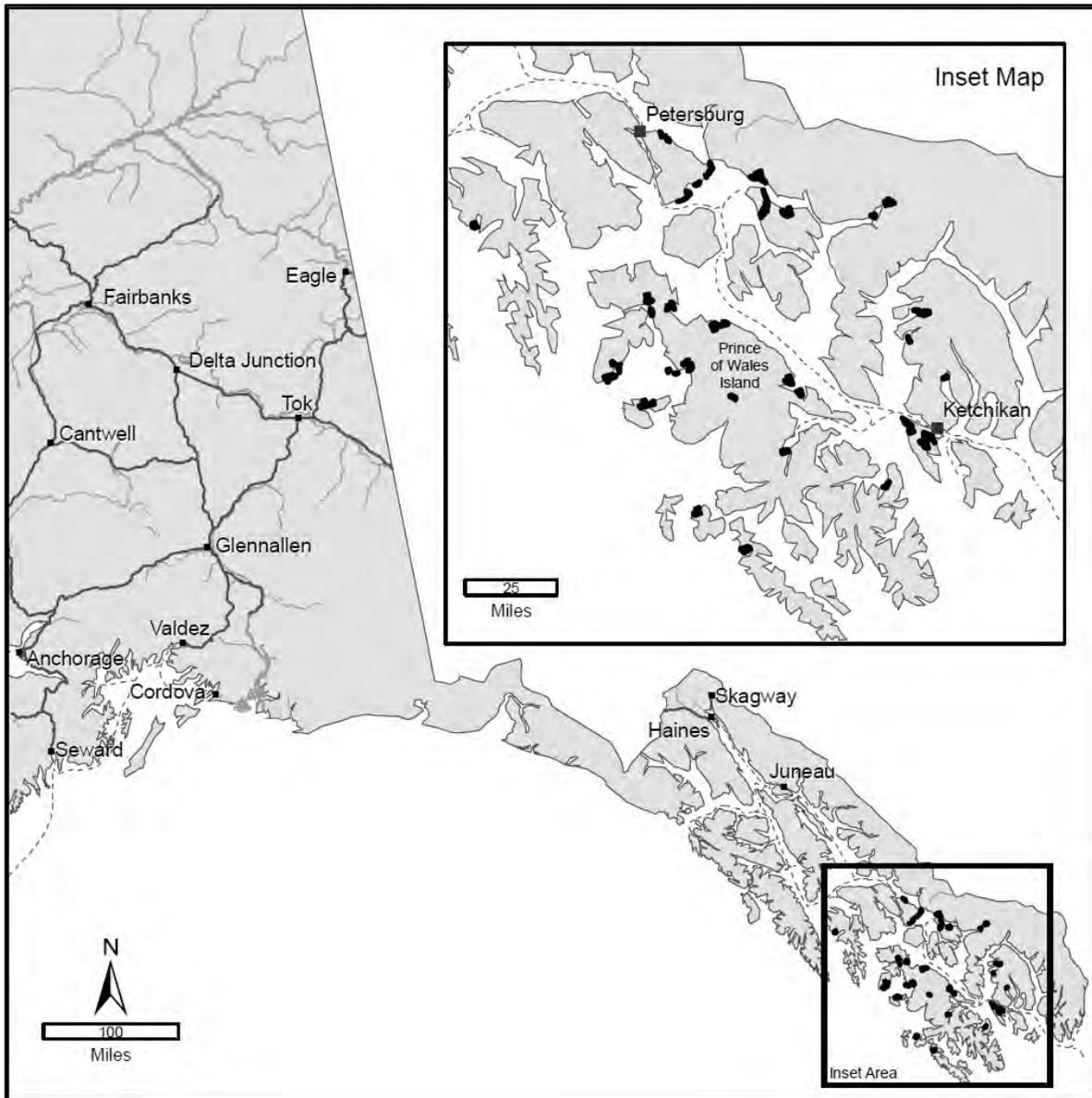


Figure 16. Southeast State Forest, State Forest lands depicted in black.

In 2010, the Legislature designated the Southeast State Forest and expanded it the following year. The State's third and newest forest includes about 48,472 acres of land located in central and southern southeast Alaska. Many of the Forest's 32 management units are on Prince of Wales Island. Other units are located on Dall, Gravina, Heceta, Kosciusko, Kuiu, Mitkof, Revillagigedo, Suemez, Tuxekan, and Wrangell islands. Two of the state forest units are located on the mainland. While this State land allowed for forestry activities prior to its designation as a State Forest, the State Forest designation enables the Division of Forestry to actively manage resources for a long-term supply of timber to local processors.

Pre-commercial thinning of previously harvested lands that were logged before the land was conveyed to the State reduces the amount of time required for timber stands to reach commercial maturity, improves understory browse for deer, and provides short term employment opportunities. As a State Forest, these lands will be retained in State ownership, thus making long-term investments in management activities, such as pre-commercial thinning, a realistic management option. The Annual Allowable Cut for the Southeast State Forest is 332 acres per year and the annual timber volume available per year is 9,147 MBF (DOF 2020a).

State Legislatively Designated Special Areas

Some state lands are legislatively designated for special purposes such as wildlife habitat, conservation, recreation, and for the use, enjoyment, and welfare of the people. The Department of Natural Resources, Division of Parks and Outdoor Recreation manages 3.2 million acres in more than 157 State Park units including Recreation Areas, Historic Sites, and Marine Park units. General uses are limited by statute and regulation on state park land and the removal of resources is generally prohibited.

The Alaska Department of Fish and Game (ADF&G) manages 32 special areas including State Game Refuges, State Game Sanctuaries, and Critical Habitat Areas, covering 3.2 million acres. ADF&G manages for wildlife habitat in selected special areas. Additionally, ADF&G pursues wildlife habitat enhancement projects where management concern exists regarding available browse or other habitat needs for wildlife. For example, ADF&G actively manages habitat in the Delta Junction State Bison Range and has projects in the Anchor River/Fritz Creek Critical Habitat Area for moose browse.

Alaska Mental Health Trust Authority Lands

The Alaska Mental Health Trust Authority owns approximately 1,000,000 acres of land, of which 175,000 acres have commercial forest potential. Alaska Mental Health Trust Authority lands are managed for revenue generation by the Trust Land Office within the Alaska Department of Natural Resources to support mental health programs (Trust Land Office 2016). Timber sales have provided about \$50 million in revenue to the Alaska Mental Health Trust Authority. Its most valuable forest lands are in Southeast Alaska, and historically most timber sales have been in Southeast. However, its largest forest land holdings are in Southcentral and the Interior, and the Trust Land Office also seeks to provide timber sales near Fairbanks, Delta Junction, Kenai, and the Matanuska-Susitna valleys when such sales are viable (Alaska Mental Health Trust Authority 2020). The United States Forest Service/Alaska Mental Health Trust Land Exchange Act of 2017 (P.L. 115-31) authorized an equal-value exchange of approximately 21,000 acres between the two parties. Under the land exchange, the Alaska Mental Health Trust Authority is trading lands around communities for more remote Forest Service lands (Trust Land Office 2016). Like other land managers in Southeast, the Trust Land Office is transitioning to young-growth timber management.

University of Alaska Trust Lands

The University of Alaska owns 149,797 acres, of which 12,166 are designated for educational purposes and 137,631 acres are managed for investment purposes for the Land Grant Trust Fund to support the University (University of Alaska 2020). Approximately 32,000 acres are managed for forest resources, and most of this acreage is second growth. Notable areas of University of Alaska Trust forest lands are adjacent to the Haines State Forest and the Tanana Valley State Forest. Historically between fiscal years 1987 to 2020, timber receipts have comprised approximately one-fifth of the University of Alaska's total land management receipts (\$48.9 million of \$234.7 million) and have been the main natural resources revenue source.

The University of Alaska has a Memorandum of Agreement with the Alaska Division of Forestry to collaborate efforts on timber sales and to allow the Alaska Division of Forestry to administer and monitor timber sales. Recently the University of Alaska has participated with partners including the USDA Forest Service, Alaska Division of Forestry, the Alaska Mental Health Trust Land Office, and Sealaska to combine acreage for sales.

Borough and Municipal Lands

Boroughs and municipalities own approximately 241,000 acres of forest land in Alaska. Borough and municipal lands include forested parks which benefit communities and provide ecosystem services. Common tree and forest management by local governments includes forest insect and disease management, hazard tree removal, subsistence forest products permitting, small timber sales, Firewise for public infrastructure, and community tree planting and maintenance. At times local governments undertake larger scale forest management; for example, the Kenai Peninsula Borough harvested significant areas of its land following the spruce beetle outbreak of the 1990s and early 2000s. Local governments have an important role in determining how forests will be retained or converted to other uses as communities grow through planning and zoning regulations. Similarly, they also have a major role in mitigating risk in the wildland-urban interface.

Annette Islands Reserve

Located twenty miles south of Ketchikan in the coastal forest, the 133,332-acre Annette Islands Reserve is the home of the Metlakatla Indian Community and is the only federally recognized Indian Reserve in Alaska. The land is held in trust by the federal government for the benefit of the Metlakatla Indian Community. The Metlakatla Indian Community holds delegated responsibility to prescribe rules and regulations for the use of the Reserve (Metlakatla Indian Community 2020). Large scale

timber harvest began on Annette Island in the 1960s but dramatically declined with the closure of the pulp mills in Southeast in the 1990s. The Metlakatla Indian Community has an inventory of the public trees in parks, along streets, and around public facilities, and a Community Forest Management Plan that identifies goals and practices to help guide the ongoing commitment to maintaining and expanding a community forest that conveys many benefits to residents and visitors.

Alaska Native Corporation Lands

Alaska Native Corporations are the largest private landowners in Alaska, owning 44 million acres total, including 1.3 million acres of inventoried timberlands (Marcille et al. 2017). Alaska Native Corporations manage their lands for the benefit of their shareholders. There are two categories of Alaska Native Corporations: Alaska Native Regional Corporations and Alaska Native Village Corporations. The 12 Alaska Native Regional Corporations own 27 million acres, and the 174 Alaska Native Village Corporations own 17 million acres (ANCSA Regional Association 2020). In 2015, 90,848 MBF, or two-thirds of all forest products by volume, came from private lands, the vast majority of which are Alaska Native Corporation lands (Marcille et al. 2017). Alaska Native Corporations in Southeast Alaska have historically been the most active forest managers by volume and acreage because of their high value timberlands. Alaska Native Corporations in the Interior boreal forest also have timber and biomass programs, which are typically geared towards supplying local markets, creating jobs, and displacing community energy costs through the use of wood energy. Recently Alaska Native Corporations in both the coastal and boreal forests have started to manage some lands for the carbon credits market. Management of fish and wildlife habitat to benefit subsistence is also an important focus. Native corporations also strategically sell land for private development.

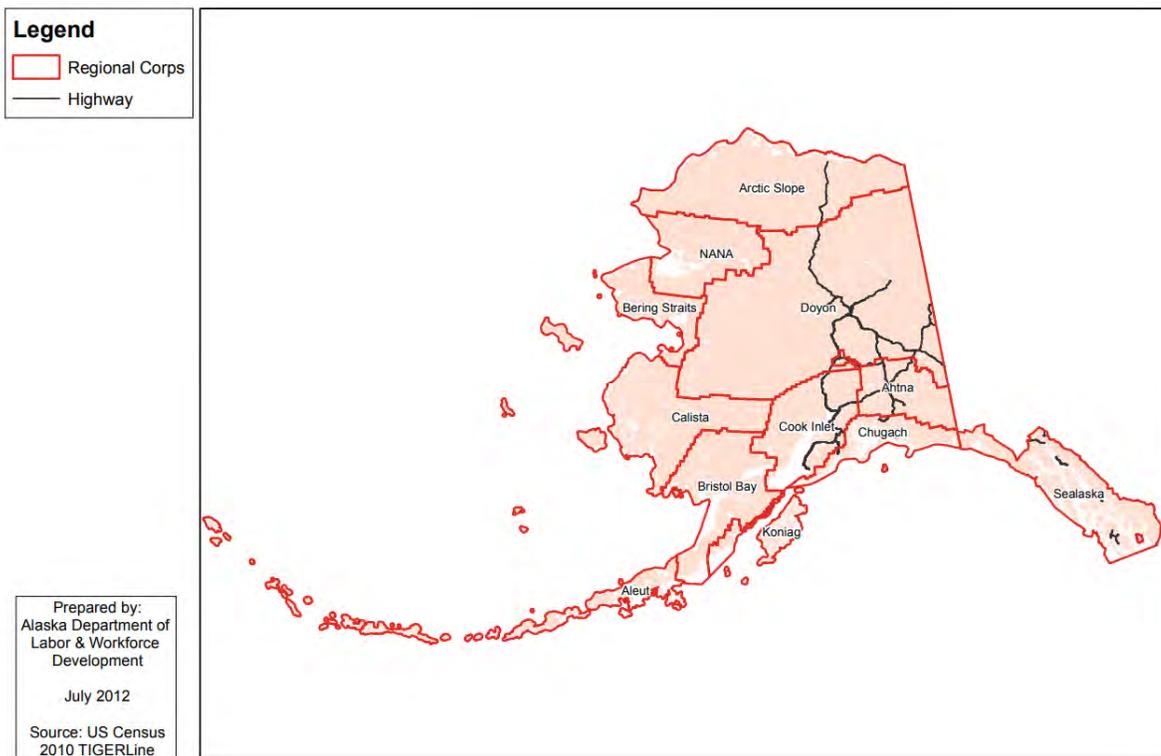


Figure 17. Statewide Regional Corporations, Alaska Native Regional Corporation Boundary. (Alaska Department of Labor & Workforce Development 2012)

Individual Private Landowners

Less than one percent of land is in private ownership, excluding Alaska Native Corporations. The Forest Action Plan refers to these landowners as individual private landowners. Individual private forest landowners own 3,395,000 acres of forest land (Oswalt et al. 2017). Individual private parcel sizes in Southeast tend to be quite small, often under five acres, while parcels in the Interior may be several hundred acres. Information on private forest landowners is sparse, but the more than 1,000 Forest Stewardship Plans completed in Alaska to date convey a picture. The average property size has been 50 acres; however, the median property size is 15 acres—a few large outliers skew the perspective. The goals of individual forest landowners vary widely, from making their cabins and homes safer from wildfire, to harvesting firewood and house logs, to making their lands better habitat for wildlife and maintaining healthy forests.

Population and Communities

Forests matter to Alaskans. Alaska's three largest cities contain half of the state's population and are located in forested regions:

- Municipality of Anchorage (295,365)
- City and Borough of Juneau (32,247)
- City of Fairbanks (31,668)

The five largest boroughs by population contain 80% of Alaska's population and are located in forested regions:

- Municipality of Anchorage (295,365)
- Matanuska-Susitna Borough (105,743)
- Fairbanks-North Star Borough (97,121)
- Kenai Peninsula Borough (58,471)
- City and Borough of Juneau (32,247)

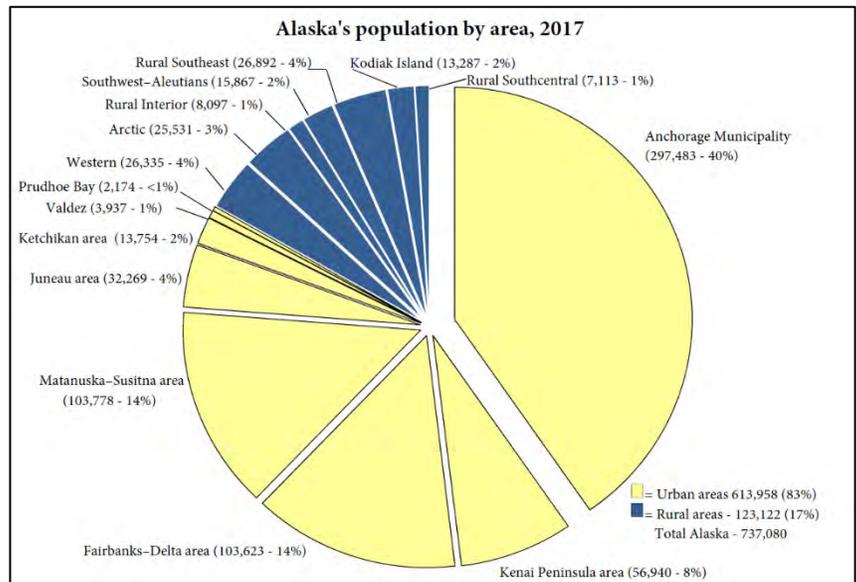


Figure 18. Alaska's population by area, 2017 (ADF&G 2018b)

Alaska's population is 736,239 people, which is 0.2% of the population of the United States (Robinson et al. 2019). Alaska's population grew from 2000 to 2010 then remained stable for several years until outmigration led to population decreases starting in 2016. Most of Alaska's population (58%) were born outside of Alaska, and Alaska's industries including oil and gas, military, fisheries, construction, and tourism attract a transient population. Within Alaska, the Matanuska-Susitna Borough is by far the fastest growing area due to net migration, a trend that is likely to continue into the foreseeable future. It is not unthinkable that this growth rate may increase as other regions around the country (and globe) are impacted by climate change producing "climate refugees" seeking refuge from the impacts of climate change.

Due to Alaska's land ownership patterns, most communities are of moderate density and are surrounded by large areas of uninhabited public or Alaska Native Corporation land. While most of the population lives along the road system in the Railbelt, more than 200 communities are not connected to the road system (Schmidt et al. 2020). Alaska is largely a roadless state and the distance between communities is vast. These communities typically rely on diesel fuel for generating electricity, distributed through microgrids, and for home heating. Diesel fuel arrives by barge during the summer months once or twice per year. As a result, the cost of energy in these communities is extremely high. For low-income households earning less than \$28,000 per year, energy costs for electricity, heating, and transportation can erode half of the household's annual income. This is a serious challenge considering unemployment in rural areas is high, as much as 10 – 15%.

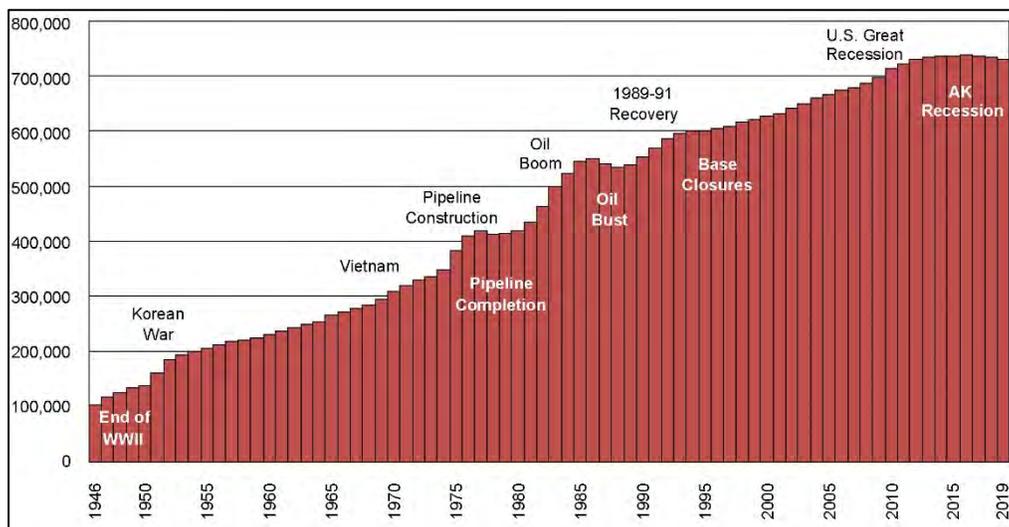


Figure 19. Alaska population, 1946-2019 (Alaska Department of Labor & Workforce Development 2020)

The small size of so many Alaska communities means that there are fewer local government agencies, nonprofits, and community associations with which to partner on various cooperative fire and forestry projects. Small communities also find it especially challenging to meet minimum matching requirements for cost-share grant programs such as Western Wildland Urban Interface and Volunteer Fire Assistance.

Economy

Alaska's economy is buoyed by abundant natural resources but challenged by its location far from major population centers and markets (DCCED 2017). The small population limits the available workforce, and limited infrastructure increases the cost of doing business. The federal government and the petroleum industry are the two largest base sectors in the Alaska economy and provide directly or indirectly for two-thirds of Alaska's jobs. Historically, military installations, tourism, mining, and fishing have been key to Alaska's economy. Oil has been Alaska's main industry and chief export, directly or indirectly providing one-third of jobs. However, since 2012 oil prices have decreased and so has oil production. Alaska's oil fields are on the decline and now produce one-quarter of what they once did. Alaska's dependence on natural resources has led to boom-and-bust cycles in the past. Future diversification would give Alaska's economy greater resilience.

The forest industry has historically been highly important to the Southeast Alaska economy, although this drastically declined after the closure of the two pulp mills. Statewide in 2015, the forest industry contributed 1,580 jobs and \$111 million in labor income to Alaska's economy (Marcille et al. 2017c). This includes wood products manufacturers, workers engaged in forestry support activities, and workers employed in forestry and logging.

The current economic climate in Alaska has drastically reduced State of Alaska revenues and, specific to the Forest Action Plan, has caused unprecedented challenges for maintaining a robust wildland fire program within the Alaska Division of Forestry. Stagnant or decreasing budgets at the state level have prevented the Division from increasing capacity to accommodate the increased threat of fires both in the wildland urban interface and rural Alaska. Economic constraints may ultimately hinder suppression efforts.

Another issue relevant to the Forest Action Plan is the importance of wildland firefighting jobs to small communities. Firefighting on an Emergency Firefighter (EFF) crew is often the sole source of income for some residents.

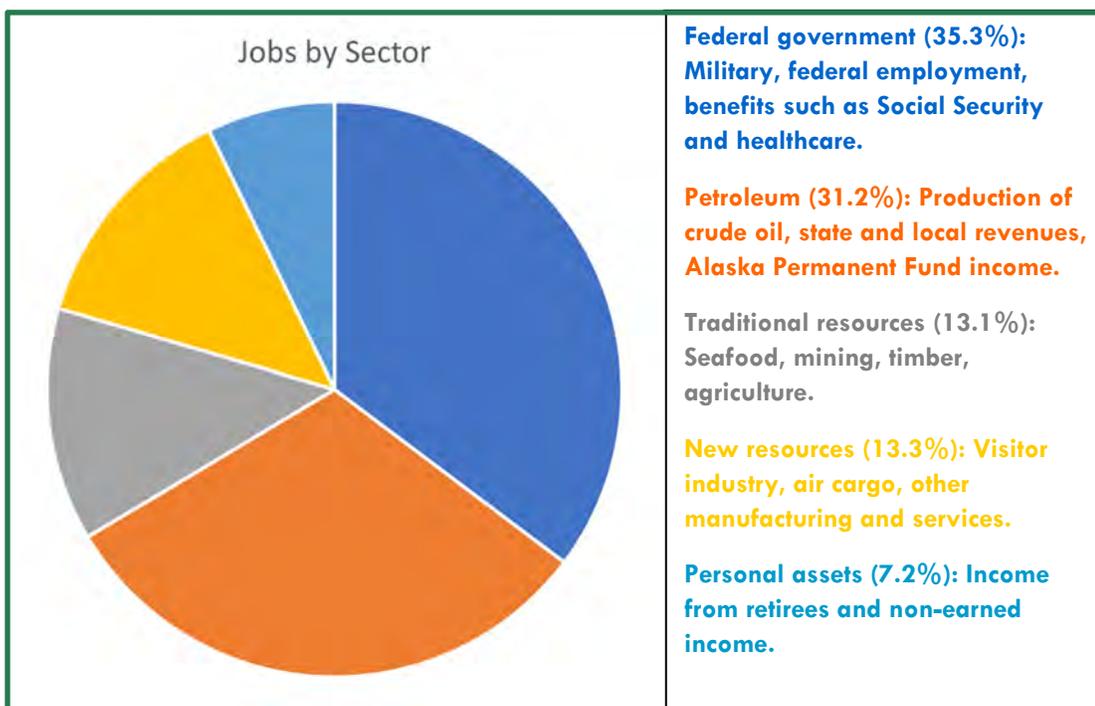


Figure 20. Jobs by sector (Data from DCCED 2017)

Landforms, geology, and soils

Alaska's major landforms are described from south to north as the Pacific Mountain System, the Intermountain Plateau, the Arctic Mountain System, and the Arctic Coastal Plain (Zasada & Packee 1994). The Pacific Mountain System arcs along coastal Alaska, from the coastal forests of the St. Elias Mountains of Southeast Alaska northwestward through the boreal forests of the interior Alaska Range and then southwestward towards the treeless Aleutians. This region is characterized by steep fjords, ice fields, and glaciers. Where glaciers are receding, afforestation is taking place. The Intermountain Plateau is characterized by the large wide river valleys of the Yukon and Kuskokwim where glaciation is rare and much of the land is covered by boreal forest. Permafrost is common in the Intermountain Plateau and northwards and has significant impacts on boreal forest cover. The Arctic Mountain System includes the Brooks Range, the southern slopes of which support boreal forest until higher elevations give way to alpine tundra. These mountains divide the Bering Sea from the Arctic Ocean. North of the Arctic Mountain System, the treeless arctic tundra of the Arctic Coastal Plain extends to the Arctic Ocean.

Alaska's bedrock geology and resulting soils today are a result of the movement of around 50 terranes over the last 200 million years (Zasada & Packee 1994). Active volcanoes stretching from the Wrangell and St. Elias Ranges over through the Aleutians have contributed layers of volcanic ash layers to soil. The Brooks Range, Alaska Range, and the coastal mountains have experienced several major glacial periods, and many of Alaska's soils originated from glaciers. Sedimentation from Pleistocene-era ice-dammed lakes are another source of soil parent materials. Uplift from earthquakes and isostatic rebound from the melting of glaciers mean that the soils for some coastal forests were once seafloor.

Half of Alaska's land surface is permafrost, unconsolidated materials, or bedrock (Zasada & Packee 1994). Alaska's soils are categorized into six soil orders. Inceptisols are typically covered by black spruce but may also contain white spruce, paper birch, and quaking aspen on well-drained, warmer sites. Histosols are typically treeless muskeg or open, low productivity stands. In the coastal forest, lodgepole pine are well adapted to histosols while in the boreal forest the typical species is black spruce followed by tamarack. Spodosols are productive upland soils of the coastal forest where they support Sitka spruce and western hemlock, and of the transitional boreal forest on the Kenai Peninsula, Matanuska-Susitna Valley, and the Kuskokwim valley where they support white spruce and paper birch. Entisols are young, permafrost-free soils largely found on active flood or outwash plains, recently exposed glacial moraines, and uplands where loess accumulate in both coastal and boreal forests. Entisols are

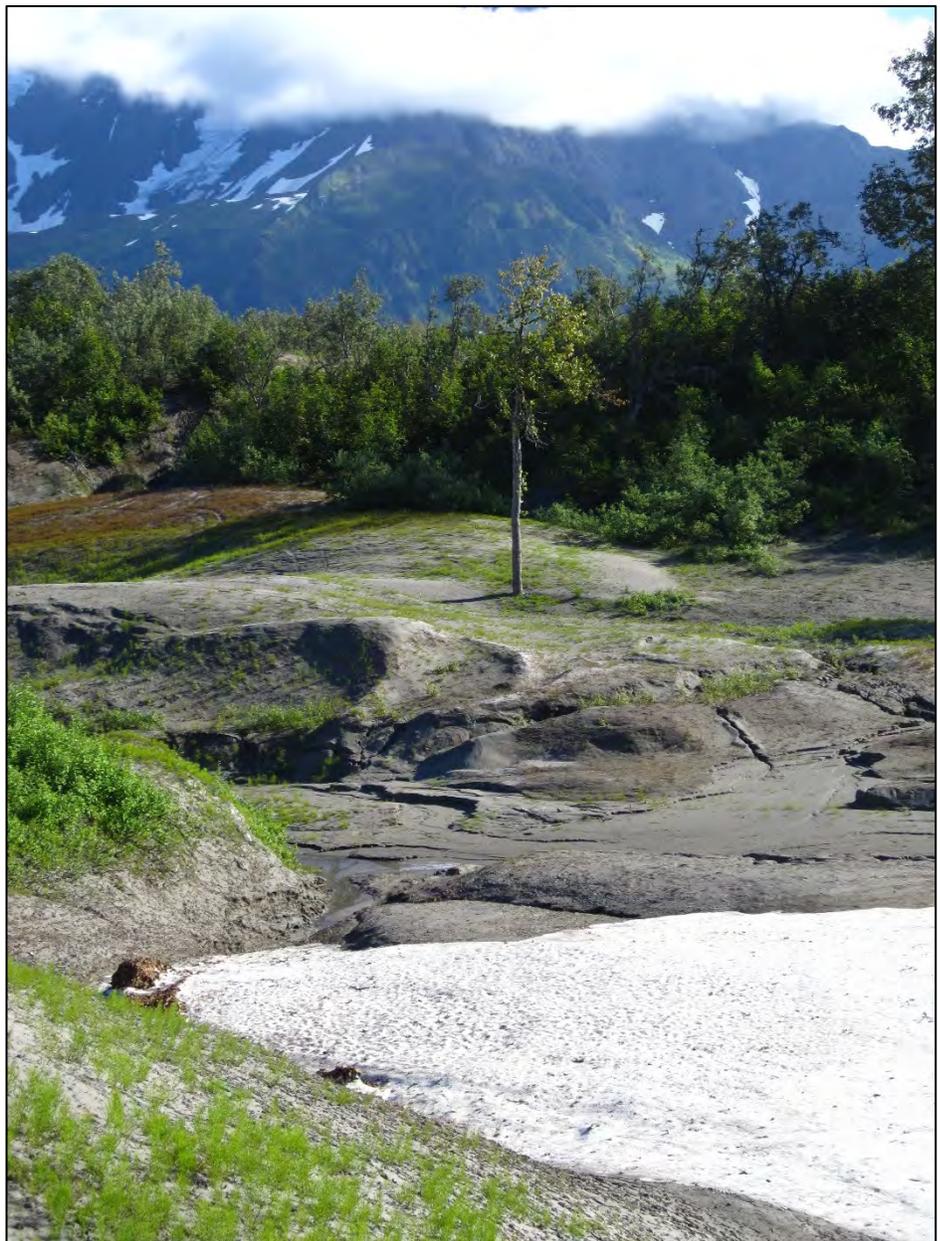


Figure 21. Lone black cottonwood, succession along the Copper River. ©2020 ADOF

associated with highly productive forest sites. Mollisols are generally tundra soils but can be forested along the Copper and Chitina Rivers and the Yukon Flats. Gelisols are characterized by permafrost near the soil surface and a gelic layer, meaning a layer that shows evidence of frost churning and/or ice segregation in the active layer and/or the upper part of the permafrost. Vegetation on gelisols includes mosses, sedges, shrubs, and black spruce as well as white spruce (NRCS 2020).

Many of Alaska's forested areas contain mineral potential and some have been mined historically or are in active operation. Forestry issues related to mining are timber harvest during land use conversion for mining sites and access roads, preventing forest insect outbreaks during timber harvest, and preventing invasive plant species establishment during land disturbance and equipment movement. Historical placer gold mining activity in the Fairbanks Mining District greatly affected the boreal forest in the area. The total area in Alaska covered by mining claims and mineral sites in 2018 was 3.8 million acres (Athey & Werdon 2019). Production by value was zinc (58%), gold (28%), lead (7.9%), and silver (6.6%).



Figure 22. El Capitan Cave, Prince of Wales Island. ©2020 ADOF

Climate

Alaska's four major climatic zones are maritime, transitional, continental, and arctic (Zasada & Packee 1994). The coastal forest is in the maritime zone and is characterized by cool and cloudy summers and mild winters with year-round abundant precipitation (Viereck & Little 2007). The northern extreme of the coastal forest is colder and drier than the south. The southernmost coastal forest in Alaska receives over 220 inches of precipitation annually while the northern edge of coastal forest at Homer receives just 24 inches. Ketchikan's mean annual temperature is 46° F while Cordova's is 37° F. Summer temperatures are typically in the upper 50s° F, and winter temperatures are typically in the low 20s° F to mid-30s° F. Throughout the coastal zone at lower elevations, much of the precipitation falls as rain (Zasada & Packee 1994). However, at higher elevations the precipitation is largely snow which feeds ice fields and glaciers, causing glacial winds which affect the local climate. Gale-force winds from winter storms occur October through February.

The boreal forest extent covers both the transitional and continental zones (Zasada & Packee 1994). The boreal forest is characterized by extremes in day length and temperature. Temperatures swing from summer highs in the 90s° F to winter lows in the -40s° F (Viereck & Little 2007). The mean annual temperature is 20° to 30° F and the average temperature of the warmest summer month is 60° F. In winter, strong temperature inversions occur between valley bottoms and ridgetops (Zasada & Packee 1994).

Precipitation ranges from 6 to 12 inches per year (Viereck & Little 2007). In Fairbanks, the average snowfall is 5.5 inches, and snow cover lasts from mid-October to mid-to-late April. Despite the low precipitation, wetlands are common because of low evaporation and permafrost impeding drainage, and water is generally not a limiting factor for vegetation. Thunderstorms with lightning strikes commonly occur May through July in the Yukon, Tanana, and upper Kuskokwim River valleys. The mouths of valleys and the coasts are commonly subject to strong winds. The major rivers flood in the spring because of snowmelt and ice jams, and in the summer during heavy rains.

Climate change is affecting Alaska's forests—a threat which is discussed in greater detail below.

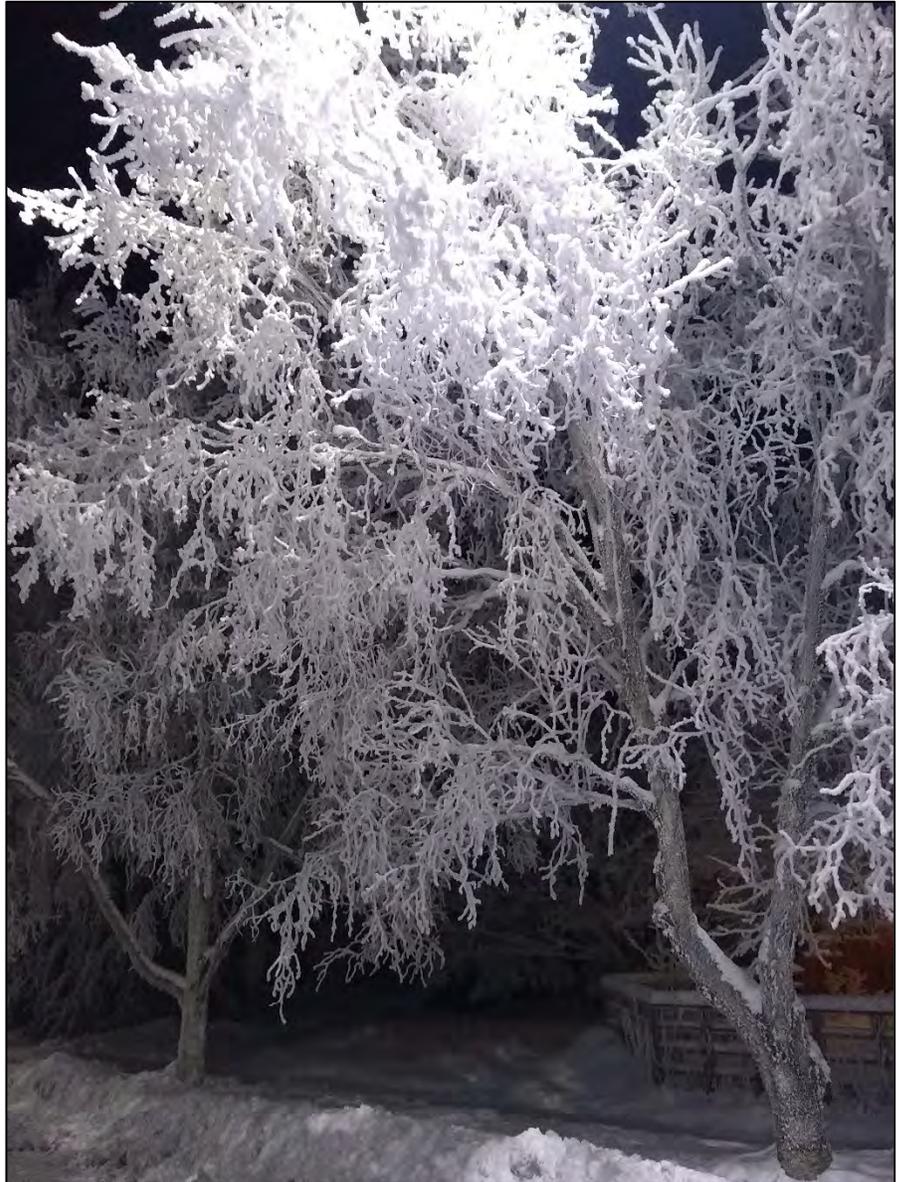


Figure 23. Paper birch street trees in Anchorage. ©2020 ADOF

Benefits and opportunities of Alaska's forests

Ecosystem services

Alaska's healthy forest ecosystems provide a wide variety of benefits to people, called ecosystem services (MEA 2005). Forest ecosystem services include:

- Provisioning services are products from the forest, including wild foods, timber and fuelwood, and water.
- Regulating services are benefits from the regulation of ecosystem processes, including air quality, climate regulation such as carbon storage, and water and erosion regulation
- Cultural services are nonmaterial benefits people get from forests through reflection, recreation, and other experiences, and include spiritual and cultural heritage values, knowledge systems, aesthetics, and recreation.

Many of these ecosystem services are discussed in more detail as individual benefits below.

Wildlife habitat

Alaska's forests provide important wildlife habitat that supports relatively high biodiversity because of their high biomass and structure compared to other habitat types in Alaska. Forests' vertical structure provides different niches, and edge habitat where forests meet other vegetation types also provide different niches (ADF&G 2005).

Coastal forest wildlife habitat

The coastal forest's large, long-lived trees and gap-phase dynamics, driven by wind to create small openings in the canopy, provide stable habitat with a wide range of structural and compositional habitat features important to many wildlife species (ADF&G 2015). Sitka black-tailed deer and brown bear are important large mammals in the coastal forest. The geography of the coastal forest in Southeast Alaska drives a high degree of endemism because of its hundreds of isolated islands. Some species which are not endemic have evolved to depend on old-growth forest, such as the marbled murrelet, a seabird which nests in large old-growth trees. Old-growth coastal forest is home to 53 species of mammals, and 20% of species and subspecies are endemic. For example, the Prince of Wales flying squirrel, Prince of Wales spruce grouse, and 5 subspecies of shrew live only in the coastal forest of this region. The coastal forest is also important year-round habitat for resident bat species and has the greatest species diversity in Alaska. The forest canopy provides cover for hunting insects over adjacent water, and some bat species use trees for day roosts, maternity colonies, or hibernation.

Old-growth coastal forest is also home to 231 species of birds. Some bird species rely on old growth features, such as woodpecker and owls using large-diameter snags for cavity nesting and roosting, the rufous hummingbird and American dipper using mosses and lichens for nesting materials. The northern goshawk hunts from underneath the forest canopy. The coastal forest's moist climate supports the rough-skinned newt, the wood frog, and the long-toed salamander. No terrestrial wildlife species in the coastal forest is listed as threatened or endangered under the Endangered Species Act.

COASTAL FOREST-ASSOCIATED SPECIES

Marbled murrelet, *Brachyramphus*
marmoratus
Prince of Wales spruce grouse,
Falcipennis canadensis isleibi
Blue grouse, *Dendragapus obscurus*
White-winged crossbill, *Loxia leucoptera*
Rufous hummingbird, *Selasphorus rufus*
Belted kingfisher, *Ceryle alcyon*
Black-backed woodpecker, *Picoides*
arcticus
Dark-eyed junco, *Junco hyemalis*
Wilson's warbler, *Wilsonia pusilla*
Hermit thrush, *Catharus guttatus*
White-crowned sparrow, *Zonotrichia*
leucophrys
Pine grosbeak, *Pinicola enucleator*
Red crossbill, *Loxia curvirostra*
Pine siskin, *Carduelis pinus*
Red-breasted nuthatch, *Sitta canadensis*
Brown creeper, *Certhia americana*
Smith's longspur, *Calcarius pictus*
Northern pygmy-owl, *Glaucidium gnoma*
Barred owl, *Strix varia*
Canopy nesting Pacific-slope flycatcher,
Empidonax difficilis
Golden-crowned kinglet, *Regulus satrapa*
Townsend's warbler, *Dendroica townsendi*
Varied thrush, *Ixoreus naevius*
Northern saw-whet owl, *Aegolius*
acadicus
Western screech owl, *Otus kennicottii*
Great gray owl, *Strix nebulosa*
Great horned owl, *Bubo virginianus*
Bald eagle, *Haliaeetus leucocephalus*
Merlin, *Falco columbarius*
Sharp-shinned hawk, *Accipiter striatus*
Northern goshawk, *A. g. atricapillus*
Black merlin, *F. c. suckelyi*
Wood frog, *Rana sylvatica*
Long-toed salamander, *Ambystoma*
macrodactylum
Rough-skinned newt, *Taricha granulosa*
Ermine, *Mustela erminea* complex
Marten, *Martes Americana/caurina*
complex
Flying squirrel, *Glaucomys sabrinus*
griseifrons/alpinus
Long-tailed vole, *Microtus*
longicaudus/coronarius complex
Keen's mouse, *Peromyscus keeni* complex
Sitka tundra vole, *Microtus oeconomus*
sitkensis
(ADF&G 2005)

Boreal forest wildlife habitat

The boreal forest's patchwork landscape supports a variety of upland and wetland habitat types ranging from closed forest to open shrub to herbaceous (ADF&G 2015). Moose are the large mammal most associated with the boreal forest. Moose depend on winter browse of young hardwood growth, willows, and other shrubs—vegetation most often found in relatively recently burned areas and along waterways. Habitat diversity is closely related to bird species diversity in the boreal forest, and birds are the largest class of vertebrates in the boreal forest. Only twenty percent of bird species in the boreal forest remain year-round. Eighty percent are migrants that are only present for the summer to breed and rear young. Deciduous forests and spruce forests have different habitat values for birds. Deciduous forests on floodplains have higher productivity and greater structure diversity than spruce forests, leading to higher occupancy and species richness than spruce forests. Spruce forests have greater densities of permanent resident species because of their more stable habitat, with white spruce forest having the greatest densities of all boreal forest types.

No regular population of terrestrial species in the boreal forest is listed as threatened or endangered under the Endangered Species Act. However, after being gone from Alaska for over 100 years, a population of 130 wood bison was reintroduced in 2015 near Shageluk in the lower Innoko and Yukon River area as a Section 10(j) nonessential experimental population of a Threatened Species under the Endangered Species Act (ADF&G 2018a). Under Section 10(j), no special rules regarding development or disturbance apply to wood bison, and wood bison can be managed as a huntable population by the State of Alaska. Wood bison feed on grasses and sedges and utilize meadow and woodland habitat. The larger landscape they inhabit is a mosaic of wetlands and boreal forest.



Figure 24. Moose print in aspen and willow stand. ©2020 ADOF

BOREAL FOREST- ASSOCIATED SPECIES

Varied thrush, *Ixoreus naevius*
American three-toed woodpecker, *Picoides tridactylus*
Black-backed woodpecker, *Picoides arcticus*
Northern flicker, *Colaptes auratus*
Violet-green swallow, *Tachycineta thalassina*
Hermit thrush, *Catharus guttatus*
White-crowned sparrow, *Zonotrichia leucophrys*
Belted kingfisher, *Ceryle alcyon*
Dark-eyed junco, *Junco hyemalis*
Northern hawk owl, *Surnia ulula*
Boreal owl, *Aegolius funereus*
Great gray owl, *Strix nebulosa*
Great horned owl, *Bubo virginianus*
Merlin, *Falco columbarius*
Harlan's hawk, *B. j. harlani* or Red-Tailed Hawk, *Buteo jamaicensis*
Sharp-shinned hawk, *Accipiter striatus*
Northern goshawk, *Accipiter gentilis atricapillus*
Olive-sided flycatcher, *Contopus cooperi*
Blackpoll warbler, *Dendroica striata*
Rusty blackbird, *Euphagus carolinus*
Wilson's warbler, *Wilsonia pusilla*
Keen's mouse, *Peromyscus keeni* complex
Kenai marten, *Martes Americana kenaiensis*
Kenai red squirrel, *Tamiasciurus hudsonicus*
Kenai brown bear, *Ursos arctos*
Columbia spotted frog, *Rana luteiventris*
(ADF&G 2005)

Fish habitat

Alaska’s forests support all five species of Pacific salmon. Alaska’s forest regions vary in terms of stream morphology, the relationship between forest vegetation and stream inputs, fish species, and fisheries uses. Forest litter provides nutrients into streams to support invertebrate production, shade to regulate water temperature, and as trees fall into streams, large woody debris for habitat and stream morphology. The residence time of large wood debris in streams depends on the size of the tree and tree species, with hardwoods rotting faster than spruce. Differences in hydrological processes and forest type are reflected in differences between regions in the Alaska Forest Resources and Practices Act (AS 41.17). For example, in the boreal forest south of the Alaska Range, riparian timber is relatively low volume and wide, unconfined and dynamic river systems are the norm. Shifting of river channels is a major contributor to large woody debris, so wider no-harvest areas are necessary. Salmon also benefit forests as a source of marine nutrients when they return from the ocean to spawn, die, and enter the nutrient cycle by dispersal into the forest by many species.



Figure 25. Large woody debris, Russian River. ©2020 ADOF

Subsistence

Subsistence is the customary and traditional use of wild resources for food, clothing, fuel, transportation, construction, art, crafts, sharing, and customary trade (ADF&G 2018b). Forests are vital both directly and indirectly to subsistence. Subsistence use occurs within Alaska’s forests statewide, around every community. Subsistence users typically harvest in traditional use areas surrounding their communities. Subsistence is likely the most prevalent use of Alaska’s forests. Forest materials are directly used for subsistence, including the gathering of berries, mushrooms including chaga, firewood, and house logs. Large woody debris in the larger river systems provide subsistence fuel and cultural wood well into the non-forested western and arctic coast. Forests provide the habitat upon which subsistence food sources depend, including salmon and whitefish, moose, and Sitka black-tailed deer, and provide opportunities for subsistence fishing, hunting, and trapping.

Subsistence is culturally and spiritually important, particularly to Alaska Native peoples who make up 55% of Alaska’s rural population (ADF&G 2018b). The act of gathering wild and traditional foods reinforces people’s relationships to plants and animals and the land and maintains cultural identity. The act of sharing subsistence food reinforces people’s relationships to each other and to their culture. Subsistence use of forests is economically important, especially in rural areas where jobs and subsistence combine in the mixed, subsistence-market economy to support households—including households that cannot harvest for themselves but who receive shared subsistence foods. Sharing with family who live outside of the local community helps to maintain cultural and family connections. Store-bought foods are prohibitively expensive in much of rural Alaska, and subsistence provides people with a sustainable and self-reliant food source. The estimated replacement value of wild food harvests in Alaska is \$227 million to \$454 million annually (ADF&G 2018b).

Table 2. Percentage of households participating in subsistence activities in rural areas. (ADF&G 2018b)

Area	Percentage of households participating in subsistence activities in rural areas			
	Harvesting game	Using game	Harvesting fish	Using fish
Arctic	63%	92%	78%	96%
Interior	69%	88%	75%	92%
Southcentral	55%	79%	80%	94%
Southeast	48%	79%	80%	95%
Southwest	65%	90%	86%	94%
Western	70%	90%	98%	100%
Total rural	60%	86%	83%	95%

Threats to Alaska’s forests are also threats to subsistence. For example, forest insect outbreaks which defoliate berry shrubs can have a serious impact on subsistence food availability. The changing climate affects wildlife migration routes and the seasonal availability of wildlife for harvest, as well as water flow, ocean patterns, and weather which affect salmon habitat and cycles. Shorter less dependable winters make access more difficult for winter food and wood gathering.



Figure 26. Conical camp frame made of both bent living trees and cut withes, Chulitna River, Lake Clark (Deur et al. 2020 [CC BY 4.0](#))

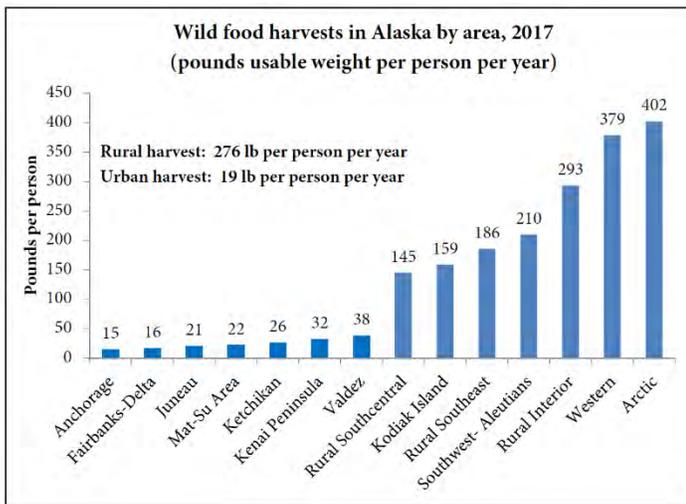


Figure 27. Wild food harvest in Alaska by area, 2017. (ADF&G 2018b)

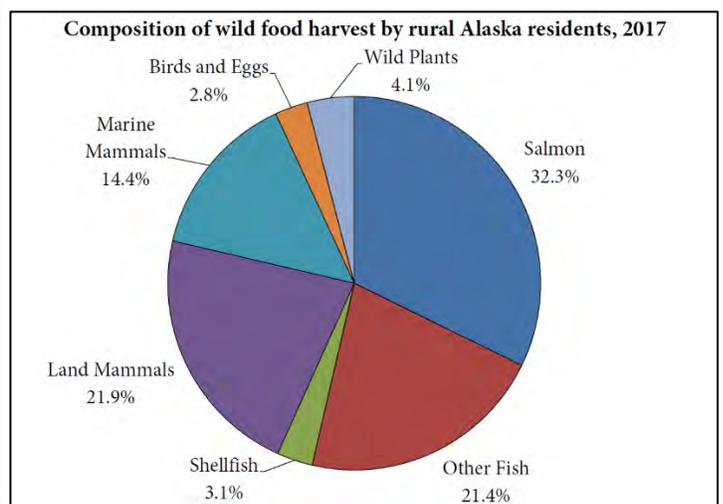


Figure 28. Composition of wild food harvest by rural Alaska residents, 2017. Many of these wild foods are found in forests, including salmon, land mammals including moose and Sitka black-tailed deer, and wild plants, particularly berries. (ADF&G 2018b)

Non-timber forest products

Non-timber forest products are biological materials harvested from the forest other than commercially sawn wood (USFS 2003). Non-timber forest products include mushrooms, birch syrup, chaga and other conks, berries, herbs, diamond willow, and tree parts for crafts and decorations such as burls and cones. Non-timber forest products are harvested for subsistence, commercial, and recreational processes. Recreational gathering of non-timber forest and tundra products is estimated at 119,000 participation days and generates \$6.5 to \$7.0 million dollars per year in consumer spending, not including equipment purchases. Recreational gathering supports 73 jobs and \$2.7 million in wages (University of Alaska 2019).



Figure 29. High-bush cranberries, Susitna River valley. @2020 AKDOF.

Carbon Storage

Trees take up carbon from the atmosphere through photosynthesis and store carbon that would otherwise absorb heat in the atmosphere, contributing to climate change. The sheer size of Alaska combined with its cold temperatures make Alaska's forests important for carbon storage, both in the soil and in vegetation (McGuire et al. 2016). Carbon storage in Alaska's boreal forest is more likely to change than carbon storage of Alaska's coastal forests because of the projected increase in temperature, which may lead to carbon loss through increased wildfires and permafrost thaw. The coastal forest stores an estimated 1,018 teragrams of carbon. Under projected climate scenarios, this could increase by 8 to 27% by the end of the 21st century, depending on forest management. The boreal forest has been estimated to store an estimated 400 teragrams of carbon in aboveground biomass.

Watershed values including water quality and quantity

Watersheds provide many ecosystem services including clean water and aquatic and riparian habitat. Alaska's salmon and resident fish species rely on healthy watersheds. Wetlands and riparian areas filter sediments and contaminants from water, minimize erosion, and regulate water storage which reduces the likelihood of flooding. The riparian area in the boreal forest is particularly important bird habitat, and coastal wetlands are important for shorebirds. Forests also supply safe drinking water for public water systems (Dissmeyer 2001). Even communities distant from forests benefit from upstream forests' contribution to clean drinking water. Forests contribute to drinking water quality because properly managed forests supply water that is relatively low in contaminants compared to other land uses, and forests contribute to water quantity because they produce relatively reliable runoff. Conserving forested watersheds which supply safe drinking water contributes to public health for current and future generations. Preventing drinking water source contamination may be more cost-effective than treating contaminated water.

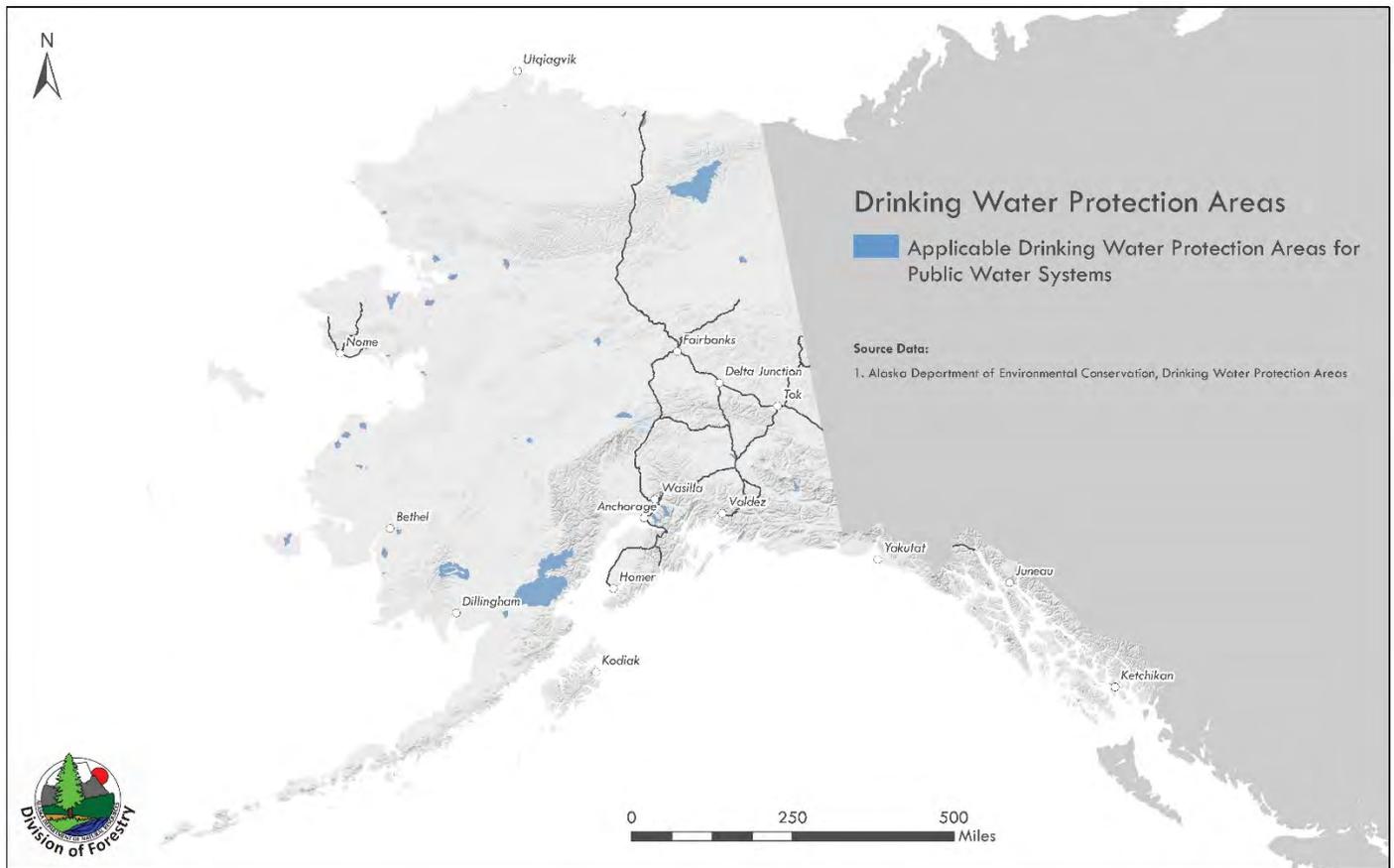


Figure 30. Drinking Water Protection Areas may be useful to consider when prioritizing and siting cooperative forestry and cooperative fire projects.

Forest products and timber management opportunities

Alaska’s forest products industry has faced tough challenges. The majority of the value of Alaska’s timber resource is in the coastal forest of Southeast Alaska (Marcille et al. 2017a). This is where the highest volume is harvested and where most of the production capacity is, although both measures have been decreasing. Timber harvest volume in Alaska decreased by half from 2005 to 2015 (Marcille et al. 2017a), as have industrial capacity, capacity utilization, and production (Daniels et al. 2016). This reflected changes in forest policies and dynamic wood product markets.

Although 77% of sawtimber volume is on national forest system land, in 2015 67% of the harvest was from private lands including Alaska Native corporations, reflecting national forest policies that have shifted away from old-growth timber harvest in response to changing social values. The Tongass National Forest’s goal is to transition to young-growth timber harvest to maintain a viable forest industry, but young-growth stands originated in the 1950s to 1980s and have not yet reached their maximum rate of growth (Daniels et al. 2016). The national forest is making some old-growth timber volume available so that the forest industry can survive the gap until young-growth timber volume becomes fully available.

Present-day efforts of the Tongass are focused on providing a reliable supply of old-growth to the existing industry, while continuing to identify and develop sale areas that contain mature young-growth stands, that can be economically operated. This approach seeks to keep the existing industry viable, while giving operators time and opportunity to test markets for young growth sawtimber.

Several approved sale areas have a commercial young growth component to them and at least one has been offered jointly with the State of Alaska Division of Forestry, under a Farm Bill provision known as the Good Neighbor Authority. This provision offers the opportunity for adjacent landownerships to implement their management activities through fiscal instruments administered by a single agency, despite multiple underlying land ownerships. A benefit of this shared approach is decreased administrative burden on the agencies and operators, allowing for larger and potentially more economically viable projects. This demonstrates the importance of land managers coordinating with each other to support a viable forest products industry, which in turn relies

upon the offerings of all ownerships in order to function. No one land manager can sustain the current and desired future industry.

Another factor in the decrease in timber harvest volume is decrease in home construction following the 2008 recession (Marcille et al. 2017a). Log exports made up 75% of the total timber harvest in 2015; changes in tariffs dramatically affect the Alaska market. A shift in Alaska’s main export destination from Japan, which favors higher quality wood, to China, which favors lower quality wood, has also affected Alaska’s timber industry (Daniels et al. 2016).

In 2015, timber harvest from the boreal forest was the only part of the state to see an increase in harvest volume from 2011, but this volume makes up just 6% of the total harvest volume in Alaska.

Table 3. Alaska production capacity by resource area and sector, 2015. *Includes only facilities active during 2015. (Marcille et al. 2017b)

Resource area ^b	Lumber production capacity	House log production capacity
	<i>MBF, lumber tally</i>	<i>Thousand lineal feet</i>
Southeast	98,255	210
Southcentral & Western ^c	6,787	417
Interior	19,298	200
2015 all resource areas^d	124,340	827
2011 all resource areas	137,331	1,740
2005 all resource areas	240,159	2,603

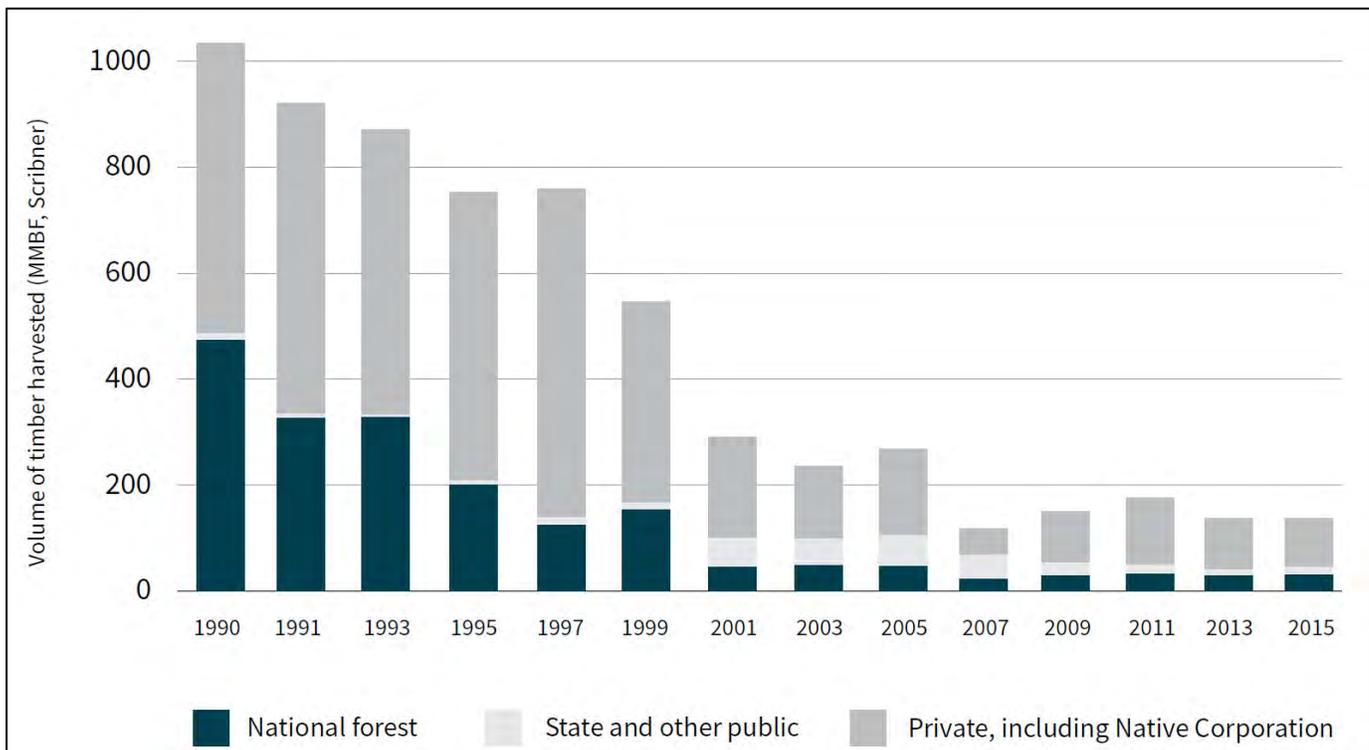


Figure 31. Alaska’s harvest volume by ownership, selected years. (Marcille et al. 2017a)

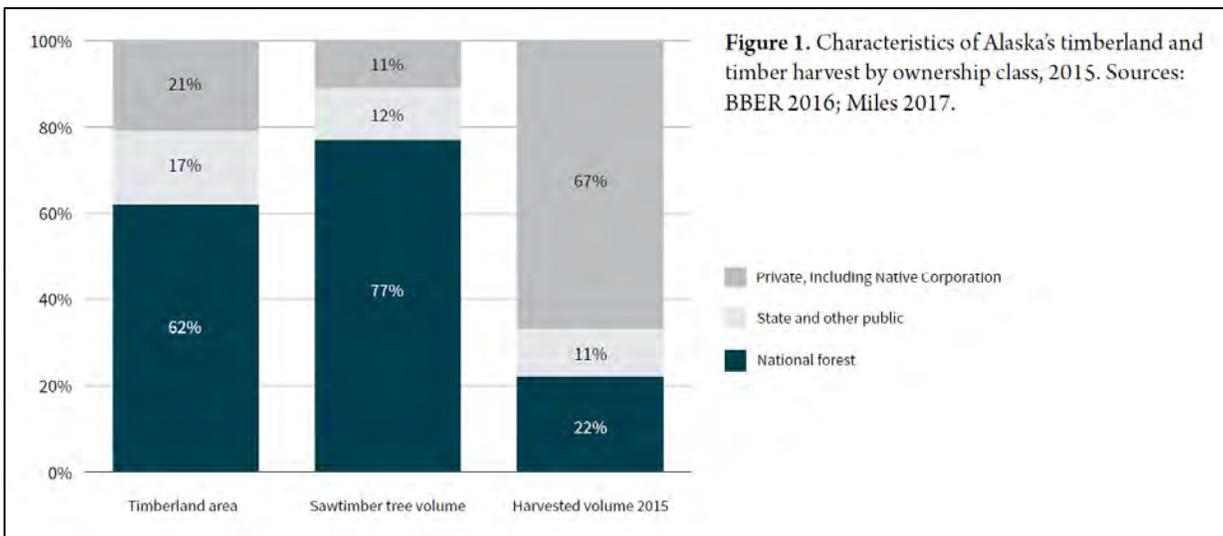


Figure 1. Characteristics of Alaska's timberland and timber harvest by ownership class, 2015. Sources: BBER 2016; Miles 2017.

Figure 32. Characteristics of Alaska's timberland and timber harvest by ownership class, 2015. (Marcille et al. 2017a)

In 2015, 78% of Alaska's timber harvest volume was exported as logs, 17% went to sawmills, 3% went to fuelwood manufacturers, and 1% went to house log and log home manufacturers (Marcille et al. 2017a). Sitka spruce is by far the leading species harvested in Alaska and the main export species, although western hemlock makes up most of the growing stock. White spruce is the main species for house logs and log home products, 48% of which are produced in Southcentral and Western Alaska, and 39% of which are produced in the Interior. Because of high transportation costs, timber in Alaska is processed in the region in which harvested.

Table 4. Alaska timber harvest by ownership class and product type, 2015. (Marcille et al. 2017d)

Ownership class	Sawlogs	House	Fuelwood	Other	All	2011 All
		logs		products ^a		
-----Thousand board feet, Scribner-----						
Private -- including Native corporations	89,244	281	823	501	90,848	127,990
National Forest	28,961	194	60	1,071	30,286	28,688
State and other public	9,556	846	4,835	--	15,237	18,590
All owners	127,761	1,321	5,718	1,572	136,371	175,267
-----Percent of harvest-----						
Private -- including Native corporations	69.9	21.2	14.4	31.9	66.6	73.0
National Forest	22.7	14.7	1.0	68.1	22.2	16.4
State and other public	7.5	64.1	84.6	--	11.2	10.6
All owners^b	93.7	1.0	4.2	1.2	100	100

^a Other timber products include tonewood and cedar products.

^b Total may not add to 100% due to rounding.

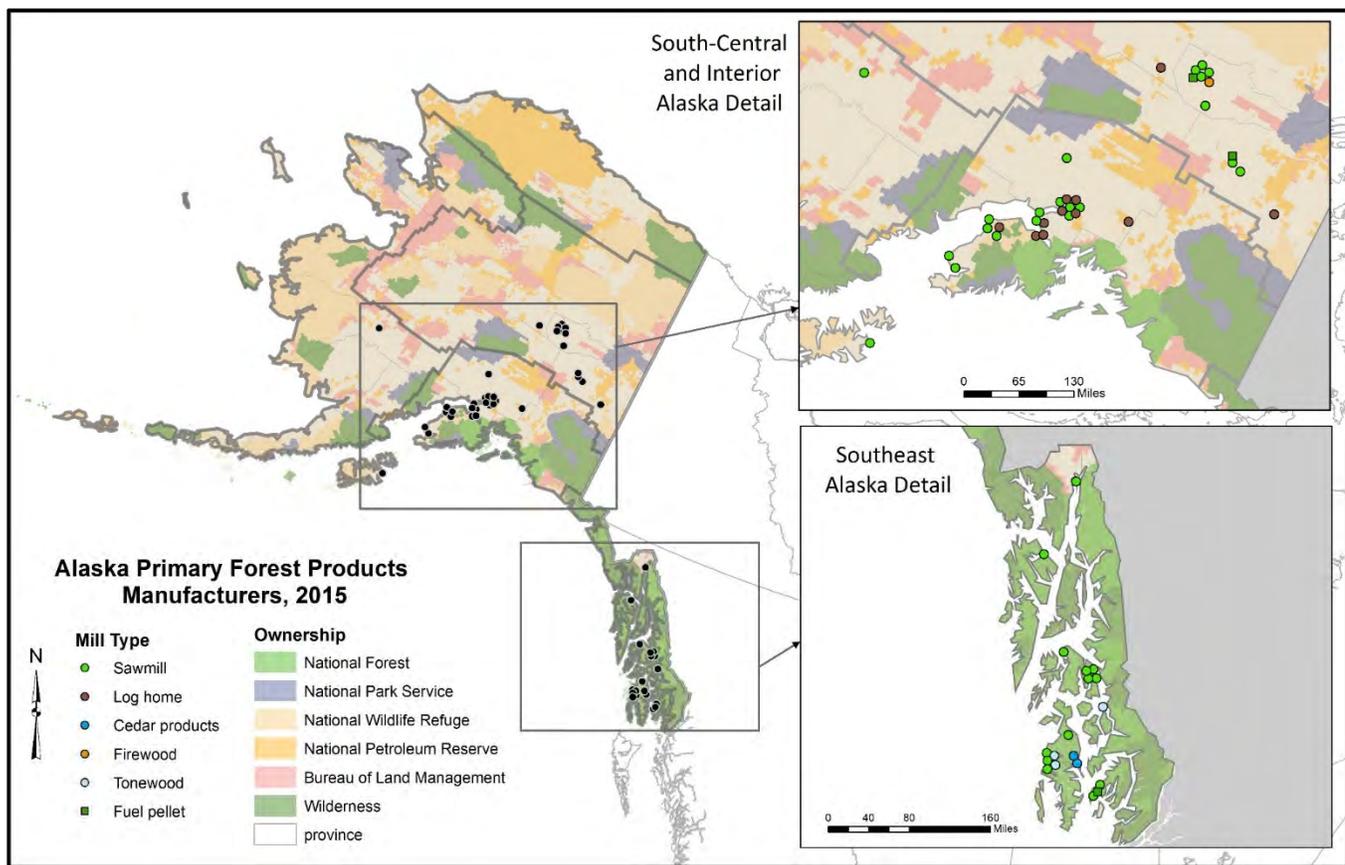


Figure 33. Alaska’s primary wood processing facilities active during calendar year 2015. (Marcille et al. 2017d)

In 2015, 60 primary wood products facilities were active, including 39 sawmills (the largest sector by number of facilities, employment, and volume), 11 log home manufacturers, and 10 other facilities that produced fuelwood/energy products including pellets, cedar products, and tonewood used for musical instruments (Marcille et al. 2017b). Southeast Alaska’s wood industry is made up of one large lumber mill on Prince of Wales Island and several smaller mills that produce unique or niche products (Daniels et al. 2016). The wood products facilities in Southcentral and in the Interior near the Tanana Valley State Forest are mostly small, portable circle or band sawmills (Marcille 2017b).

Two-thirds of wood products manufactured in Alaska are sold in Alaska, which makes wood products manufacturing important to communities and the Alaska economy even it is a small segment of the overall forest products industry in Alaska (Marcille et al. 2017c). The in-state sales value of manufactured house log and home log products was \$11 million. An opportunity that has significant interest from forest stakeholders is in developing markets for value-added niche products (Daniels et al. 2016). Specialty products account for less than 1% of the total timber harvest volume, but developing this opportunity could help create local jobs. Another in-state opportunity is processing wood manufacturing residues into manufactured firewood, mulch, and wood chips (Marcille et al. 2017c). The value of these products, including pulp-chips exported out-of-state increased significantly in 2015 to \$4.9 million.

The working forest closest to most of Alaska’s population is the birch-spruce mixed forest of the Matanuska-Susitna Valley. Due to the region’s high defect rate, demand for fuelwood remains higher compared to other wood products. The ongoing spruce beetle outbreak has heavily impacted forest lands in Southcentral and much of the impacted spruce are succumbing to decay far sooner than anticipated, making fuel wood the most likely product, unless the trees are harvested and processed soon after being killed by the beetle.

Biomass and Wood Energy

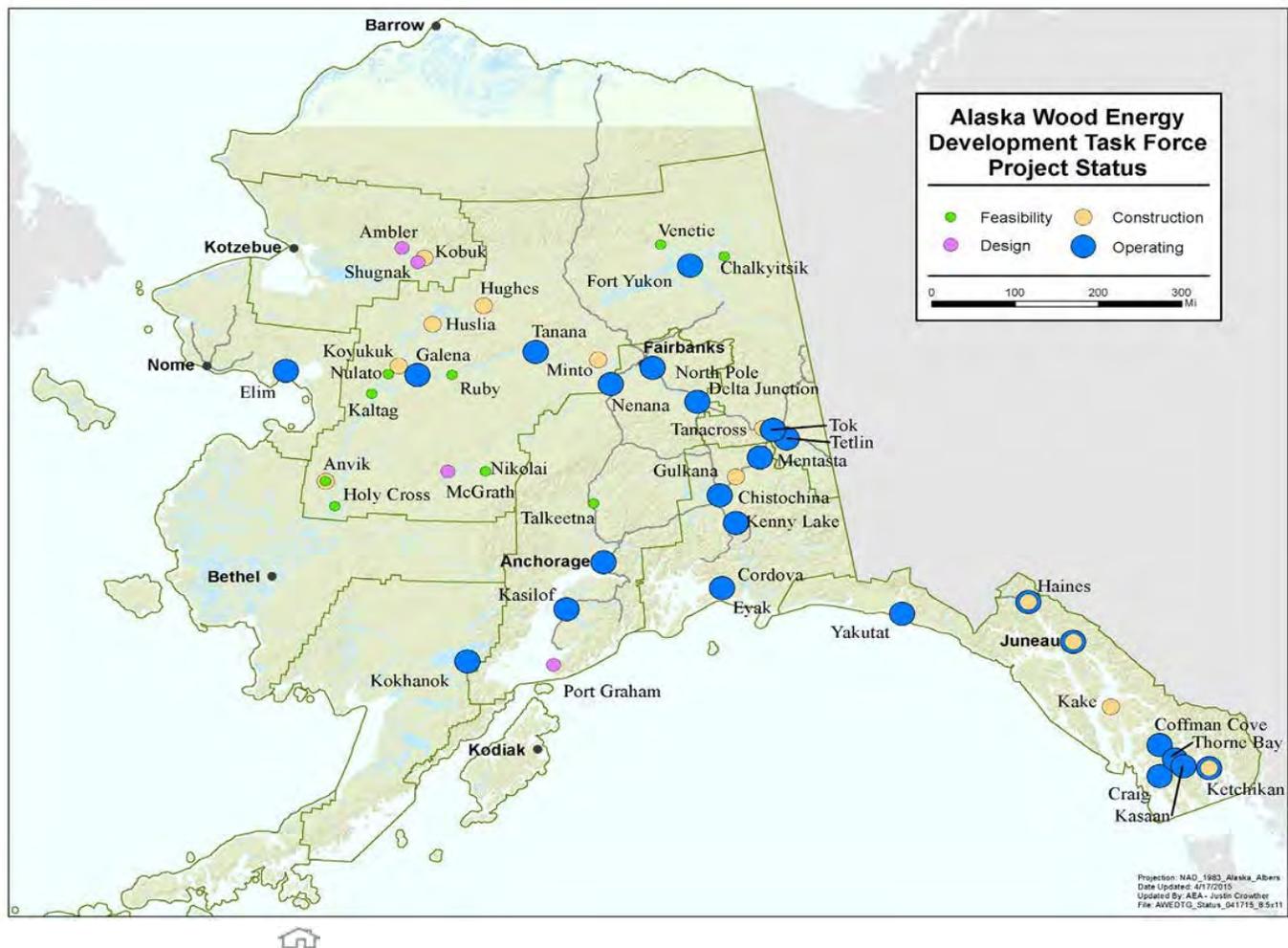


Figure 34. Biomass project map, as of June 2015. (Lowell et al. 2015)

An opportunity with high potential is the emerging wood energy market, which can utilize low-quality material as cordwood, wood chips, or wood pellets, depending on the wood boiler type. There is interest in developing a wood pellet industry in Southeast to create jobs and increase timber demand (Daniels et al. 2016). Challenges include competition from pellet producers in British Columbia and the high cost of transporting pellets to markets in Alaska. Wood energy provides a use for the woody biomass generated by hazardous fuel reduction, wildlife habitat improvement, young-growth management, and forest restoration following spruce beetle outbreaks (Lowell et al. 2015). In addition to being a new wood products industry, wood energy has benefits to communities and end users, as discussed below.

Energy independence for communities

Wood energy has the potential to move communities towards energy independence, especially in rural Alaska. Displacing expensive diesel fuel for electrical generation and heating with wood energy from locally harvested biomass can create local jobs, keep more money within the community, and reduce energy costs for local governments, businesses, and residents. Wood energy can supplement wind and hydro projects. On the small scale, every community already benefits from wood energy—woodstoves are common in homes across Alaska’s forested regions and reduce heating costs for many homeowners.

Aesthetic and Scenic Values

Alaska's forests provide amazing aesthetic and scenic values, from towering Sitka spruce gracefully hung with lichens, to beautiful fall colors of birch, aspen, and tamarack, to the vast, quiet beauty of snow-blanketed black spruce forest stretching for miles. Enjoyment of these scenic values can be inspiration for a forest visit for its own sake, or can serve as the colorful foreground for Alaska's most iconic mountain vistas. Views of the lush forested coastline are one of the highlights of a voyage along the Inside Passage. In the everyday life of Alaskans, the beauty of forests adds a welcome natural backdrop to homes and businesses as well as screening and privacy.

Community Benefits

Trees and forests within communities improve the quality of life for Alaskans, the majority of whom live in towns or cities. Some of the many benefits provided by community trees and forests are:

- Reducing runoff, flooding, erosion, and the need for costly storm water treatment.
- Helping recharge groundwater and keeping sediment and pollutants out of streams.
- Trapping and filtering dust, smoke, and other airborne pollutants.
- Absorbing carbon dioxide and other greenhouse gases, storing carbon, and releasing oxygen.
- Providing summer shade, windbreaks, and snow fences.
- Screening views and reducing noise.
- Providing habitat for fish and wildlife.
- Increasing property values.
- Making towns more attractive to residents, businesses, and tourists.
- Creating visual variety and seasonal changes.
- Providing natural areas where people can relieve stress and improve their health by recreating, relaxing, and socializing.
- Bringing the natural environment closer to where people live, work, and go to school.



Figure 35. Ripe apples in Anchorage. ©2020 ADOF

For Alaska's more rural communities, community forests are also working forests that provide timber and firewood, biomass for wood energy, non-timber forest products including berries and mushrooms, and habitat for fish and wildlife.

The benefits provided by community forests to public health and well-being have received special attention in recent years. (USFS 2018). Living near forests helps people to lead more active lifestyles, and community forests provide natural surroundings that benefit mental health and happiness and reduces stress and mental fatigue. Urban forests can help mitigate some of the health effects from urban air pollution. Living near green space has been found to result in less mental distress, more impulse control and better attention spans, more physical activity and for longer periods of time and greater intensities, and longer lifespans. During the COVID-19 pandemic, forests in community parks provided much-needed respite for residents looking for open air and space to recreate; in 2020 Anchorage Parks and Recreation noted an uptick in trail users, and Alaska State Park units had more Alaskan resident visitors than any other year (Treinen 2020).

Forest Recreation

Alaska's forests provide a world-class destination for outdoors recreation and serve as the backyard playground for Alaskans, offering a wide variety of opportunities ranging from a walk in the neighborhood forested greenbelt to a multi-week expedition on winter trails through the boreal forest. Activities include hiking, biking, skiing, ice skating, snowmachining, off-road vehicle riding, kayaking, canoeing, rafting, birding, wildlife viewing, fishing, and hunting. Developed forest recreation opportunities include trail systems, public use cabins, campgrounds, boat launches, ski areas, and day use shelters.

Forest recreation in working forests provides mutually beneficial opportunities for Alaskans and production of wood energy and forest products. Working forests near communities provide both recreation and tourism (business) opportunities for hiking, cross country skiing, wildlife viewing, mountain biking, snowmachining, off-road vehicles, and more. These opportunities improve Alaska's economic health and quality of life, and partnerships can help meet both forestry and recreation objectives.

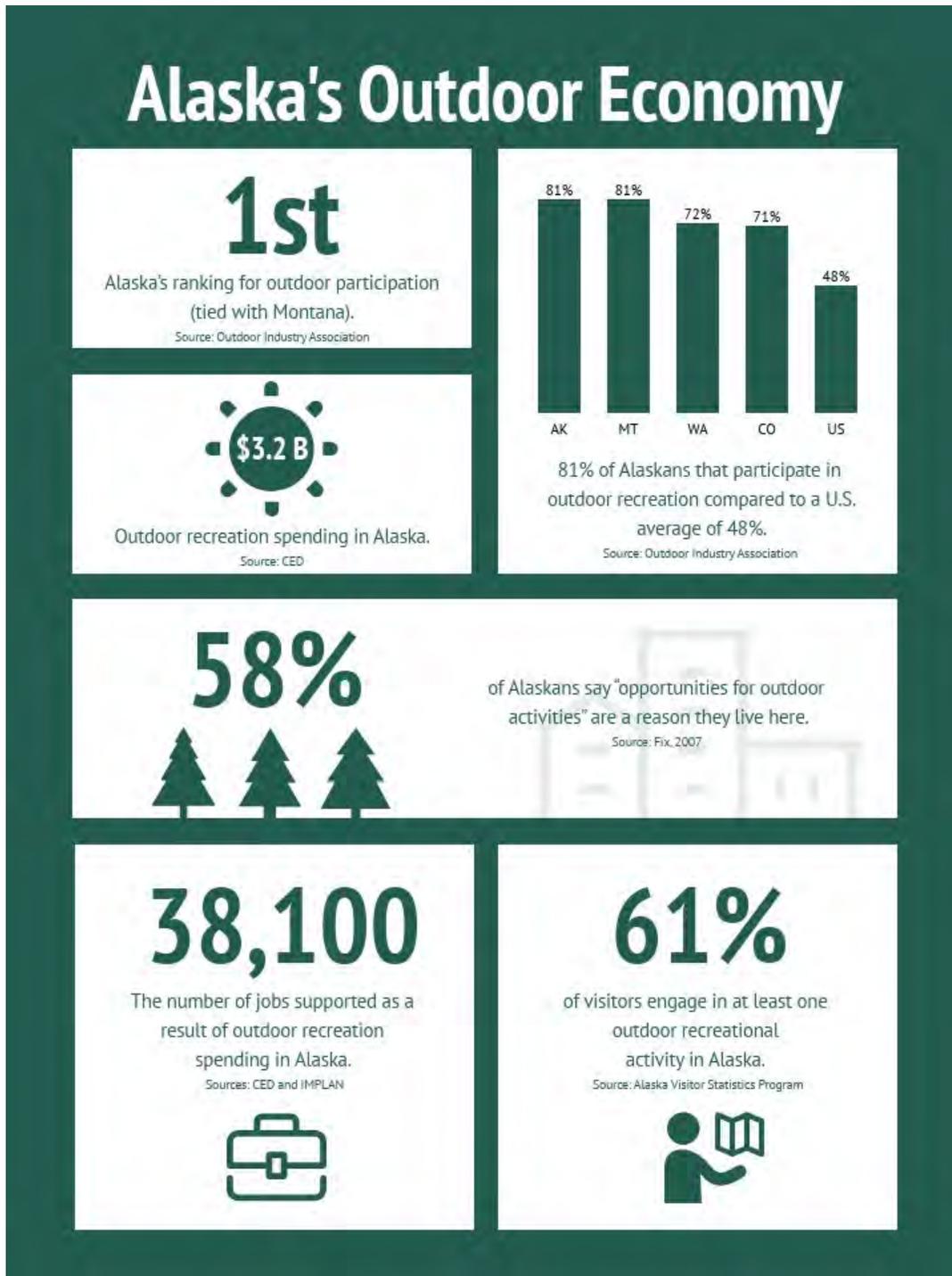


Figure 36. Alaska's outdoor economy. (UA 2019)

Threats to Forest Lands and Resources

Alaska’s forests are threatened in many ways. These threats vary by forest region and can be interactive and compounding. For example, a spruce beetle outbreak contributes dead fuels which can increase the threat from wildland fire. Understanding these threats and their interactions is key to developing strategies to address them, and to securing the benefits of Alaska’s forests.

Wildland fire



Figure 37. Cars are lined up on the Parks Highway north of the McKinley Fire in August 2019 after the road was shut down due to the fire intensifying. ©2020 ADOF

Fire seasons in Alaska are extraordinary, in terms of their size, complexity, and resistance to control. They often burn into the wildland urban interface where values to be protected are high. It is not unusual that fire severity in these stands is exacerbated following years of drought, insect infestations, and disease. These few wildfires, often burning under extreme fire weather conditions and exhibiting extreme fire behavior characteristics, exceed all efforts at conventional control, until relief in weather or a break in fuel occurs.

Alaska is an active and challenging expanse for wildland fire management. Annual acreage burned, the majority of which is in the boreal forest, can range from an average low of about one hundred thousand to a high of over six million acres.

Most starts are human caused (approximately 70%) while much of the acreage burned is caused by lightning ignitions (30%). Human-caused fires tend to be the most expensive as they are near communities and the values that need protection. The Alaska Division of Forestry (DOF), Bureau of Land Management-Alaska Fire Service (AFS) and the USDA Forest Service (USFS) have active fire programs and are responsible for the protection of the wildlands within the state, both public and private. Legislation previously passed has realigned Department authority that allows fire management decision making to include all values, not just the values of the natural resources threatened by wildland fires. All houses, cabins, commercial property, infrastructure, and other cultural resources can be considered when assessing the most appropriate and cost-effective fire management strategies.

Table 5. Past decade of fire activity.

Year	# of Fires	# of Acres
2010	688	1,125,419
2011	515	293,018
2012	416	286,888
2013	612	1,316,288
2014	377	233,544
2015	772	5,146,541
2016	552	499,559
2017	362	653,148
2018	362	411,176
2019	742	2,585,625
Mean	533	1,260,591
Median	521	574,485

Alaska Interagency Wildland Fire Management Plan

Fire suppression for all wildland fire agencies in Alaska is guided by the Alaska Interagency Wildland Fire Management Plan (AIWFMP). The plan was developed and signed in the 1980s to provide a coordinated and cost-effective approach to fire management on all lands in Alaska. The AIWFMP dictates the shared management prioritization of initial attack resources by designating four protection levels for response to wildland fires. Fire managers are quickly able to identify the most appropriate response to new fires and allocate limited suppression resources. No other state has a similar interagency fire plan. State, Federal and Native land managers may adjust fire management protection levels for their lands every winter between fire seasons. Each suppression agency in Alaska protects specific geographical areas under cooperative agreements and follows the guidelines of the AIWFMP, thus avoiding duplication of fire protection resources and efforts, while providing for the most cost-effective fire response.

Levels of Protection

Critical Management Option: Created to give the highest priority for suppression action on wildland fires that threaten human life and inhabited property.

Full Management Option: Protects cultural and historical sites, uninhabited private property, and high value resource areas.

Modified Management Option: Lands in Modified generally receive the same level of protection as those in the Full Management Option in the early fire season (evaluation date of July 10th). After the conversion date fires in Modified are evaluated and treated as Limited.

Limited Management Option: Limited Management Option lands are generally very remote, difficult to protect, have lower resource value, and as such receive limited fire suppression. Monitoring and individual site or “point” protection consistent with agency policy are typical strategies.

See Figure 54 Fire Management Options. Critical, Full, and Modified options are inputs to the Priority Landscape Area.

Acres Protected by Agency



Figure 38. Fire protection agencies.

BLM, Alaska Fire Service – Protects 194 million acres of state, federal and private land.

Alaska Division of Forestry - Protects 150 million acres of state, federal and private land.

USDA Forest Service – Protects 26 million acres of state, federal and private land.

Prior to development and acceptance of the AIWFMP, all fires were suppressed in Alaska, resulting in fuel build up and loss of biological diversity in many areas of the state, as in much of the western United States. Now, the AIWFMP restores Alaska’s fire-adapted ecosystems by designating lands in the Limited and Modified suppression options thereby enhancing multiple ecosystem values and services. The AIWFMP prioritizes response levels to wildland fire in Alaska by allowing some landscapes to burn while providing intensive response to fires in Critical and Full protection options. Still, the wildland fire problem continues to grow, properties continue to be lost, and challenges remain. Climate change is evident and recognized as an increasing problem in

Alaska. The trend in recent years has been toward longer fire seasons, bigger fires, and fires that are more resistant to control as a result of hotter, drier weather. In 2006, the Alaska State Legislature made an official change to the statutory start date of the legislated fire season, moving the start date from May 1st to April 1st, and in 2019 the fire season was extended to September 30. Six of the 10 largest fire seasons documented in Alaska since 1939 in terms of acreage burned have occurred in the past 20 years.

Wildland Urban Interface (WUI)

The increasing wildland urban interface continues to present challenges to suppressing and managing forest fire, especially considering the increasing length and severity of fire season. The wildland urban interface continues to increase as new homes and subdivisions are built to accommodate the needs of the increasing population of Alaskan communities. Responding to the rising numbers of urban interface wildland fires is one of the key issues facing the Division and its cooperators. In recent years, the Division has suppressed numerous serious urban interface wildland fires that directly threatened homes and communities. The 2019 fire season was the second-most destructive season in Alaska history. Of the 423 fires recorded in state protection areas, 251 were in the wildland urban interface areas of the state. The McKinley Fire destroyed 57 homes and 82 other structures along the Parks Highway near Willow. This was in the same vicinity as the 2015 Sockeye Fire, which destroyed 55 homes. On the Kenai Peninsula, the Swan Lake Fire congested traffic on the Sterling Highway for months, causing a significant loss of tourist and fishing revenues to communities south of the fire. In Fairbanks, the Shovel Creek Fire had numerous evacuations of nearby residences. Those fires were among a dozen fires that prompted evacuation alerts/orders in 2019 and posed “significant risk to constitute a major catastrophe” to life and property.



Figure 39. Smoke rises from the start of the M.L.K. Fire in Anchorage on July 2, 2019. ©2020 ADOF. Photo by Cindy Forrest-Elkins

About eighty percent of the population resides in communities at risk from wildland fire. The threat to these communities is increasing due to expanding suburban construction in or near forested areas and the spruce beetle outbreak that has caused over a million acres of spruce tree mortality in the Susitna and Kenai regions. Measures are needed to help reduce the risks to residents, communities, infrastructure, and other values at risk, including regional and local economic impacts during long duration incidents.

Wildland fire and spruce beetle outbreaks

The threat of a catastrophic wildland fire in Alaska is exacerbated not only by the continued human expansion into the forested lands of the state but by the buildup of beetle-killed timber. Past and current spruce beetle outbreaks have produced large stands of dead and down timber, particularly on the Kenai Peninsula and in the Matanuska-Susitna Valley, two of Alaska’s biggest wildland urban interface areas. The spruce beetle outbreak that affected the Kenai Peninsula and parts of the Copper River valley in the 1990s was the most extensive bark beetle outbreak documented in North America up to that time. Cooperative aerial surveys indicated that roughly 2.3 million acres had been impacted by the time that outbreak peaked in 1996 (Werner et al. 2006). At least 1.1 million acres have been impacted in the current spruce beetle outbreak, which was first detected in 2016 (see Spruce Beetle Outbreaks below for more detailed information).

The wildfire risk caused by past and current outbreaks will remain for decades and continue to be a critical wildland fire issue that has the potential to impact private land in the wildland urban interface with catastrophic wildland fire. In some locations, particularly on the southwestern portion of the Kenai Peninsula, grasses increase following spruce beetle mortality. Grasses are flashy fuels that dry quickly and can rapidly carry fire. Beetle-killed snags and fallen trees can make it harder for wildland

firefighters to fight fires due to the safety hazards and the increased resistance to control. The combination of fine fuels and sound, woody material can potentially produce intense fires. Because they are exposed to the wind and sunlight, standing dead spruce trees dry out quickly after wet periods. These standing dead trees can potentially torch and initiate spot fires even after the needles have been lost. If stands are open enough to allow winds to reach surface fuels, fires may spread more rapidly than in stands of live trees with a closed canopy. The present fuel conditions in spruce beetle-impacted stands of Southcentral may lead to severe and unpredictable fire behavior (Alaska Society of American Foresters 1997).

In addition to the heavy fuel loads, several other conditions in Southcentral contribute to a higher-than-normal fire hazard. Temperatures over the last several decades have been warming thereby resulting in a longer fire season. Also, the growing population in Southcentral is leading to increasing probabilities of human-caused ignitions.

Smoke

Smoke from wildland fires and poor air quality associated with it has become an increasingly difficult problem and a public health concern in Alaska. There is a trend in recent decades toward an increasing number of smoky days in Alaska’s Interior each season. When fires burn near communities, the smoke from these fires can become a health issue for those community residents.

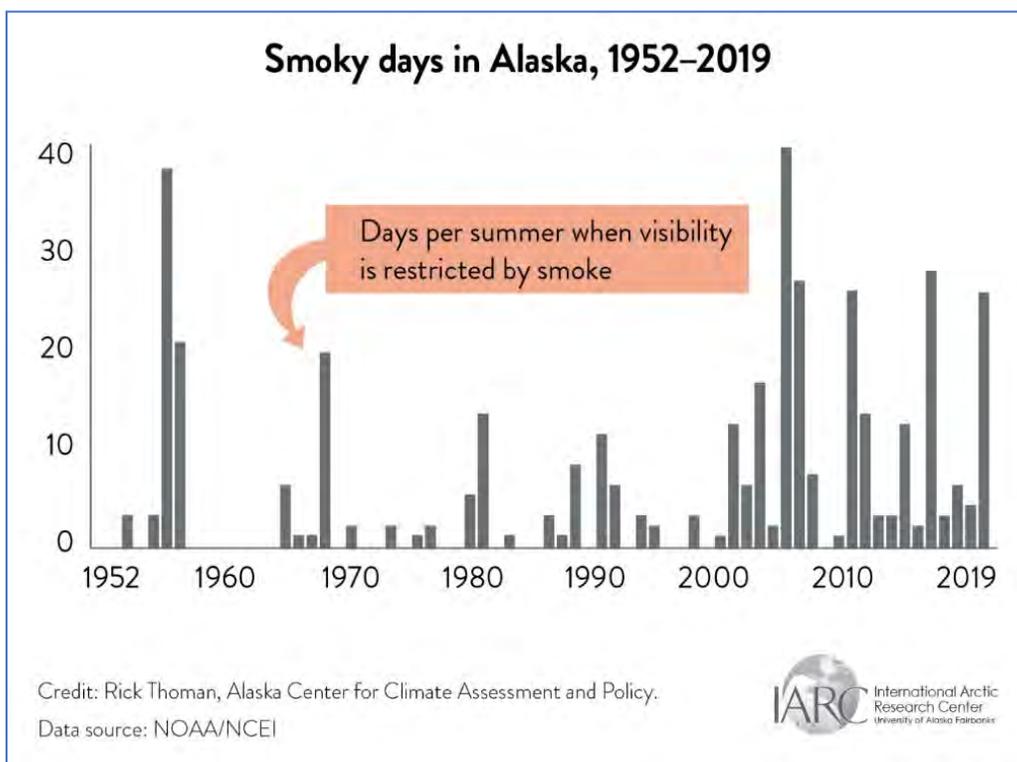


Figure 40. Smoky days in Alaska.

Administrative factors that compound the wildland fire threat

Increasing costs

Costs of fire management vary not only directly with the intensity and length of fire seasons. Fire management relies heavily upon the private sector during fire season, and private sector costs continue to escalate with liability, energy, and additional labor costs. Earlier and longer fire seasons mean that the baseline of historic expenditures is no longer indicative of the normal fire season with observed climate change.

High contractual costs contribute to the overall increasing cost of fire suppression. Alaska’s vast distances and lack of roads necessitates the use of air resources for wildland fire response. Air tankers, helicopters, lead planes, smokejumpers and reconnaissance aircraft are essential to the success of fire management programs. Initial attack and supporting remote fires in Critical, Full or Modified protection areas with supplies, crews and equipment can be logistically complicated and requires the use of aircraft and sometimes watercraft which contributes to the high cost of responding to these remote incidents.

Reconnaissance aircraft are needed for monitoring staffed fires and fires in the Limited management option zones. Cost increases due to market pressures on vendors, particularly those supplying contractual firefighting aircraft, are being manifested through much higher than anticipated bids on all aviation contracts. Availability of additional aircraft has been severely impacted by increased mining, oil, and gas exploration in the state. In addition, changes in the aviation industry caused by fuel, labor, and liability insurance have increased overall costs.



Figure 41. State General Fund and Federal expenditures for fire suppression by State fiscal year (July 1-June 30).

Decreased state and federal capacity

Both state and federal budgets have decreased. The Bureau of Land Management’s Alaska Fire Service, DOF’s primary cooperator, has experienced a significant reduction in their operational capability due to Federal budget reductions. While the Division of Forestry has relied on Federal cooperators for support in the past, there is now reduced ability to use Federal resources to augment State resources on wildland fires. In addition, US Forest Service State Fire Assistance (SFA) grants have long been a significant source for funding some of DOF’s key preparedness programs. Large fire costs experienced by the USFS in recent years have at times caused the re-direction of SFA funds to cover the expense of fire suppression on National Forest lands. In addition, both DOF and AFS rely heavily on Federal personnel and resources from the Lower 48 to assist when Alaska experiences a large fire season. In 2019, for example, Alaska imported more than 5,200 personnel – most of which were Federal resources - from the Lower 48 to assist with wildfire suppression. Typically, this isn’t a problem because Alaska’s fire season starts in April and is waning by mid-July, just about the time when fire season in the western U.S. begins to heat up. However, with longer fire seasons in Alaska and the Lower 48 also seeing a trend toward bigger, longer fire seasons, competition for resources and availability of out-of-state personnel in Alaska could be negatively impacted.

Non-Wildfire Response

Personnel with Incident Command System (ICS) training and experience are increasingly being used for all-risk incident response both in state and nationally. These responses range from hurricanes such as Katrina and Rita, to windstorms, floods, fuel spills, and earthquakes. The State of Alaska is increasingly relying on trained and experienced Alaska Division of Forestry personnel availability in disaster planning and all-risk incident management. The Alaska Division of Forestry has provided extensive logistical and warehouse support, supplies, and incident management teams to the Division of Homeland Security and Emergency Management. However, many of these personnel are not budgeted for the duration of the fire season in order to ensure their availability for the summer fire season. The increased all-risk workload falls to fire managers who have full-time fire management responsibilities; however, it serves to assist in retaining seasonal employees by increasing work opportunities.

Forest insects, disease, and abiotic stressors

Coastal forest

The temperate rainforests of Southcentral and Southeast Alaska experience periodic disturbance from several forest damage agents. Spruce beetle (*Dendroctonus rufipennis*) is the primary tree-killing bark beetle species in these forests with numerous species of bark and woodboring beetles having secondary effects. Yellow-cedar decline, linked directly to root freeze injury resulting from decreased snowpack in the warming climate, has been ongoing in Southeast coastal forests for many years. This decline had been thought to be confined to old growth yellow-cedar, but more recent efforts have documented this damaging decline affecting young growth yellow-cedar (trees around 25-40 years old) in some stands on Zarembo, Kupreanof, Wrangell, Mitkof, and Prince of Wales Islands as well (USFS 2015, USFS 2019). Periodic outbreaks of defoliating insects occur in these forests as well, with hemlock sawflies currently outbreaking across much of Southeast; the sawfly population declined in 2020 but the impacts of the outbreak may not be apparent immediately. Drought conditions across Southeast are thought to have exacerbated the outbreak by limiting entomopathogenic fungi that generally keep sawfly populations in check. Hemlock dwarf mistletoe causes growth loss, top kill, and mortality in Southeast and contributes to canopy wildlife habitat. Dothistroma needle blight (*Dothistroma septosporum*) affects shore pine in Southeast, occasionally reaching outbreak status, which can result in tree mortality. Spruce aphid and black-headed budworm also cause growth loss but usually not tree mortality in these forests. Other common disturbances in these forests include strong winds, flooding, avalanches, ice and snow events, and other associated factors, some of which may predispose stands to forest pest outbreaks. Many other foliar, stem, and root diseases cause volume loss, cause wood defects, and contribute to mortality in all tree species throughout the temperate rainforest.

Boreal forest



Figure 42. Extensive birch leafminer damage (brown leaves) visible across the lower Matanuska-Susitna Valley in 2019. This damage occurs late in the growing season and is primarily an aesthetic issue. ©2020 ADOF. Photo by Jason Moan

Like the temperate rainforest, the boreal forest experiences periodic disturbance from several forest damage agents. Spruce beetle (*Dendroctonus rufipennis*) and the northern spruce engraver (*Ips perturbatus*) are the primary tree-killing bark beetle species in the boreal forest of Alaska, with numerous species of bark and woodboring beetles having secondary effects. Spruce beetle has historically been much more damaging in Southcentral and some parts of Western Alaska than in the Interior,

however, where damage from the northern spruce engraver beetle (*Ips perturbatus*) has typically been more prominent. Defoliating insects including aspen leafminer and willow leafblotch miner are widespread in the Interior. Aspen leafminer also occurs in the Copper River valley and is scattered elsewhere. Parts of the Copper River valley and much of Interior have been experiencing an aspen leafminer outbreak for much of the last decade. Aspen trees are typically able to withstand the leafminer activity. Additionally, invasive birch leafminers have been causing extensive late-season defoliation in birch trees across the major population centers and road system in Southcentral and Interior. Periodic instances of outbreaks of other forest insects and of forest pathogens also occur in the boreal forest. Recently, large-spored spruce-Labrador tea rust (*Chrysomyxa ledicola*) was observed in outbreak across a large area in Southwest and was also commonly scattered elsewhere in both the boreal forest and the temperate rainforest. Spruce needle rust does not commonly result in mortality. A recently discovered disease, called aspen running canker, has been documented killing quaking aspen throughout much of Interior, Southcentral, and the Copper River valley forests. USDA Forest Service Forest Health Protection (FHP) first detected the canker around 2014 near Tok and have been the primary agency investigating the pathogen. Based on the widespread distribution of running aspen canker in the state, it is presumed native. Many other foliar, stem, and root diseases cause volume loss, cause wood defects, and contribute to mortality in all tree species throughout the boreal forest, as do abiotic stressors such as wind and flooding.

Statewide forest health conditions

The 2019 forest health conditions are discussed below. Additionally, Table 6 shows relative amounts of damage types documented over the last 5 years during the annual aerial detection surveys. Table 6 and the associated caption are excerpted from the cooperative report “Forest Health Conditions in Alaska 2019” which was published in early 2020.

Table 6. Mapped affected area (in thousands of acres) from 2015 to 2019 from aerial survey. Note that the same stand can have an active infestation for several years. *not documented in previous reports.

Damage Type	2015	2016	2017	2018	2019
Abiotic damage	11	3.3	5.6	5.0	10.8
Alder defoliation	26	2.9	3.4	0.9	2.6
Alder dieback	12	8.4	1.0	3.2	1.2
Aspen defoliation	118	229.3	168.5	259.7	132.4
Aspen mortality	0.0	0.0	0.0	5.7	0.1
Birch defoliation	42	85.5	7.2	132.8	283.4
Cottonwood defoliation	9.2	2.3	1.0	3.6	1.7
Fir mortality	0.02	0.03	0.04	0.1	0.1
Hardwood defoliation	190	161.9	38.7	15	3.9
Hemlock defoliation	0.1	0.0	0.0	48.6	381
Hemlock mortality	0.5	0.0	2.7	0.1	0.0
Larch mortality	*	*	*	0.01	0.0
Porcupine damage	1	3.5	1.5	2.5	1.9
Shore pine damage	3.4	4.9	0.3	3.7	0.4
Spruce damage	8.8	36.2	36.1	2.5	117.8
Spruce mortality	42.3	204.5	411.4	594.3	140.6
Spruce/hemlock defoliation	3.1	3.1	1.1	4.2	0.0
Willow defoliation	67	156.3	113.2	39.9	32.7
Willow dieback	1.2	2.8	1.0	0.0	0.6
Yellow-cedar decline	39	39.3	47.4	17.7	20.0
Other damage	*	*	*	0.7	9.5
Total damage acres	574.6	949.8	840.3	1139.9	1140.8
Total acres surveyed	32,938	26,876	27,540	27,954	24,421
Percent of acres surveyed showing damage	1.70%	3.50%	3.05%	4.08%	4.67%

Spruce Beetle

The spruce beetle is an important driver of natural disturbance to renew forests, but large spruce beetle outbreaks have historically also been the most significant threat to human uses of Alaska's forests from forest insects or disease. When outbreaks occur, large areas of beetle-killed trees in the wildland urban interface create wildland fire risks for communities as well as falling hazards. Large outbreaks create a vastly greater supply of wood than can be used before the wood decays. With few markets for the beetle-killed wood, vast areas of standing and downed dead trees result in a greatly changed aesthetic and leave the forests in varying levels of successional change.

In 2019, Southcentral was estimated to be in the fourth year of a spruce beetle outbreak, causing mortality of much of the mature white spruce in the region. The outbreak has affected more than 1.1 million cumulative acres of mixed spruce and birch forests since 2015. Spruce beetle activity was observed on about 139,500 acres in 2019, a 76.4% decrease from that observed in 2018 (590,000 acres). However, the outbreak continued to expand outward from its previous extent. As the outbreak has progressed and the most severely affected areas approach near exhaustion of susceptible white spruce, beetle attacks have shifted more heavily into black spruce. In the Matanuska-Susitna Borough, the most heavily affected area in the current outbreak, spruce beetle activity was documented within roughly 20,000 acres of black spruce forests in 2019. The outbreak and the resulting landscape of dead trees is having far reaching impacts in the state, affecting infrastructure, public safety, tourism, recreation, and other sectors.

Between 2010 and 2015, spruce beetle activity in the state was near historical lows, as documented during the annual cooperative aerial detection surveys. The current outbreak was first detected in 2016, with the affected trees presumed to have initially been attacked in 2015. Spruce beetle outbreaks often result when suitable environmental conditions and susceptible hosts occur in conjunction with a large-scale disturbance. Any large-scale disturbance that may have been associated with the beginning of the current outbreak has not been identified.

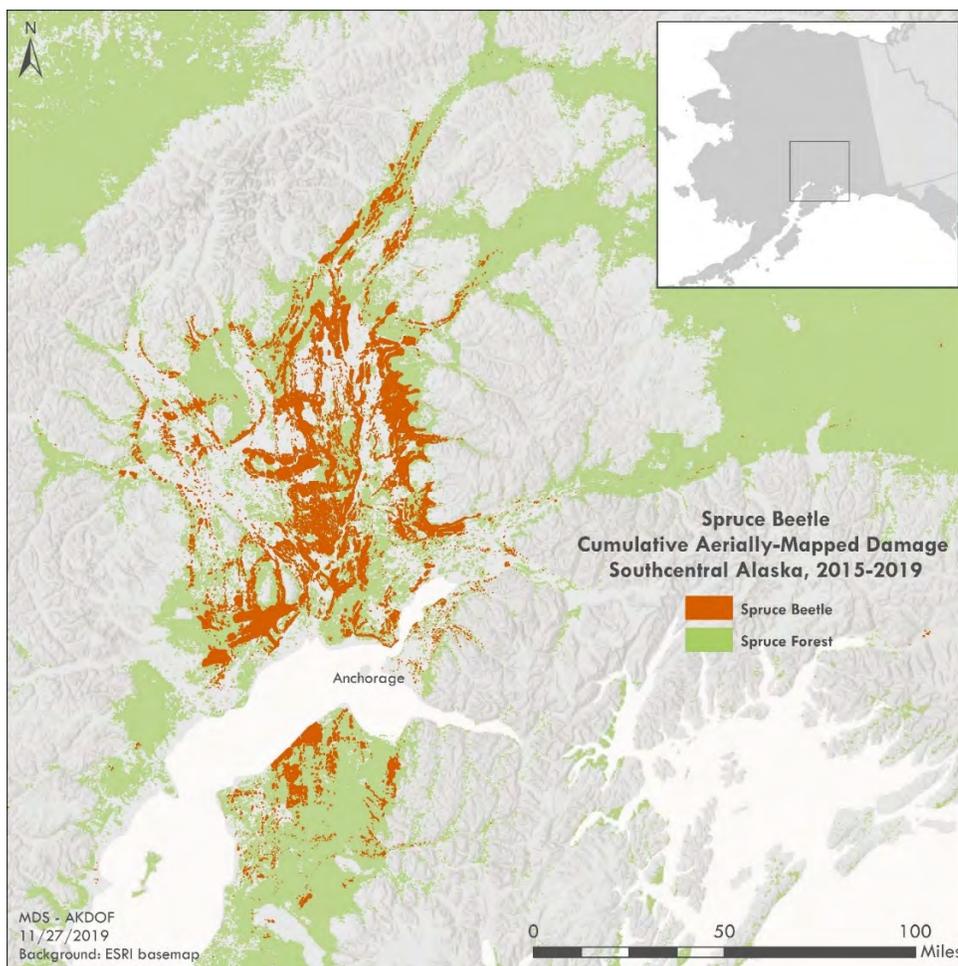


Figure 43. Spruce beetle cumulative aerielly-mapped damage, Southcentral Alaska, 2015-2019.

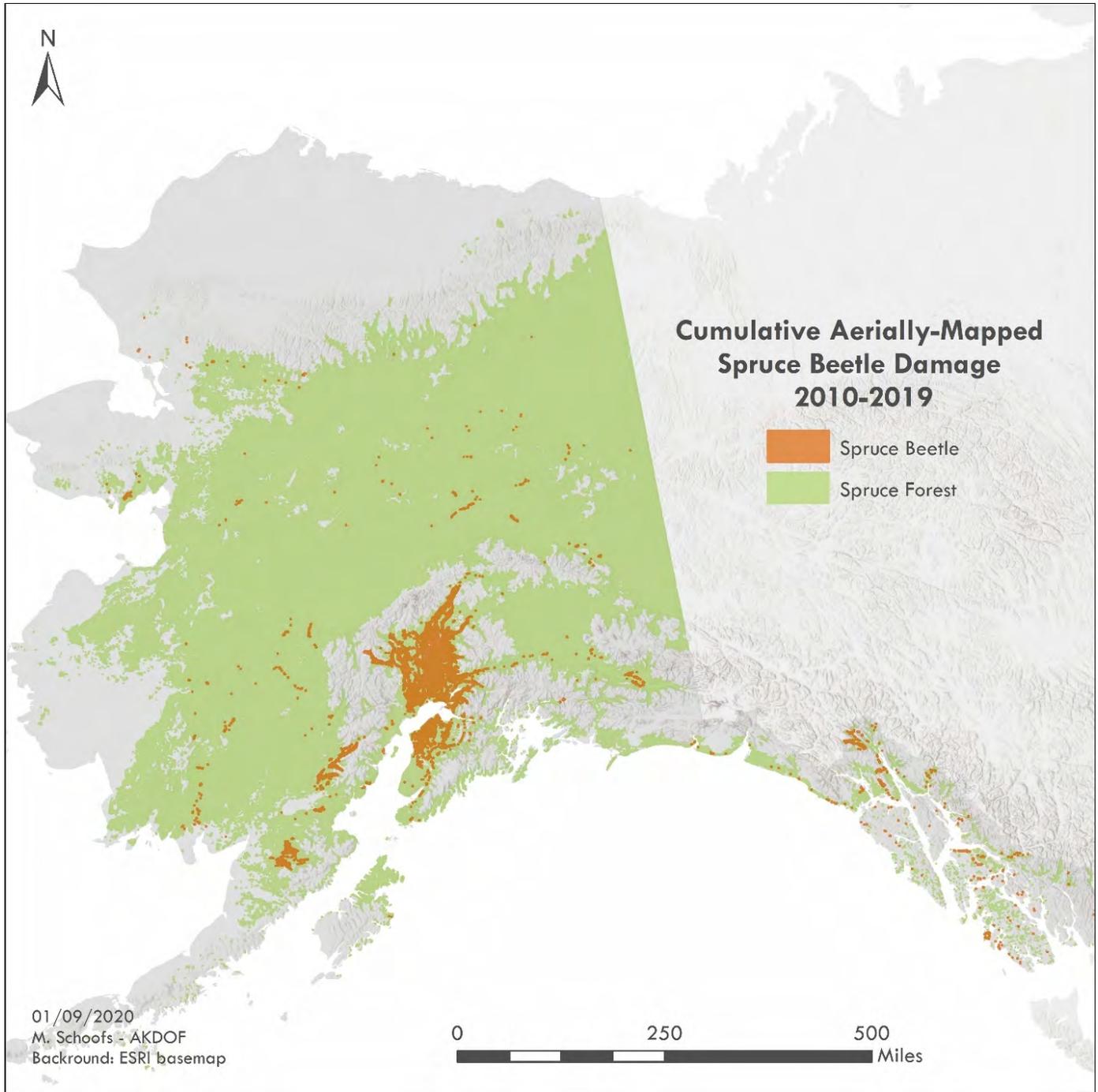


Figure 44. Cumulative aerially-mapped spruce beetle damage, 2010-2019.

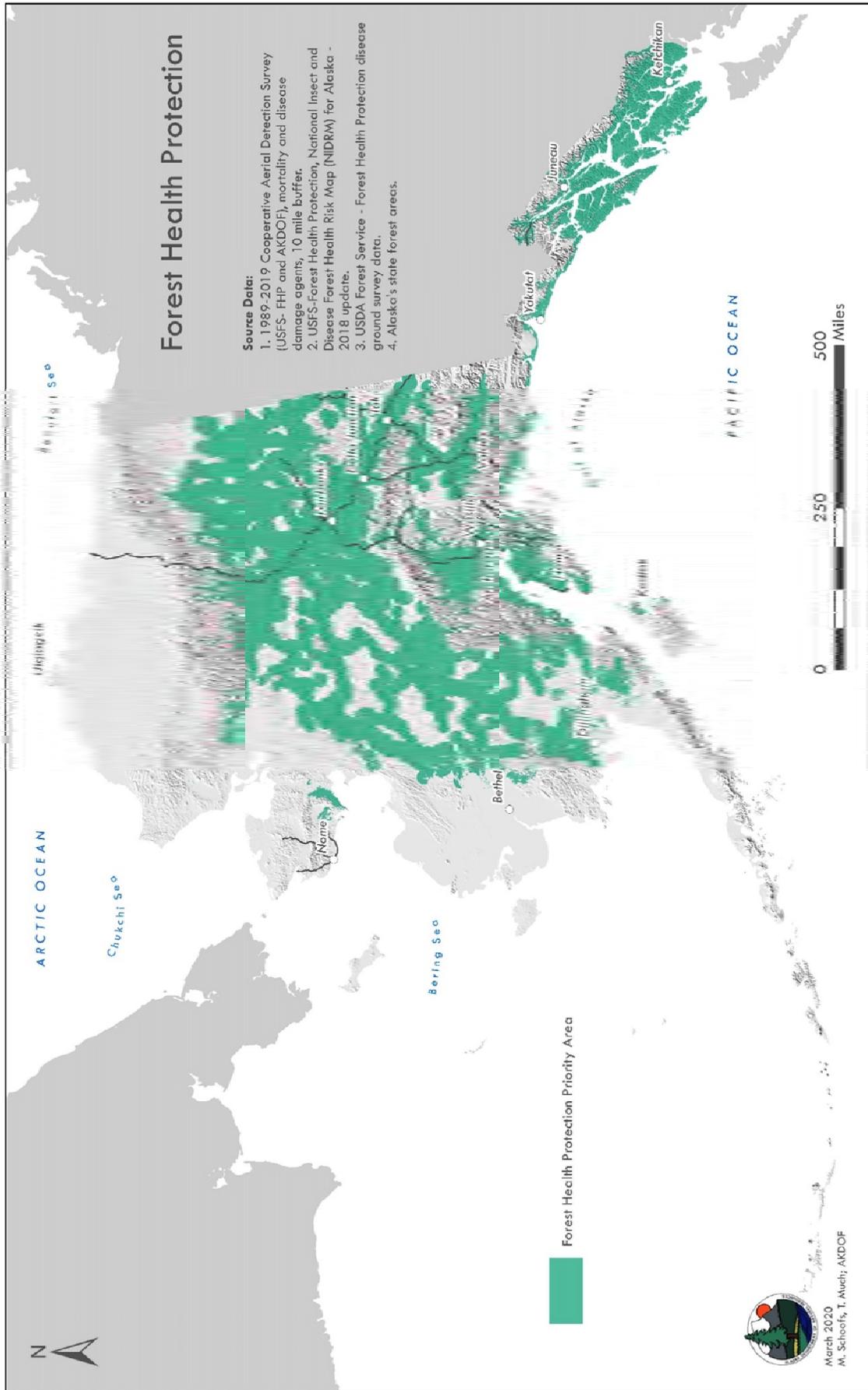


Figure 45. Forest Health Protection Priority Area. This GIS data layer was created for consideration as part of the Priority Landscape Area and may be useful when considering future forest health-related projects.

Reduced forestry infrastructure

A threat to forest management in Alaska is reduced forestry infrastructure and capacity. On a statewide level, mills are operating far under capacity. However, due to Alaska's high transportation costs, timber is processed within the region where it is harvested. Southeast has high mill capacity but low supply while Southcentral and the Interior have low mill capacity but episodic large volumes of timber available due to wildland fire and spruce beetle outbreaks. Without well-distributed mills and other forest processing infrastructure throughout the forested regions of the state, it is not possible to economically manage forests for fuel treatments, timber stand improvement, wildlife habitat, or salvage after fire or forest insect or disease outbreaks. Low forest products prices and high transportation costs may not make these management activities economically viable even with sufficient mill capacity, but there is social value in putting forest resources to local use rather than leaving large quantities of dead trees where they increase wildland urban interface fire risk and falling hazards.

Reduced workforce capacity is also a serious forestry infrastructure issue, from a lack of agency capacity to prepare timber sales, to a lack of experienced operators and laborers. Much of the forest products industry in Alaska is reliant on dependable state timber sales to keep operating, so the decrease in the number of state timber sales due to reduction of Alaska Division of Forestry staff capacity has a cascading effect.

Climate change

Climate change has already altered the structure and function of Alaska's boreal and coastal forests, and greater alterations are projected (Wolken et al. 2011). Dramatic examples of the changes are yellow-cedar decline in the coastal forests of Southeast, woody vegetation expanding into wetlands in the boreal forest mosaic, and the increase in the frequency of large fire years in the boreal forest. Climate drivers interact with biophysical factors in complex feedback loops to create changes in the forest environment, succession, and biota. Climate change is a crossover threat from the State Wildlife Action Plan. Climate change affects ecosystem services and the benefits of trees and forests to communities. For this reason, the Municipality of Anchorage developed the Anchorage Climate Action Plan (MOA 2019), which specifically addresses threats in the context of community forestry and the wildland urban interface in Alaska's largest city. Numerous Alaska Native communities have undertaken climate adaptation planning through Bureau of Indian Affairs Tribal Resilience Program funding.

In the boreal forest, the main climate drivers are surface air temperature and precipitation, which interact with biophysical factors including wildland fire, permafrost thaw, snow and ice, insects and disease, and invasive species (Wolken et al. 2011). Climate change can dramatically change the structure and distribution of permafrost, which in turn can change surface hydrology. Depending on slope, soil permeability, and geologic substrates, this change can create more wetlands and thaw lakes or improve surface drainage. Overall, however, climate change is expected to result in drying in the boreal region. Because of increases in fire frequency, the area of late successional boreal forest landcover is expected to decrease, while the area in early successional hardwood forest is expected to increase (Rupp et al. 2016). Decreased spruce growth is also expected. In some areas boreal forest could shift to grassland or shrubland. Shrubification of tundra is occurring across the Arctic, including in Alaska.

The climate drivers in the coastal forest include surface air temperature and precipitation as well as wind and cloud cover, which in turn interact with biophysical factors including snow and ice, invasive species, and insects and disease (Wolken et al. 2011). Complex negative and positive feedback loops between these climate drivers influence how climate change impacts the forest environment, biota, and succession. Melting glaciers are expected to cause hydrologic changes which will affect the composition and soil nutrient cycling of coastal forests. Forest composition change is already evident with yellow-cedar decline (Hennon et al. 2016).

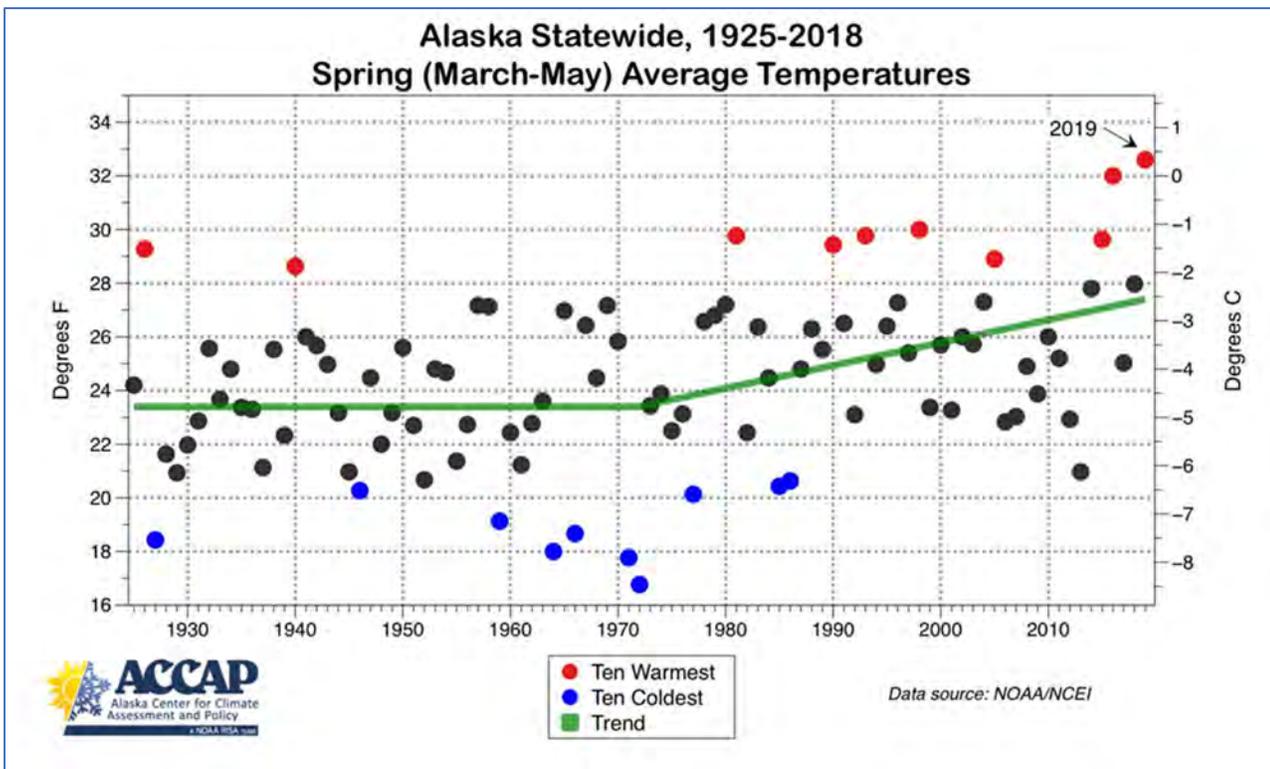


Figure 46. Alaska statewide, 1925-2018 Spring (March-May) Average Temperatures.

Climate change and wildland fire

Climate change is influencing the length of the wildland fire season in Alaska. Fire activity tends to begin earlier, more often trends to warmer, drier summers, and has increased activity into the fall beyond historical norms. Along with an earlier, longer fire season, an increase in lightning in portions of the state, all-risk incidents, and increased urban interface, wildland fire has occurred with the growth in population. There has been a trend towards larger fires impacting towns and communities with smoke. This has brought some temporary interruptions in tourism and increased health concerns. A longer growing season could improve forestry yields but warmer temperatures and increased summer drying will increase flammable vegetation, thus increasing the potential for more wildland fires. The lengthening fire season and increased fire activity requires the constant rotation of firefighting personnel, including incident management teams and suppression crews.

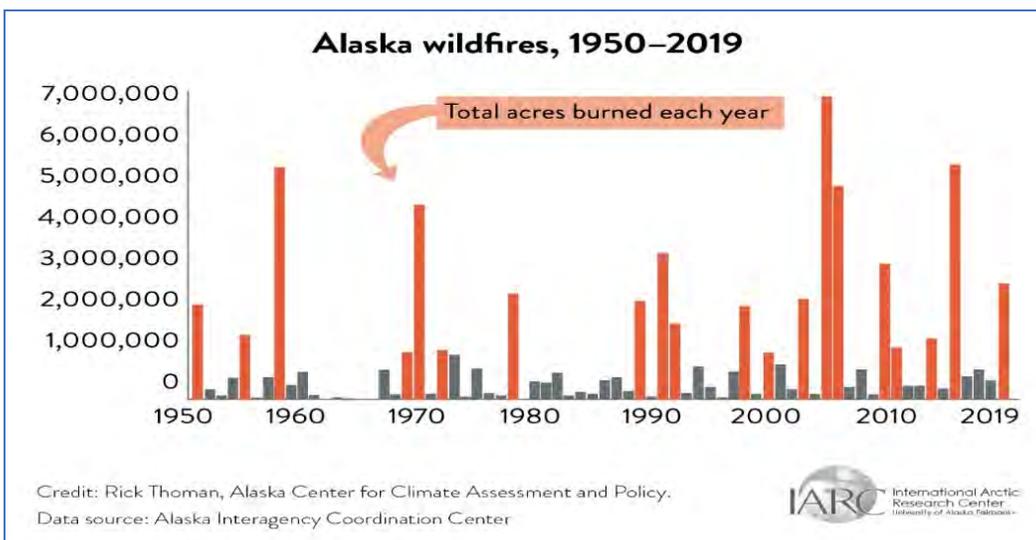


Figure 47. Alaska wildfires, 1950-2019.

Climate change and forest health

Alaska's rapidly changing climate has been well-documented (Stafford et al 2000, Wendler et al 2017) and has the potential to substantially affect forest health. A warming climate may carry with it a suite of cascading effects on the boreal forests of North America (Euskirchen et al 2009).

Coniferous forest types may shift, , and with that, a shift in associated forest pests may occur (Bentz et al 2010). In addition, forest insect outbreaks are expected to increase in frequency and intensity as temperatures increase (Wolken et al. 2011).

Some of these changes are already being observed in Alaska. Yellow-cedar decline has long impacted the yellow-cedar stands of Southeast Alaska and is directly connected to decreased early spring snowpack, which allows uninsulated fine roots to freeze, ultimately killing the tree. Previously, this decline was thought to affect only mature yellow-cedar, but more recently, yellow-cedar decline has been documented affecting young-growth stands of yellow-cedar in Southeast Alaska (USFS 2015).



Figure 48. Stand suffering intense mortality of yellow-cedar on western Chichagof Island. USDA Forest Service

Bark beetle populations can also be influenced by climate (Bentz et al 2010). In Alaska, studies have shown that increased temperatures can decrease the time it takes for spruce beetles to complete their lifecycles, which can lead to rapid population increases (Werner & Holsten 1985, Hansen et al. 2001) and consecutive warm summers can lead to intense spruce beetle outbreaks (Berg et al 2006). Within the spruce beetle outbreak that has been occurring in Southcentral since at least 2016, field observations have confirmed the presence of a mix of the typical semivoltine (2-year) and the more rapid univoltine (1-year) spruce beetle life cycle. This mix of life cycle timing may be partly to blame for the rate of beetle population buildup in the outbreak area. Another example is the association between drought years in Southeast and hemlock sawfly.

The changing climate may also result in increased stress on the native trees, leading to higher susceptibility to insect attacks (Vose et al 2018) and increased geographic suitability for invasive threats (Lipton et al. 2018).

Climate change and invasive species

Climate change creates conditions that are more hospitable to some non-native plants and forest insects and causes land disturbance that provides for easier establishment of invasive plants (Wolken et al. 2011). In the Interior, several invasive plant species are known to invade newly burned areas, which means the projected increase in area burned and severity of wildfire in the boreal forest may increase the spread of invasive species over wider areas.

Climate change and fish and wildlife habitat

Climate change is a crossover threat with the State Wildlife Action Plan. According to the State Wildlife Action Plan, of particular concern is that climate-induced vegetation change may cause the boreal forest to expand into tundra on the northern edge, while being replaced by grasslands at the southern edge. The State Wildlife Action Plan identifies climate change as the most impactful threat to wildlife, especially at the northern edge of the continent where niches are not just shifting, they are disappearing.

Climate change and forest management

Increased temperatures may increase tree growth in the coastal forest, however, growth in the boreal forest is likely to decrease. Additionally, the projected reduction in white spruce forest and increase in hardwood forest represents a shift to less valuable species (Beck et al. 2011, Hansen et al. 2020). Climate change threatens forest management logistics in the boreal forest where winter roads and frozen soils provide important access to forest resources that would otherwise be inaccessible due to wet soils. Winter roads are becoming less reliable as the climate warms and cold weather becomes less consistent. Shorter winter harvest seasons and loss of access would lead to less area available for harvest. Wood energy operations in remote Alaska could be especially negatively impacted because transport of woody biomass to communities is dependent on frozen rivers which are used as highways.

Climate change does create potential opportunities for forest management. The use of the carbon credits market, which was created to incentivize reduction in the greenhouse gases linked to climate change, may provide economic benefit to landowners and long-term carbon loss mitigation. Changes in climate may also provide opportunities for migration-expansion of forest cover types being stressed or lost in other areas, such as yellow-cedar. Expansion of dry continental tree species, such as lodgepole pine, would be expected both naturally and under forest management. Ecological niches for displaced flora and fauna may develop naturally or through assisted migration.



Figure 49. Winter road construction problems on a Tanana River slough. ©2020 ADOF. Photo by Derek Nellis

Invasive species

Invasive species are non-native species that aggressively compete with native species and spread beyond control to affect natural resources. Despite Alaska's relative geographic isolation, limited road system, and cold winter temperatures, the state is not impervious to invasive species introductions, establishment, and spread. The limited tree diversity in Alaska means that the consequences could be devastating were a tree-killing invasive species that targets a specific tree species or genera to establish and spread in the state. The content contained herein addresses the primary terrestrial invasive taxa of concern in our forests. While of concern in the state, invasive aquatic plants, animals including mollusks, and other taxa are not included here. Invasive species are a crossover threat from the State Wildlife Action Plan, which addresses invasive animals as well as invasive aquatic plants. Changes to forest ecosystems as a result of invasive forest insects and diseases or invasive plants can negatively impact habitat for native fish and wildlife populations.

With an extensive transportation network, robust tourism industry, seasonal fluctuations of people transiting in and out of the state for work, and most commodities having to be shipped into Alaska, there are myriad pathways of introduction for invasive species into the state and a variety of ways that invasive species are spread around the state once established. Alaska also often serves as a stopover or the destination on international air and shipping routes. Invasive species have the potential to enter the state via human-mediated pathways such as boat, plane, car or truck, as well as natural pathways such as waterways, wind, and on animals. Additionally, some invasive taxa are themselves mobile. Invasive species can be associated with personal

belongings, nursery stock, firewood, wood packing material, and other products. Once established in Alaska, spread within the state may vary depending on the species involved, host distribution, climatic requirements, and other factors.

Within the forest insect realm, the invasive balsam woolly adelgid (BWA) was first detected in Alaska in 2019 in Juneau. This pest of true firs has been devastating to susceptible hosts in other parts of the country where it is established. Since its detection in Alaska, state and federal partners have coordinated delimiting surveys, public outreach, and have secured funding to cost-share treatments for affected trees.

While the BWA was a recent detection in the state, Alaska's forest managers have long contended with invasive forest insects. Notably in Southeast, the non-native spruce aphid (*Elatobium abietinum*) was first detected in 1927. Confined to Southeast for decades, this insect now occurs in coastal areas throughout the range of Sitka spruce in the state, as far north as Prince William Sound and the southwestern Kenai Peninsula. Spruce aphid populations are directly connected to temperature, favoring mild winters which build up populations.

Alaska is also home to several invasive sawflies, nearly all of which have at some time been implicated as the cause of extensive defoliation events and, in the case of the larch sawfly (*Pristiphora erichsonii*), of causing extensive tree mortality after several successive years of outbreak. Other invasive sawflies damaging Alaska's forests in recent years are green alder sawfly (*Monsoma pulveratum*), amber-marked birch leafminer (*Profenusa thomsoni*), and late birch leaf edgeminer (*Heterarthrus nemoratus*).

Alaska's forests are likewise at risk of invasive forest pathogens. In most cases, forest pathogens are not easily detected during annual aerial surveys. As such, ground surveys are the primary method through which forest pathogens are detected or monitored. To date, most invasive tree pathogens that have been confirmed in Alaska have been of low to very low concern in the forest and are primarily of concern for ornamental or non-native trees. Those invasive forest pathogens currently of highest concern are the European spruce needle rust (*Chrysomyxa abietis*), sudden oak death (*Phytophthora ramorum*), and Mal del Ciprés (*Phytophthora austrocedrae*).

Invasive plants can outcompete native plants through growth and reproductive characteristics; capable of rapid growth, early maturity, vegetative reproduction, production of prolific and long-lasting seed. Spread is also accelerated by the lack of natural competitors and controls. Numerous invasive plants are established in Alaska. The known ranges of such in Alaska and adjacent Canadian provinces are available online through the cooperative Alaska Exotic Plants Information Clearinghouse, which is hosted by the Alaska Center for Conservation Science at the University of Alaska Anchorage. Included among those invasive plants present in the state that impact or have the potential to impact forest ecosystems are bird vetch (*Vicia cracca*), multiple species of hawkweeds (*Hieracium* spp.) and knotweeds (*Fallopia* spp, *Persicaria wallichii*), reed canarygrass (*Phalaris arundinacea*), and European bird cherry and chokecherry (*Prunus padus*; *Prunus virginiana*). The latter two, European bird cherry and chokecherry, have been popular ornamental trees and are aggressive colonizers of riparian forests, displacing native willows and other riparian vegetation. Both bird vetch and reed canarygrass can impact forest regeneration success, potentially inhibiting tree seedling establishment or survival. Eradication and/or control efforts have been underway in response to invasive plant infestations in a number of communities and by a number of agencies and individuals around the state.

Alaska's changing climate has the potential to impact the invasive species currently established in the state, some positively and some negatively. Likewise, changes in temperatures and precipitation type or timing may also increase the relative suitability of our forests to invaders for which the current climate is a barrier to establishment.



Figure 50. Balsam woolly adelgids on subalpine fir in Juneau. USDA Forest Service/State and Private Forestry/Forest Health Protection

Forest conversion and fragmentation

Forest conversion and fragmentation in Alaska is largely a result of population growth and expanding residential areas and recreational cabins. There are several aspects of this threat: loss of working forests, loss of important forest areas, fragmentation of wildlife habitat, increased risk of introducing invasive species, a decrease in ecosystem services from forests, and expansion of the wildland urban interface which exposes more people to wildland fire risk. As the wildland urban interface encroaches into previously undeveloped forest, fire management of the surrounding forest may shift towards more suppression, altering the fire regime and impacting ecosystem services. In the Matanuska-Susitna Borough, forest conversion is occurring at such a rate that land clearing largely meets the demand for forest products and fuelwood, minimizing the demand for managed timber sales. Social buy-in for working forests is also affected by forest conversion. As more people move into areas near working forests, there may be more opposition to forestry operation.

Statewide, forest conversion and fragmentation are mitigated by the large amount of land in various protected statuses. State and federal conservation units cover 37% of the area of the boreal forest region and preclude forest conversion and fragmentation (ADF&G 2015). The Tongass and Chugach National Forests cover 95% of the coastal forest region; 3% of the Tongass is available for timber production.

State Land Disposal Program

The Alaska Constitution, State laws, and the Alaska Legislature all direct the Department of Natural Resources (DNR) to sell state land for settlement and private ownership. This program enlarges the wildland urban interface and presents a challenge for fire managers. Thousands of acres of state land have been sold, primarily in remote areas. Alaskans are building recreational cabins as well as primary homes in these areas. Historically, these areas were often poorly situated (i.e. on a ridge top) with limited or no ingress and egress and surrounded by volatile fuels. Today the Division of Forestry reviews land sale proposals and works with the DNR Land Sales program to design developments to avoid problematic locations; the Land Sales program has suspended some projects due to high fire risk. Where feasible the Land Sales program tries to brush the rights-of-way in rural areas to improve access and create fire breaks. Although physical conditions and platting requirements are a constraint, state land sales are designed with multiple points of ingress and egress where possible.

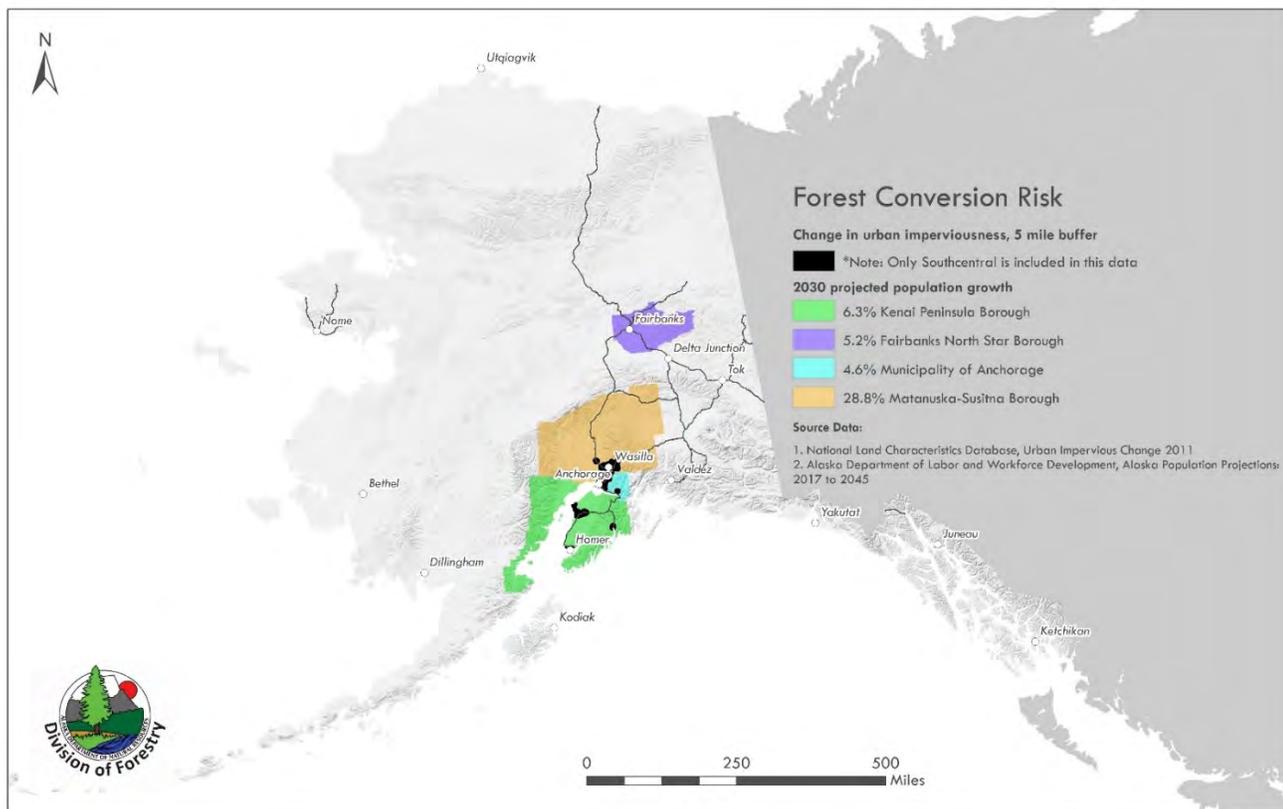


Figure 51. Forest Conversion Risk based on projected population growth and change in urban imperviousness. These GIS data layers were created for consideration in the Priority Landscape Area.

Priority Landscape Area

While all of Alaska’s forest provides benefits for wildlife, fish, and people, in order to focus limited funding resources, a Priority Landscape Area has been identified as providing the most opportunities to maximize the benefits of forests and combat the threats facing forests.

The following benefits and threats are reflected in the inputs to the Priority Landscape Area.

Primary Benefits

Forest products and timber management opportunities
Non-timber forest products

Primary Threats

Wildland fire
Reduced forestry infrastructure

Ideally, each forest threat and benefit identified in the Alaska Forest Action Plan would be analyzed to inform the Priority Landscape Area. However, the reality in Alaska is that statewide-scale geospatial data of sufficient detail to meaningfully inform the Priority Landscape Area is limited. Also, there is limited practical utility in prioritizing areas geographically for some forest threats and benefits. For example, addressing a newly identified, highly damaging invasive species would be prioritized regardless of its location. Finally, geographic prioritization of some forest threats and benefits could create social equity issues. Therefore, each forest threat and benefit was considered in the context of the availability of relevant statewide geospatial data, and the significance of the available geospatial data to implementing the strategies. GIS overlay analysis was used to determine the Priority Landscape Area using the selected GIS layers.

As in 2010, the Priority Landscape Area largely reflects the Fire Management Options from the Alaska Interagency Wildland Fire Management Plan. Wildland fire was by far the number one issue identified by both stakeholders and Alaska Division of Forestry staff in developing the 2020 Alaska Forest Action Plan. However, the use of this layer goes beyond fire management. The members of the Alaska Wildland Fire Coordinating Group represent federal, state, and Alaska Native land management agencies and structural fire fighters. They work together to assign Fire Management Options according to factors including values-at-risk, ecological considerations, and suppression costs—all factors which are directly or indirectly tied to the benefits, threats, and strategies of the Alaska Forest Action Plan. The Priority Landscape Area additionally includes private forest lands, the vast majority of which are Alaska Native corporation lands. Alaska Native corporations are active and important partners in the Division of Forestry cooperative programs. Lastly, the Priority Landscape Area includes State Forests and Forest classified State lands, which are important working forests. The Priority Landscape Area is limited to the forested areas of the state. Given the statewide scale of the Priority Landscape Area, the forested ecoregions (Nowacki et al. 2001) were used to filter forested versus non-forested areas. The Priority Landscape Area reflects the areas of the state with the most need for implementation of strategies to conserve working forests, protect forest from threats, and enhance public benefits from trees and forests.

The Priority Landscape Area is intended to be considered as a factor when determining where to focus projects and funding. However, geospatial information on a finer scale and more specific to the purpose at hand should also be considered. Maps included in the Forest Resource Assessment are a helpful starting point in exploring additional data that may be useful to consider when implementing the Plan.

GIS methodology

The methodology follows the 2010 Priority Landscape Area methodology of an unweighted GIS overlay analysis with union of the input layers. Layer sources are indicated on the following maps.

Input layers

The layers that were selected as inputs to the Priority Landscape Area are:

1. Fire Management Options

Threat: Wildland fire.

This layer includes the Critical, Full, and Modified options according to the Alaska Interagency Wildland Fire Management Plan.

This layer was clipped to the forested Unified Ecoregions layer (Nowacki et al. 2001).

2. Forest Stewardship Lands

Benefits: Forest products and timber management opportunities, Non-timber forest products.

Threat: Reduced forestry infrastructure.

This layer includes the private lands eligible for Forest Stewardship assistance based on BLM Alaska Fire Jurisdictions 2019 land ownership data, including lands owned by Alaska Native corporations, Alaska Mental Health Trust Authority, and University of Alaska.

Parcels which intersected the forested Unified Ecoregions were included in this layer (Nowacki et al. 2001).

3. State Forest Land and State of Alaska Forest Classified Land

Benefits: Forest products and timber management opportunities, Non-timber forest products.

Threat: Reduced forestry infrastructure

This layer includes State Forest lands and Forest classified State land.

Layers considered but rejected

The layers that were considered but rejected are:

1. Forest Health Protection

This layer was based on 1989-2019 Cooperative Aerial Detection Survey mortality and disease agents with a 10-mile buffer, the National Insect and Disease Forest Health Risk Map for Alaska—2018 update, Forest Health Protection ground survey data, and Alaska State Forests. This layer was rejected because although forest insects and disease were identified as major threats to forest resources, this layer was too geographically broad. This layer could have been narrowed to reflect the areas most important for economic/community purposes; however, this would largely duplicate the Fire Management Options layer.

2. Forest Conversion Risk

The data used for this layer were National Land Characteristics Database change in urban imperviousness, 5-mile buffer; and 2030 projected population growth by borough. This layer was rejected because forest conversion was the lowest ranked issue by both stakeholders and Alaska Division of Forestry staff. Additionally, the data that the change in urban imperviousness layer is based on is limited to Southcentral Alaska. The most relevant current use for this layer would be community forestry projects, but geographic location was determined to be an undesirable filter for community forestry implementation, which seeks to provide opportunities to any community statewide.

3. Watershed benefits

The data used for this layer were Alaska Department of Environmental Conservation Drinking Water Protection Area data. However, most of these areas are too small to be useful at the scale of a statewide map. This layer would be useful when considering project locations within a specific region.

4. Forest products and timber management opportunities

The data used for this layer were Alaska State Forests, operating biomass systems, and sawmills. However, the data in this layer was out-of-date and current information was unavailable. Also, it was not feasible to determine a meaningful buffer distance given the widely varying mill capacities and transportation networks. The need for more informative geospatial data for Alaska's forest products opportunities statewide is evident, and as such information is developed and improved, it should be considered in future updates to the Priority Landscape Area.

Future refinement

The geospatial layers which were considered but rejected for the purposes of the Priority Landscape Area would be helpful in strategically implementing projects for certain purposes and/or at certain scales. Creating a mapping application to consider these additional layers would be helpful and relates to several forest resources strategies in this Plan.

Multi-state areas that are a regional priority

While Canadian lands are outside the scope of the Priority Landscape Area, cross-boundary areas are important for wood energy opportunities, forest health, and wildland fire management. Alaska and the Yukon Territory collaborate on wood energy opportunities, including through the Alaska-Yukon Wood Energy Conference. Forest health managers in Alaska and British Columbia coordinate information regarding spruce beetle outbreaks, in particular.

The Northwest Wildland Fire Protection Agreement (P.L. 105-377), known as the Northwest Compact, promotes cooperation by State, Provincial, and Territorial wildland fire protection agencies to prevent, suppress, and control wildland fires. The members of the Northwest Compact are Alaska, Yukon Territory, British Columbia, Alberta, Washington, Idaho, Montana, and Oregon. The members maintain an operating plan that details mobilization of resources through Northwest Compact orders, among other cooperative efforts (Northwest Compact 2017).

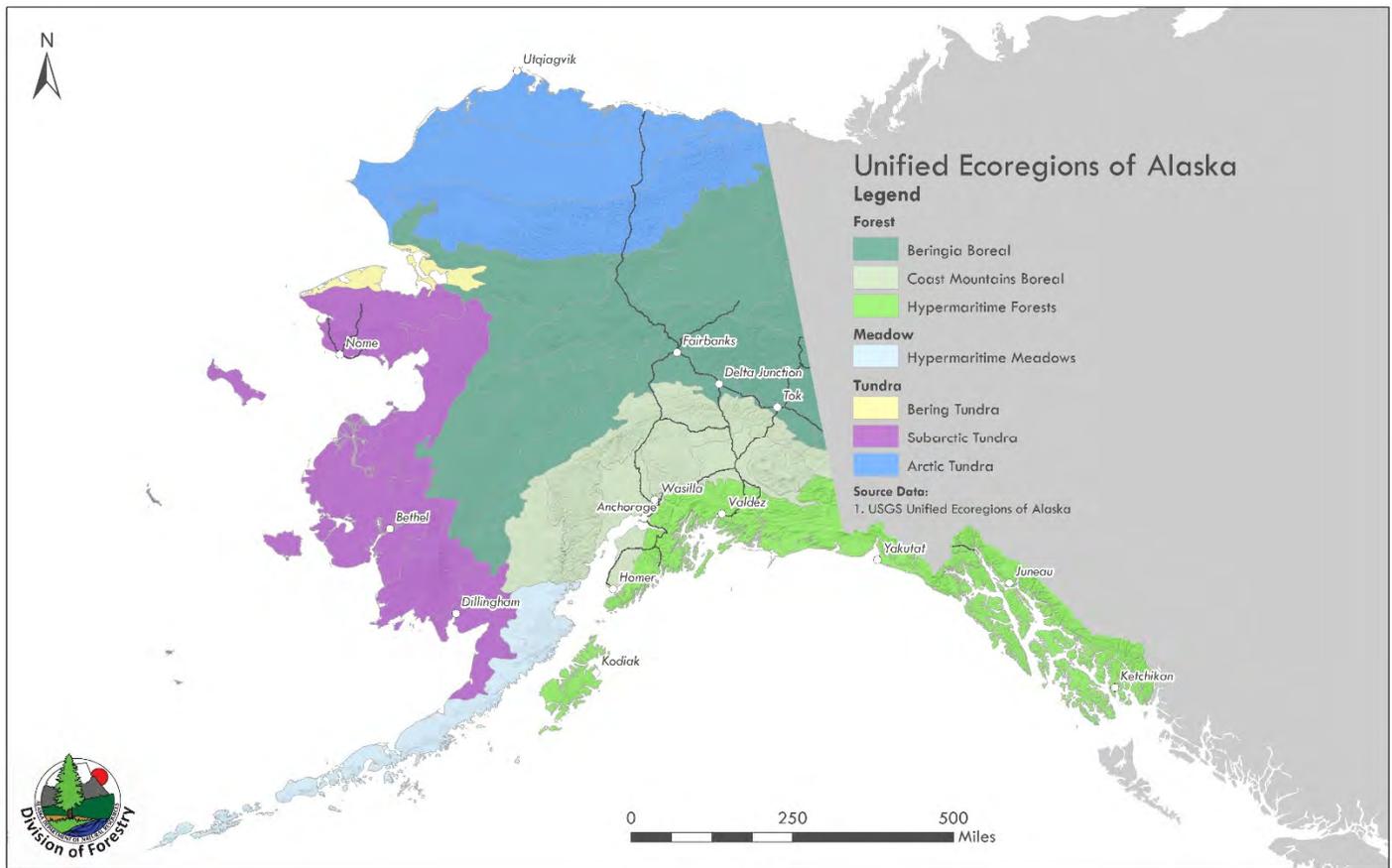


Figure 52. Unified Ecoregions of Alaska. The forested ecoregions were used to filter non-forest versus forest lands for each of the input layers. (Data from Nowacki et al. 2001).

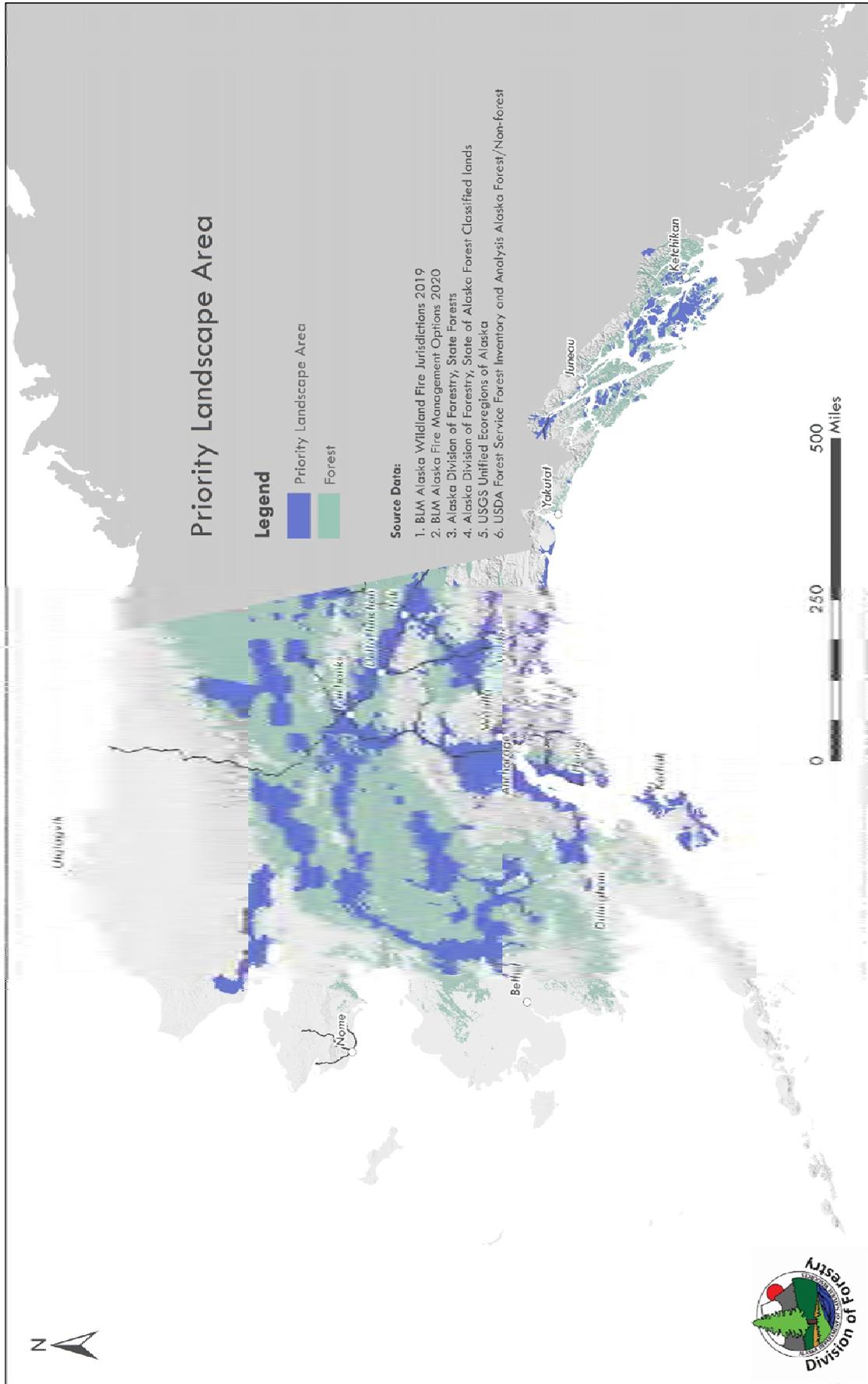


Figure 53. Priority Landscape Area for the 2020 Alaska Forest Action Plan

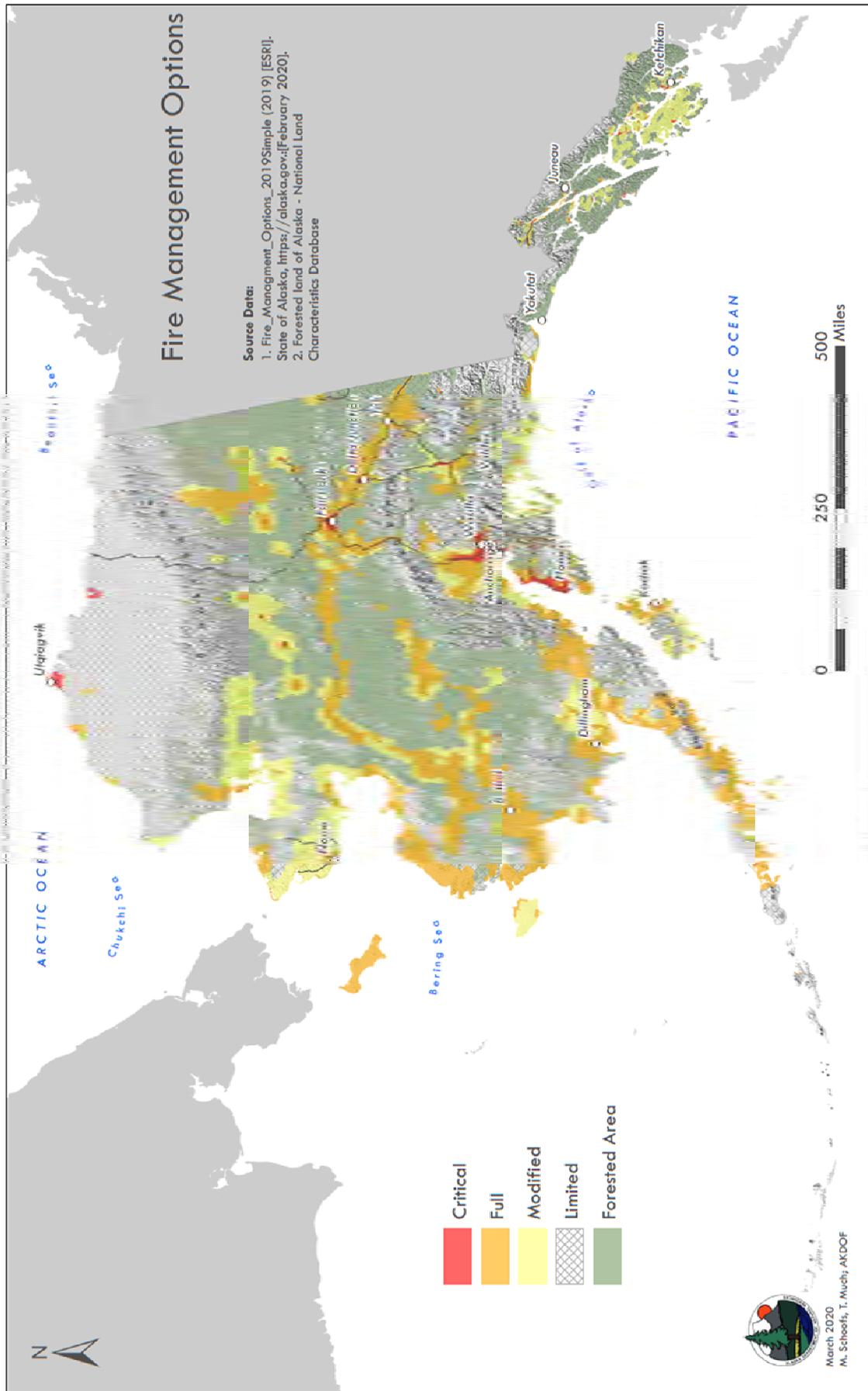


Figure 54. Fire Management Options. Critical, Full, and Modified options are inputs to the Priority Landscape Area.

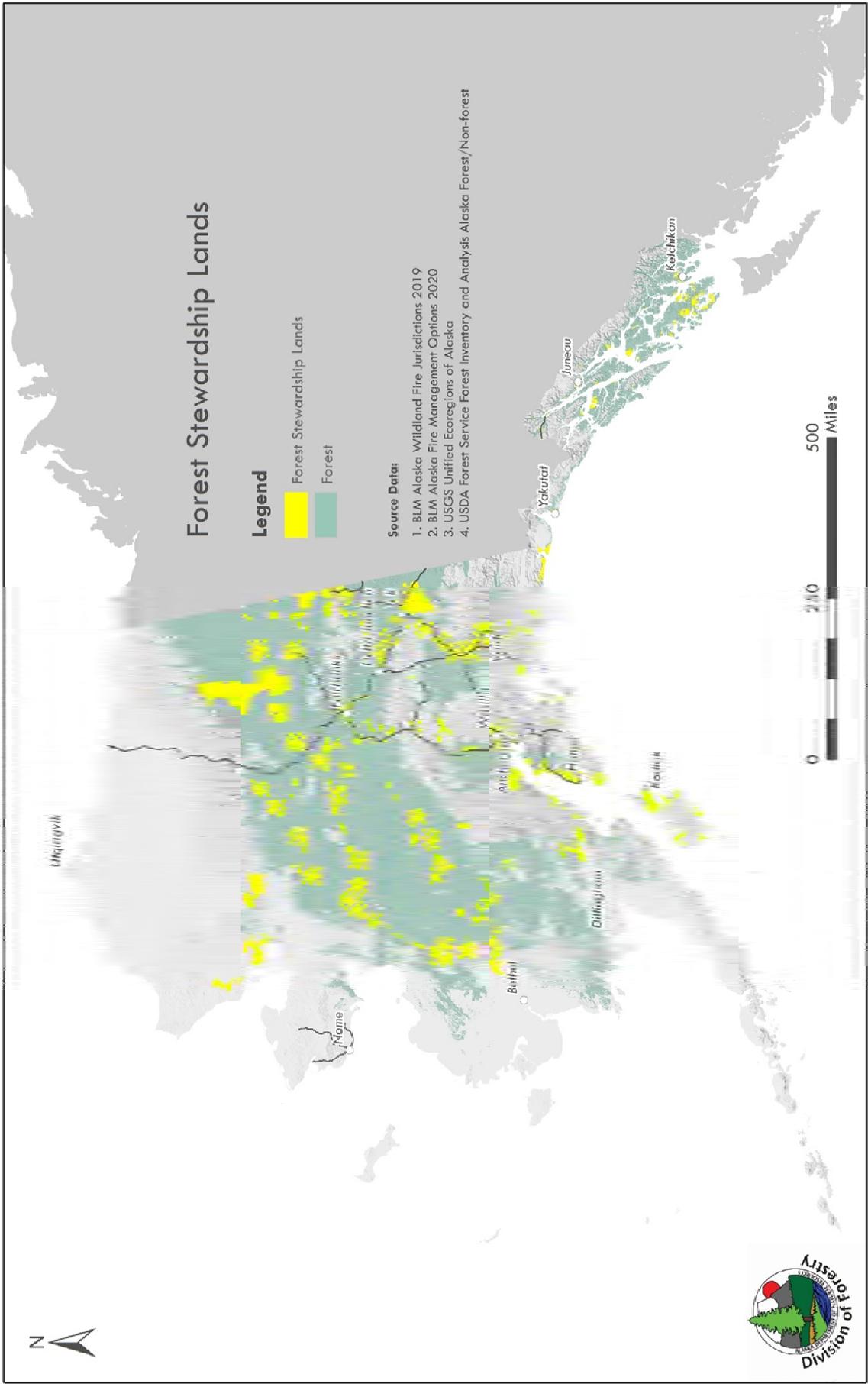


Figure 55. Forest Stewardship Lands. Input to the Priority Landscape Area.

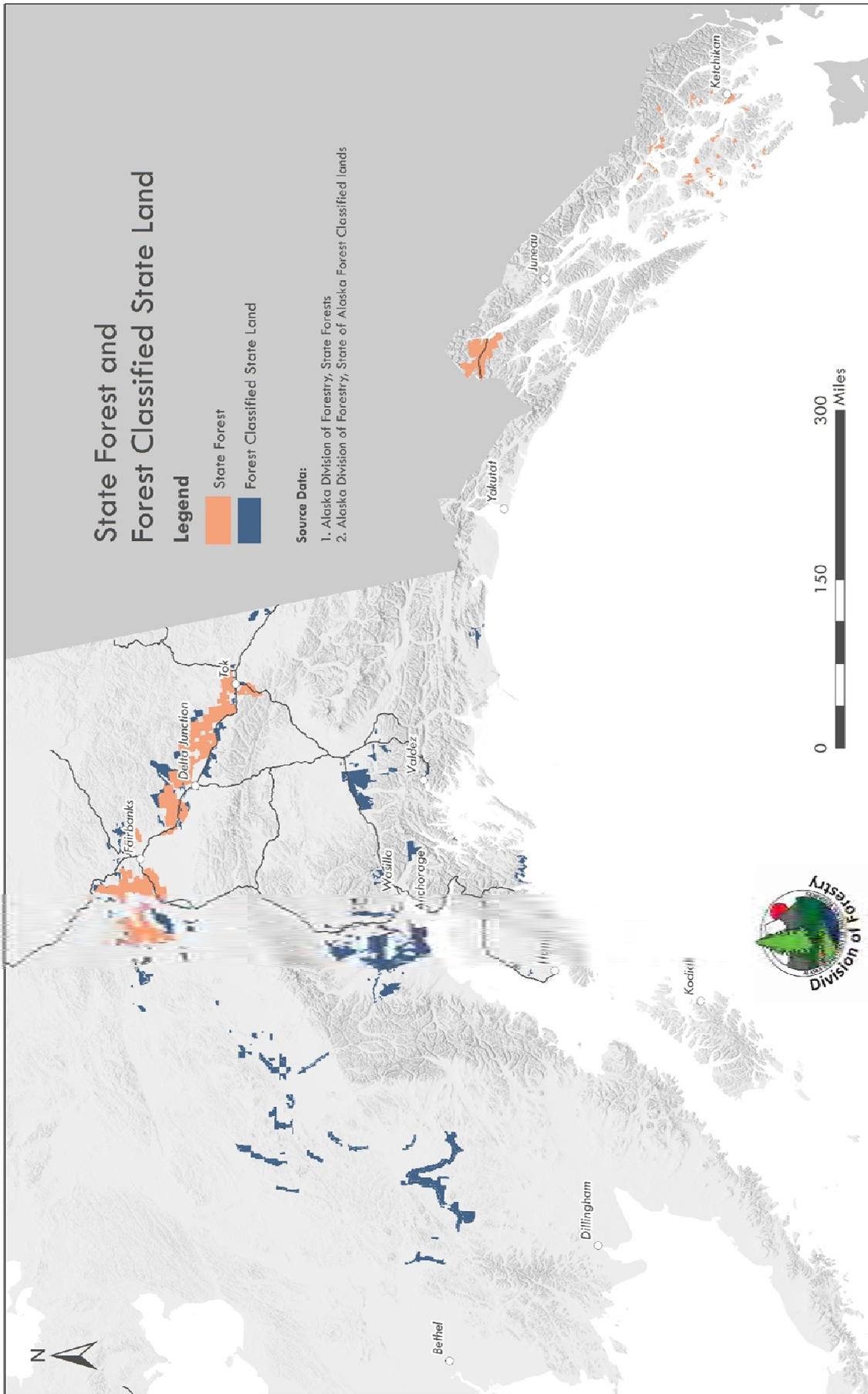


Figure 56. State Forest and Forest classified State land are inputs to the Priority Landscape Area.

STATEWIDE FOREST RESOURCE STRATEGY

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RESOURCES NECESSARY FOR THE STATE FORESTER: PAGE 84

STRATEGIES MATRIX: PAGE 100



Figure 57. Smoke hangs in the air during the Deshka Landing Fire in August 2019 near Willow. ©2020 ADOF. Photo by Trevor DoBell-Carlsson

Forest Resource Strategies

What is a strategy? For the Forest Action Plan, a strategy is a plan of action to address the threats to forest resources. The Forest Resource Strategy provides multiple options to address the threats to forest resources in order to conserve the benefits of Alaska's forests. This strategy is meant to provide a roadmap of potential solutions to anyone working to address forest resource problems. The strategies are grouped according to the primary State and Private Forestry national priority they address.

Alaska's vast forests and dispersed population centers makes having a forest resource strategy crucial. Partnerships are increasingly required to make an impact at a measurable scale. Projects will continue to be pursued opportunistically as willing partners and funding arise, but the goal of this forest resource strategy is to provide a roadmap to direct forest conservation efforts into a more cohesive approach that will have substantial impacts to forests and the people who benefit from them.

This approach aligns with the national initiatives for Shared Stewardship, Joint Chiefs, and the National Association of State Foresters Performance Measures. It also aligns with Alaska's homegrown approach to problem solving, where organic groups such as Kenai Peninsula All Lands All Hands and the Mat-Su Spruce Beetle Partnership have worked to address forest issues across boundaries. Perhaps the longest standing example of an Alaskan all lands partnership is the Alaska Interagency Wildland Fire Management Plan—the nation's first and only statewide, all lands plan for wildland fire management.

1. Strategies to Conserve and Manage Working Forest Landscapes for Multiple Resources and Values

1.1. Monitor and ensure sustainable forest practices

Sustainable forest practices help to ensure forests and fish resources into the future. They ensure water quality and quantity, soils, slope stability, and riparian areas are conserved during forest management activities, helping to protect fish passage and fish habitat. They ensure that lands are reforested after timber harvest. Sustainable forest practices help working forests continue to contribute to jobs in the timber and fishing industries.

The [Alaska Forest Resources and Practices Act](#) (Alaska Statute 41.17) is the primary tool for ensuring sustainable forest management activities on state, municipal, and private lands in Alaska. The Forest Resources and Practices Act regulates best management practices for timber harvest, forest road construction, and reforestation. It sets the standards for non-point source pollution measures. It also sets standards to ensure that timber harvests do not inadvertently lead to outbreaks of forest insects or increase wildland fire risk. It regulates each of the three designated forest regions according to the unique characteristics of that region (see Figure 4. Forest Resources and Practices Act Regions)

Effectiveness monitoring and research keep Alaska's science-based forest practices standards up to date and are an important part of this strategy. Examples include road condition surveys and fish passage mapping, windthrow prediction, and silvicultural research.

Ensuring sustainable forest practices on non-federal lands requires cooperation by the Alaska Division of Forestry, Alaska Department of Fish and Game, and the Alaska Department of Environmental Conservation to review harvest operation plans, monitor compliance, and enforce the Forest Resources and Practices Act. Encouraging landowners and operators to voluntarily implement sustainable forest practices is also important because some operations are exempt from the Forest Resources and Practices Act. Exempt operations may include harvests under 10 acres in Region I or 40 acres in Region II/III which are not adjacent to surface waters or a riparian area, salvage harvests as a result of forest insects or disease or fire, and land use conversion.



Figure 58. The Standard Creek bridge near the Tanana Valley State Forest is an example of installing a bridge instead of a culvert in a deep v-notch or drainage, in keeping with the Alaska Forest Resources and Practices Act. ©2020 ADOF

1.2. Assist private landowners to conserve and manage their forests

Assisting private landowners to conserve and manage their forests includes providing technical and financial assistance. Traditionally this assistance has taken the form of site visits with landowners, stand inventories, and forest stewardship plans. To meet the high demand for technical assistance, in addition to site visits and one-on-one meetings with landowners, this strategy may also include new ways to reach landowners remotely, such as through online instructional videos, workshops, publications, and information. Nationally, private landowners with forest stewardship plans are more likely to actively manage their forests than those without; they are 2.7 times more likely to meet their management objectives for their forest land and 2.4 times more likely to reforest (NASF 2020). Working with other partners, including the Natural Resources Conservation Services, nonprofit partners, and soil and water conservation districts, is an important part of this strategy.

Components of this strategy may include but are not limited to:

- Collaboration with existing natural resource organizations and nonprofit organizations
- Encouraging landowners to utilize private forestry professionals and consultants when appropriate
- Utilizing cooperatives, associations, and public/private partnerships that develop forest management capacity
- Leveraging funds with private buy-in for development of plans
- Encouraging implementation planning that supports local forest products development and other strategies that improve the economic value of forest land and management

1.3. Maintain and improve fish and wildlife habitat

Forest management can provide the opportunity to maintain and improve wildlife habitat. This strategy is a crossover from the Alaska Wildlife Action Plan Conservation Action, Land and Water Management, Forest Habitat Management and Restoration (ADF&G 2015, p. 127). Activities under this strategy include:

In the coastal forests of Southeast,

- Thinning of dense second-growth stands,
- Retention of snags and mature trees during timber harvest,
- Establishment of buffers along shorelines and riparian areas,
- Establishment of old-growth reserves of specific size, spacing and composition to sustain viable, well-distributed wildlife populations, and
- Transition to second-growth (i.e. young-growth) management; and

In the boreal forest of Southcentral and the Interior,

- Create early seral habitat beneficial to game species in the boreal forest through tree harvest and prescribed burning.

Additionally, for the boreal forest this strategy incorporates the following principles and guidelines from the Alaska Department of Fish and Game Wildlife Technical Bulletin “Managing Boreal Forest for Timber and Wildlife in the Tanana Valley of Eastern Interior Alaska” (Paragi et al. 2020).

- Principle 1. Manage forests for a range of habitat types that support diverse wildlife species, because this is likely to maintain forest ecosystem resilience to environmental disturbances.
 - Guideline 1a: Describe habitat features and their landscape connectivity to the extent possible from existing environmental data and use this information in forest planning.
 - Guideline 1b: Focus new inventory of stands to include habitat features that are important for wildlife and use this information in forest planning.
 - Guideline 1c: Design larger timber sales in uplands to emulate wildland fire patterns.
- Principle 2. An integrated approach to forest and wildlife management at the stand and landscape scales maintains habitat benefits.
 - Guideline 2a: Favor diverse woody regeneration that includes willows and deciduous trees.
 - Guideline 2b: Maintain snags, cavity trees, and woody debris.
 - Guideline 2c: Identify landscape connectivity beneficial to wide-ranging species.
- Principle 3. Stand-level planning and management of habitat and wildlife can mitigate wildlife damage to desired forest products.
 - Guideline 3a: Manage habitat to reduce herbivory.
 - Guideline 3b: Maintain habitat for predators of herbivores.
 - Guideline 3c: Monitor abundance of vertebrate herbivores and their predators.
- Principle 4. Landscape-level planning for both wildlife habitat and access management is appropriate given competing interests, the scale of natural disturbances, and desire for a managed forest on State lands.
 - Guideline 4a: Include the value of wildlife habitat when considering road access options for timber harvest and wood salvage after natural disturbances.
 - Guideline 4b: Involve wildlife stakeholder interests when planning forest road networks.
- Principle 5. Consider best practices for wildlife habitat conservation in managed forest as hypotheses that can be verified for effectiveness and adjusted over time using an adaptive management approach to optimize desired outcomes for both forests and wildlife.
 - Guideline 5a. Involve stakeholders in discussions of options and tradeoffs in monitoring strategies.
 - Guideline 5b. Establish a scientific advisory group to guide silvicultural prescriptions and monitoring.
 - Guideline 5c. Verify best practices for wildlife habitat using scientific methods; adjust and update using an adaptive management approach.
 - Guideline 5d. Utilize suitable techniques and volunteer help to monitor a broad network of sites.

1.4. Support non-timber forest products

Support for non-timber forest products includes technical and cost-share assistance to landowners for managing forest lands for non-timber forest products goals, public information about sustainable and culturally respectful gathering of non-timber forest products, providing access to gathering areas, and management and support of sustainable commercial opportunities. The Department of Natural Resources, Division of Mining, Land and Water manages non-timber forest products on State lands, including permitting commercial harvesting. Individual private landowners often have the goal of enhancing non-timber forest products; Forest Stewardship Program assistance can help implement this strategy on their lands. This strategy includes encouraging partnerships between organizations such as the University of Alaska Cooperative Extension Service, USDA Forest Service Pacific Northwest Research Station, and timber and trade groups to support non-timber forest products.

1.5. Support wood products opportunities

This is a wide-ranging strategy to support wood products opportunities, including but not limited to the examples below, where they are most appropriate and needed. This strategy seeks to develop and nurture an Alaska forest products economy with collaboration between Federal and State agencies, nonprofit organizations, and for-profit entities. It aims to develop local businesses that are forest-resource based and can derive an income from permitted public and private lands from conducting value-added secondary processing from timber sales and gathering of nontimber forest products. Supporting nursery efforts for Alaska grown tree seedlings would help supply reforestation efforts. By establishing and increasing value from the existing forest resource base, forest management can focus on quality and cost of production with the benefit of local employment and resale.

1.5.1. Wood energy opportunities

Support for wood energy opportunities includes public outreach about the benefits of wood energy, information for individual forest landowners about efficient woodstoves and wood boilers for home use, information for the public about smoke mitigation. This strategy includes technical and financial assistance with wood energy systems, biomass inventory, and forest management to ensure a wood energy supply. The Forest Stewardship Program is an important resource for implementing this strategy.

This strategy has potential to benefit the more than 200 communities that are located off the road system and that rely on diesel fuel for electrical power generation and home heating (Schmidt et al. 2020). In addition to reducing the cost of electricity and heating, wood energy has the potential to create local jobs for harvesting biomass, maintaining access to harvest areas, and maintaining wood energy systems. This strategy also has the benefit of creating a use for biomass removed during fuels treatments to reduce wildland fire risk to communities.



Figure 59. Harvesting Galena biomass.

Forest Stewardship Supports Wood Energy

In 2012, Gana-A 'Yoo Corporation received a grant from the Forest Stewardship Program to develop a Forest Stewardship Plan for 395,000 acres. A sustainable timber harvest was designed and Gana-A 'Yoo entered into a 20-year timber sale agreement with the city of Galena. From cordwood to chips to the boiler, this is the most remote self-sufficient biomass heating system in North America and possibly in the world, heating the 14-building Galena Interior Learning Academy. It displaces approximately 95,000 gallons of oil per year, introduces \$415,000 to the economy yearly, and encourages active forest management including reduction of wildfire-prone spruce fuel near the village.

Funding from the Forest Stewardship Program allowed Gana-A 'Yoo to hire a private consulting forester who conducted a timber inventory and designed the sustainable harvest within a reasonable working perimeter of Galena; economically, this project is keeping money in the community instead of using it to purchase oil, providing forest-based employment for residents, and providing much-needed forest management in Interior Alaska.

1.5.2. Carbon credit opportunities

The carbon credits market is a new forest management opportunity since the 2010 Alaska Forest Action Plan and is a strategy that requires careful consideration of tradeoffs. This strategy may include Forest Stewardship Plans and forest inventory to develop carbon credit opportunities, and requires coordination between landowners, forest managers, and fire managers.

Carbon credits provide revenue to landowners who participate in market programs such as the program established by the State of California under the California Air Resources Board (CARB) to offset the harmful impacts of burning of fossil fuels in manufacturing and other industries. In order to qualify under the California program for carbon credits, the area in which the land is located must have forest inventory data available from the national Forest Inventory and Analysis (FIA) Program. This data is used by CARB to set a “common practice” or average carbon stocking for the area in which the project is located. This has been a barrier to entry for landowners in the Interior, where FIA inventories have only recently begun. The CARB program is not the only carbon credit program in existence and other programs have different requirements, but participation in other program is not common at this time. Committing to retaining the existing forest cover for carbon credits has significant tradeoffs, particularly in the fire-influenced boreal forest. Retaining forest cover means reductions in managing for wood products and interrupting the disturbance cycles that create early seral wildlife habitat, such as hardwood and shrub regeneration following wildfire that benefits moose.

Often, landowners participating in the CARB carbon offset program request the fire management option be changed to a more protective status in order to protect their carbon credit investment, particularly during the project development time period before carbon credits are approved. Once the project is fully developed and credits are issued, there is an insurance pool to cover losses of carbon due to natural disturbances such as fire. This has created new challenges for Alaska’s fire managers. Alaska Native individual, group, and corporation landowners are afforded fire protection at no cost as part of the Alaska Native Claims Settlement Act. The Alaska Division of Forestry has been receiving fire management option changes related to preventing or suppressing fire on large tracts of land in the boreal forest. The Division of Forestry is the suppression agency for this area and is reluctant to endorse these changes. New proposals tend to set a precedent in the boreal forest where fire is well established as a natural process. The Division of Forestry already has significant challenges and endorsing carbon credit protections in areas where there is a high probability for ignitions with continuous fuels does not represent a sound ecological or fire management approach. Lands currently in the Limited option are often managed with an emphasis on fuels hazard reduction and habitat enhancement. Proposals tend to follow extensive political boundaries with straight lines and patchwork selections with limited consideration for firefighting principles. These selections are also on boundaries that conflict with management objectives from neighboring land managers such as the National Park Service or U.S. Fish and Wildlife Service.

In coastal Alaska where natural fire is rare and carbon credits management does not interfere with the primary disturbance processes, the main tradeoff for carbon credits is foreclosing opportunities for forest products.

1.5.3. Innovative uses for wood products

Innovative uses for forest products can add value to potentially overcome the barrier of Alaska’s long distance to markets and provide jobs. More often innovative uses for forest products can fill a local market niche and provide local jobs on a small scale. USDA Forest Service State and Private Forestry is an important resource for this strategy.

1.5.4. Support reliable supplies of wood for local and regional markets

Supporting reliable supplies of wood for local and regional markets can include forest inventory to strategically plan for timber supply between multiple landowners over time, coordinating planning among timberland owners, maintenance of infrastructure including forest roads, and building capacity to offer timber sales.

1.5.5. Young Growth Strategy

In the coastal forests of Southeast, managing young-growth is a vital strategy to supporting reliable supplies of wood into the future. In 2013 the Secretary of Agriculture directed the Tongass National Forest to “speed the transition away from old-growth timber harvesting and towards a forest industry that utilizes second growth – or young-growth – forests” (Department of Agriculture Secretary’s Memorandum 1044-009). The Tongass Young Growth Management Strategy describes management direction and an overview of the strategy including guidelines for using intermediate treatments and for monitoring (USFS 2014). Completing inventories of young growth stands and modeling future supply are the first steps in transitioning to young-growth. All lands coordination between landowners regarding activities such as pre-commercial thinning could be part of this strategy to help utilize the limited labor pool in Southeast.



Figure 60. Second-growth stand on Prince of Wales Island. ©2020 ADOF. Photo by Mike Cooney

COORDINATION: ALL LANDOWNERS GROUP

As the Tongass National Forest continues to offer old-growth timber as an interim step towards a predominantly young-growth timber sale program, coordination with other landowners has become increasingly important. Most landowners offering timber sales are unable to offer frequent, large-scale, multi-year contracts that might allow for industry adaptation to shifting markets, minimization of mobilization costs, and/or amortization of the cost of associated road construction. By coordinating among their respective ownerships and using new authorities granted the Forest Service and State, early attempts at consolidated multi-ownership timber sale contracts may serve as a future model that supports a desired industry in the state. To support this approach, the Tongass Young-Growth Challenge Cost Share Agreement established an All Landowners Group that meets on a regular basis to attempt to coordinate potential sale offerings into larger packages that might better meet each party’s objectives, and better serve the remaining industry in Alaska.

Tongass Young-Growth Challenge Cost Share Agreement (TYG CCSA)

The TYG CCSA, a partnership of the Forest Service, the Alaska Division of Forestry and private sector interests, provided federal funding to complete two young-growth forest inventory projects in Southeast Alaska; one covering Tongass National Forest lands and a separate one covering State of Alaska forest lands. Through TYG CCSA workforce development efforts, local residents were trained through forestry training academies conducted by the Prince of Wales Vocational and Technical Education Center, and then hired by the Division of Forestry to collect field data for both inventory projects.

Tongass Young-Growth Inventory

Following a five-year collaboration, the Alaska region of the USDA Forest Service and the Alaska Division of Forestry issued their “Young-Growth Inventory,” which includes information for every young-growth timber stand in the national forest, plus management tools that will improve Tongass managers’ ability to develop and plan future young-growth forest restoration projects, pre-commercial tree-thinning projects, and timber sales to meet forest management objectives on the Forest. A description of the inventory project, including project mapping and data analysis, is available at the Forest Service’s Tongass Young Growth Inventory Portal: <https://www.arcgis.com/apps/MapJournal/index.html?appid=e748ce92139c4100a65ad8b12510d620> The inventory report, “Analysis of Young-Growth Forest Inventory Information and Future Timber Volume Estimates on the Tongass National Forest” is available at: http://forestry.alaska.gov/Assets/pdfs/home/TongassNF_CCSA_YG_Inventory_Analysis_20201104.pdf

State of Alaska Southern Southeast Alaska Forest Inventory

An operational-level forest inventory funded through the TYG CCSA and covering State forest lands located in Southern Southeast Alaska (SSEA) was initiated in 2019 and completed in 2020. Inventory data from both old-growth and young-growth timber stands provided the basis for mapping, quantifying and assessing area-wide forest and commercial timber resources and for establishing the Annual Allowable Cut for SSEA. Data acquired and analyzed through the forest inventory project was entered into the State’s GIS to create an updated timber type layer (map) of the commercial forest timber base in SSEA depicting individual timber stands. Updated timber type descriptors for each individual stand include stand species composition, stand density and per acre timber volume. The inventory report is available at: http://forestry.alaska.gov/Assets/pdfs/forestinventories/2020_SSE_State_Inventory_AAC.pdf

2. Strategies to Protect Forests from Threats



Figure 61. An aerial view of the damage caused by the McKinley Fire on August 18, 2019. ©2020 ADOF

2.1. Cultivate fire adapted communities

What is a fire adapted community?

The National Wildfire Coordinating Group defines a fire adapted community as “A human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire.” More fully, fire adapted communities are knowledgeable, engaged communities where actions of residents and agencies in relation to infrastructure, buildings, landscaping, and the surrounding ecosystem lessen the need for extensive protection actions and enable the communities to safely accept fire as part of the surrounding landscape. (Fire Adapted Communities Coalition 2020)

Fire plays an important role in Alaska’s boreal forests which are home to most of the state’s human population. Cultivating fire adapted communities improves public safety and makes fire management more effective. Providing technical expertise and funding to communities to become safer and more fire resilient can include the following:

- Planning assistance to help the wildland urban interface develop more safely
- Assistance with the development of Community Wildfire Protection Plans
- Volunteer Fire Assistance funding to help fund volunteer fire departments and training
- Equipment for volunteer fire departments through the Federal Excess Property Program

Forest Stewardship Plans are an important tool for private landowners in the wildland urban interface for fire management planning. Forest Stewardship Plans can identify fuel treatment units or fuel break locations and incorporate Firewise recommendations to make homes safer. Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) funding for fuels treatments can be part of this strategy in conjunction with Forest Stewardship Plans for eligible landowners.

Planning assistance can include foresters and fire managers reviewing proposed land sales and development proposals. Foresters and fire managers can work with municipalities, boroughs, and the Department of Natural Resources Land Sales program to address the following: location of subdivisions in relation to fuel types, reduction of hazardous fuels prior to land disposal, need for ingress and egress for fire emergencies, and encouraging home and cabin owners to observe Firewise principles.

This strategy can also include smoke management to reduce the health impacts of smoke to residents. The first step is notification and education. In concert with the Department of Environmental Conservation (DEC), Alaskans are provided education of potential health impacts from wildland fire smoke. In addition, DEC issues Air Quality Advisories (AQA) when wildfire smoke may impact a community. Residents armed with this information can make decisions for themselves on whether to leave the area, take precautions in place, or not be concerned. A secondary range of actions that can be implemented include early season suppression on fires in Limited protection areas to inhibit fire growth to the suppression of new starts within a defined geographic area in proximity to a community.

2.1.1. Community Wildfire Protection Plans (CWPPs)

An important component of this strategy is Community Wildfire Protection Plans (CWPPs). CWPPs identify prevention needs such as hazardous fuel reduction projects to reduce the risk of wildfire impacts, “Firewise” education, and wildland fire prevention campaigns. These needs are often dependent on competitive and/or federal funding sources for full implementation. Communities with CWPPs may have a higher priority for funding for fuels reduction projects. Alaska currently has 30 CWPPs covering 70 communities with 10 plans under development covering another 16 communities. Existing plans are predominantly in the more heavily populated interface areas of the state with an increasing number of rural communities developing plans each year. Communities that are especially prone to the risk of catastrophic wildland fire have been identified in the Communities at Risk list and their landscapes fall within Critical or Full protection zones in the AIWFMP.

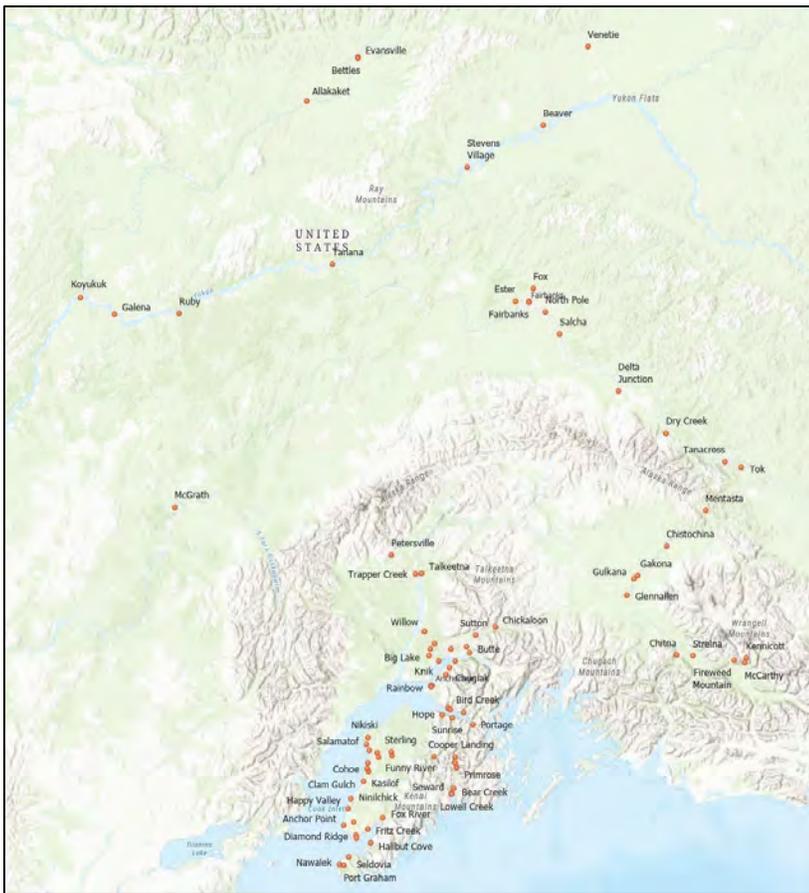


Figure 62. Communities with Community Wildfire Protection Plans

2.2. Manage fuels to reduce risk to communities and to benefit forest ecosystems

Comprehensive strategic planning for fuels management is needed in order to get the most benefit from limited funding. At the landscape level, fuel breaks have been successfully used to provide a safe and strategic location for firefighters to defend communities from wildland fire. With proper funding, planning, development, and maintenance, fuel breaks can continue to play a critical role in the protection of Alaskan communities. The concept of firesheds and other fire risk assessment efforts are being implemented by the USDA Forest Service to identify areas on public lands where the fires that affect communities are likely to start and spread. These concepts can be used to target fuels treatments on public lands in Alaska.

Creating new fuel breaks to protect communities requires fuel type mapping, identification of strategic areas around communities, and project planning and implementation. Projects are developed by individuals with special skills and experience, so treatments are tactically sound and cost efficient. Maintenance is required on existing fuel breaks every 15 to 20 years, and many of Alaska's existing fuel breaks are in need of maintenance. The type of maintenance required varies by fuel type. The most common types of maintenance are use of a roller chopper to mulch regeneration, shear blading, and hand clearing in shaded fuel breaks to remove dead and downed trees. Hazardous fuels reduction also creates a supply of biomass for wood energy.

Community Wildfire Protection Plans (CWPPs) and Division of Forestry fire staff have identified the following communities as having fuel break projects in need of design and funding: Delta Junction, Glennallen, Upper Tanana Valley, Fairbanks, Healy, Caswell, Meadow Lakes, Houston, Kenai, Homer, Sterling, and villages throughout western Alaska. Funding for fuel breaks and Firewise projects has been primarily based on a competitive grant process via the USDA Forest Service. Projects have a three to five-year window to utilize the funds and the competitive aspect makes year-to-year planning difficult due to uncertainty of receiving a grant. To augment federal grants, the State of Alaska has designated \$5 million from capital improvement funds with the intent of developing a self-sustaining annual increment, through a cost-recovery program. These State general funds represent the first State of Alaska invested funding to initiate a fuels program and strategic planning to prioritize projects on a statewide and interagency scale. To complete projects currently identified, an estimated \$18.0 million is needed. In addition to these identified communities, there are numerous communities in fire prone areas across the state in need of fuel treatments. Additional efforts are needed to identify fuel management needs in communities without CWPPs, particularly those located off the road system.

Forest Stewardship Plans also identify fuels management needs and apply to this strategy. A single Forest Stewardship Plan for Alaska Native corporation lands can cover hundreds of thousands of acres, making the plans a robust source of information to direct fuels management. For qualifying private landowners, Forest Stewardship Plans can work in conjunction with the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) to fund fuel management projects and fuel breaks.

Prescribed fire is another tool within this strategy. Managing fuels using prescribed fire benefits wildlife, particularly moose, by spurring the regeneration of hardwood trees and willows and other shrubs. Compared to mechanical fuels treatments, prescribed fire is logistically more complex, often involves more risk, and requires efforts to minimize smoke, but can treat much larger areas at a lower cost and better mimics natural processes. Through program development and frequent application, the costs and risks of this method can be reduced. A combination of practices with prescribed fire could begin to provide a scale of efficiency that reconciles the cost and capacity issues that are a barrier to fuel treatment projects, while reducing suppression costs.

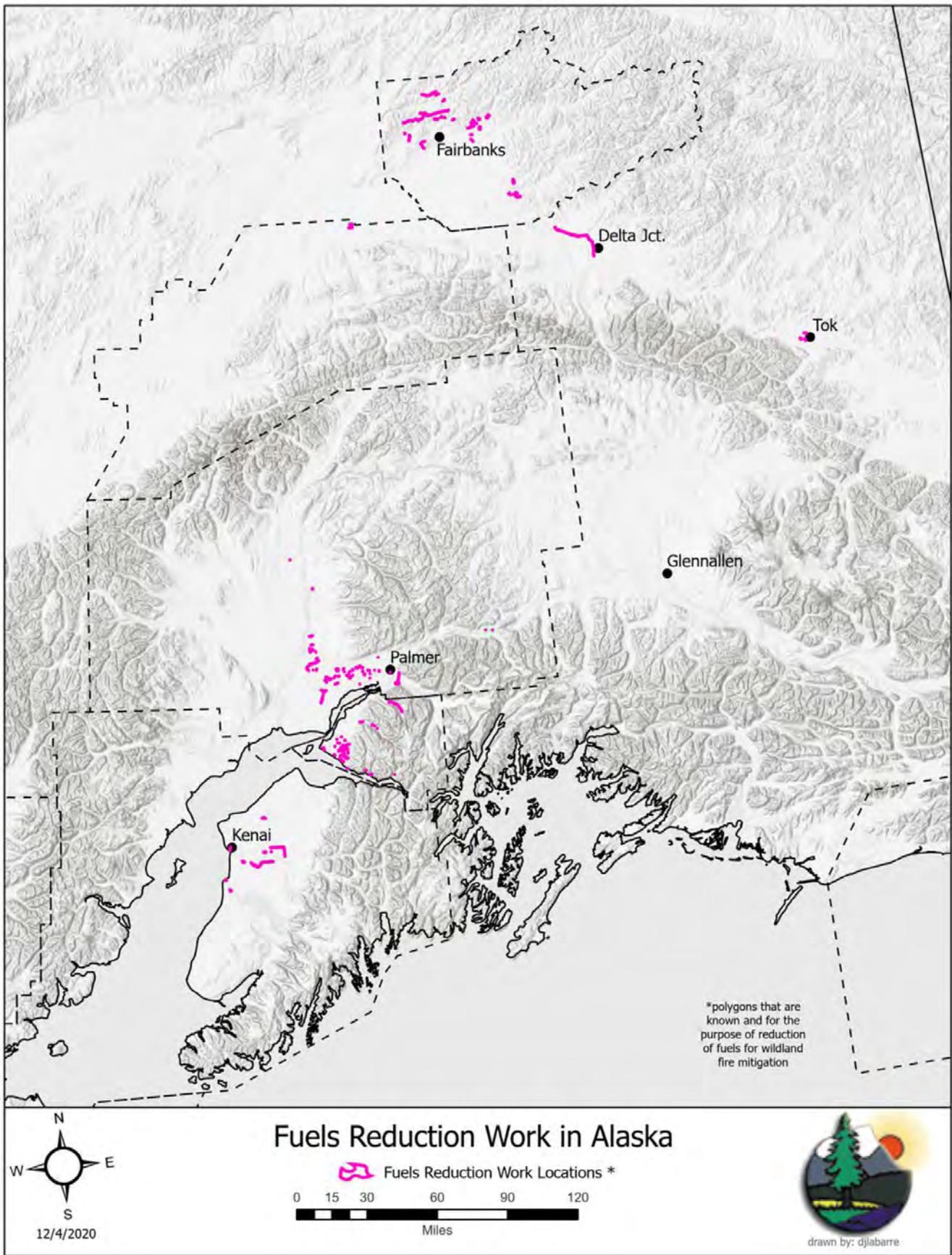


Figure 63. Fuels reduction work in Alaska as of December 2020, as tracked by the Alaska Division of Forestry.

2.3. Monitor and mitigate economic and ecological impacts of forest insects and disease

This strategy includes aerial and ground surveys for forest insects and disease, technical and financial assistance for landowners impacted by forest insects and disease, and explorations into new methods of preventing and suppressing forest insect outbreaks and restoring forests impacted by forest insects and disease. This strategy recognizes that forest insects and disease have an important ecological role in Alaska's forests, and is targeted to those situations that have undesirable economic and ecological impacts. The Alaska Division of Forestry Forest Health Program is a major resource for implementing this strategy.

2.4. Prevent, identify, and control invasive species

Working to prevent, identify, and control invasive species is vital for the health of Alaska's forests. This strategy is a crossover strategy with the State Wildlife Action Plan; some taxa addressed in that plan, such as invasive animals and aquatic plants, are not included herein. Compared to much of the world, Alaska is fortunate to have relatively few widely established invasive species, which increases the potential success of this strategy. Detection monitoring, eradication and control efforts, and invasive species outreach and education occur throughout the state, facilitated by a variety of agencies and individuals and covering many taxa. To address new populations of invasive species, Early Detection and Rapid Response (EDRR) is the recognized strategy of coordinated actions to find and eradicate invasive species before they spread.

Prevention of invasive species is the most critical and cost-effective component of this strategy. Prevention consists primarily of education for the public, training for forest operators and wildland firefighters, identifying potential new vectors for the introduction of forest-related invasive species, and developing and encouraging best management practices for preventing the introduction of invasive species during forestry and firefighting operations. This part of the strategy can also include cooperating with the Division of Agriculture on the quarantine and inspection of commodities for invasive forest pests. Working to maintain healthy native plant communities, especially on disturbed sites, also helps to prevent invasive species. This may include native seed collection and storage for use in reforestation and revegetation projects.

Identification of invasive species includes existing inventory and monitoring programs such as Early Detection and Rapid Response and aerial surveys for forest insects and disease. It also includes using the eyes and boots on the ground, including citizen groups, forest operators, and natural resources agency staff including wildland firefighters. Data sharing of invasive species locations also falls within this category, such as citizen science reporting of invasive species, and sharing of information between agencies. Predictive modeling and risk assessments can also assist with detection of invasive species. Database and mapping tools such as the Alaska Exotic Plant Information Clearinghouse (AKEPIC) and the Early Detection and Distribution Mapping System (EDDMapS) are essential for inventory and monitoring of invasive species.

Control of invasive species uses the principles of integrated pest management to achieve the management goals of eradication, containment, and suppression depending on the characteristics of the infestation and potential harm caused by the invasive species. Control methods can include cultural, mechanical, or chemical methods. Examples of the control component of this strategy include targeted invasive plant removals by agency staff, pass-through grant opportunities to incentivize landowners to remove or treat invasive species on their properties, and training and education to enable the public to remove invasive plant species.

Invasive species strategic plans with crossover to this strategy:

*Department of Natural Resources,
Division of Agriculture, Strategic Plan
for Invasive Weed & Agricultural Pest
Management and Prevention in Alaska
<http://plants.alaska.gov/invasives/stratplan/InvasivesStrategicPlan.pdf>*

*Alaska Invasive Species Partnership
(formerly Alaska Committee for
Noxious and Invasive Plant
Management, 2016 Strategic Plan
http://uaf.edu/ces/files/invasives/cnipm/CNIPM-Strategic-Plan_2016.pdf*

2.4.1. Early Detection Rapid Response Program for Invasive Forest Insects

Non-native bark and ambrosia beetles, forest defoliators, and tree-killing woodborers are a serious threat to our nation's urban and rural forests. The most effective and lowest cost defense against exotic species introductions is an effective monitoring system designed to detect introductions early and allow for rapid response actions. The Early Detection and Rapid Response (EDRR) Pilot Project was initiated in Alaska by USDA Forest Service Forest Health Protection in 2001. Fully implemented in 2007, the EDRR program has expanded into a comprehensive monitoring, detection, and response system. Currently, the Alaska Division of Forestry Forest Health Program administers the program across a network of 14 sites, strategically located near population/transportation hubs where introductions are most likely to occur. These sites are maintained by a collection of cooperators representing several federal and state agencies. Since 2002, no target non-native bark or woodboring beetles have been detected in these samples.

The list of target species for this EDRR monitoring effort is shown below. Please note that targeted detection trapping for the brown spruce longhorn beetle (*Tetropium fuscum*) was initiated in Alaska in 2019 as part of a pilot program within the national bark and woodboring beetle EDRR monitoring program.

- *Hylurgops palliatus*
- *Hylurgus ligniperda*
- *Tomicus minor*
- *Tomicus piniperda*
- *Pityogenes chalcographus*
- *Orthotomicus erosus*
- *Ips sexdentatus*
- *Ips typographus*
- *Trypodendron domesticum*
- *Xyleborus species*
- *Tetropium fuscum*

2.5. Retain working forests and important forest land

Conserving working forests through conservation easements or property acquisition from willing sellers is one strategy to prevent forest conversion and fragmentation. The Forest Legacy Program is one possible resource to implement this strategy. To date this strategy has been implemented to preserve important forest lands near and adjacent to State Parks and State Recreation Areas. In the future this strategy could be important to retain working forest land adjacent to and within State Forests. Conservation land trusts can be integral partners to this strategy.

3. Strategies to Enhance Public Benefits from Trees and Forests

3.1. Maximize the benefits of trees and forests to communities

This strategy includes assistance focused on trees, forests, open spaces, greenbelts, and related natural resources, to include soil, water, air, and wildlife. A relatively small financial investment produces big dividends for communities and direct benefits to Alaskans.

This strategy includes, but is not limited to:

1. Community Education and Support. Provide opportunities to schools, community forestry citizen groups, local governments, nonprofit organizations, and community residents to build, support and improve understanding of community forestlands and trees and their benefits with an outcome of local self-sustaining capacity.
2. Improving the Health of Community Forests. Accomplished by promoting Right Tree Right Place education, local production and sale of Alaska tree stock and seedling, discouraging invasive and nuisance tree and shrub species, increasing community tree canopy and tree health.
3. Planning. Providing technical and planning assistance by staff, volunteers, consultants, and other organizations, that incentivizes and develops professional community forestry management plans, tree care, tree surveys and inventories, equipment, and current technology.
4. Sponsored Programs. Promoting affiliated organizations and partnerships such as Tree City USA, Tree Line USA, Tree Campus K-12, Tree Campus Higher Education, or Tree Campus Healthcare, local Soil and Water Conservation Districts, One Tree, Global Releaf, 4-H, Society of American Foresters, Local Chapters, and others.
5. Fostering Professional Tree Care. Increasing the use of professionals and skills of existing local capacity of arborists, foresters, community planners, educators, and tree workers by promoting continued training and professional development.

6. Improve understanding of economic, ecological, and societal benefits. Accomplished by field demonstrations, workshops, news articles, community forums, multi-media, and social and electronic media that raise the awareness of the ecosystems benefits of Community Forests, e.g., carbon sequestration, energy conservation, wildlife habitat, community mental health, localized climate moderation, increased property values and improved public safety.
7. Community and Home Protection. Promoting Firewise communities, noise abatement, pedestrian and traffic control and aesthetic improvements with the use of trees and community forests. Protecting public and private infrastructure from short term and long-term impact of improper tree planting and maintenance.
8. Grants - Providing grant opportunities and administration for community forestry projects.
9. Sustainable Use - Support the use of woody materials generated from community forest management, including wood products, biomass energy, and biochar.
10. Research - Supporting community forestry-related research relevant to Alaska's communities and climate.

This strategy has crossover with the Statewide Comprehensive Outdoor Recreation Plan:

Goal 1, Increase Participation in Outdoor Recreation, Strategy C. Coordinate with health care providers for "Prescriptions to Parks."

This strategy also has significant crossover with the Anchorage Climate Action Plan (MOA 2019), which identifies the urban forest and watersheds as one of seven sectors in which to take action. Considering the Plan's strategies, objectives, and actions is recommended when undertaking community forestry strategies in Anchorage.

3.1.1. Support Green Infrastructure

Green infrastructure is a strategy to manage rain runoff that uses natural or engineered systems that mimic natural processes. Green infrastructure featuring trees minimizes erosion and sedimentation and prevents pollution from reaching waterbodies. Many of Alaska's communities are fortunate to be along salmon streams, and green infrastructure can help protect fish habitat.

This is another crossover strategy with the Anchorage Climate Action Plan (MOA 2019), which specifically includes strategies, objectives, and actions for green infrastructure. Considering the Plan is recommended when implementing this strategy in Anchorage.

Additionally, the Green Infrastructure for Interior Alaska guide contains a wealth of information to consider when implementing this strategy (Fairbanks Green Infrastructure Group 2019).

3.2. Provide sustainable forest recreation opportunities

Providing forest recreation opportunities including trails and recreational use of forest roads enhances the community benefits of forests, provides a greater public return on forest infrastructure over long harvest return intervals, educates people about the benefits of forests, and can enhance understanding and acceptance or support of forest management. While recreation and timber proponents are sometimes at odds, the access that forest management provides can offer many benefits to outdoor recreationists, including mountain bikers, skiers, runners, snowmachiners, dog mushers, ATV users, and others.

Because of the long rotations for timber harvest in Alaska, many years go by between harvest, planting, silvicultural activities such as thinning, and eventual harvest again. The expense to decommission and reconstruct a forest road and trail system for access can make silvicultural activities and use of the forest for socially beneficial but low-return activities such as timber harvest for wood energy cost prohibitive. Maintaining forest trails and roads in usable condition for recreation increases public benefits from trees and forests and decreases costs per entry for forest management. As an example, the Tanana Valley State Forest provides Fairbanks residents with substantial recreational opportunities accessible from the forestry roads and trails system.

The Division of Forestry encourages smart multiple use management of State Forest lands that adds value for all users, especially in providing improved motorized and non-motorized recreational access to public lands. This improved access expands recreational uses that strengthen our state's economic and community health. The legislation that established Alaska's State Forests insists on multiple use, and though forestry may be its primary use, smart management

strategies can encourage and help sustain both forest management and recreation. The Division will seek projects where expanded recreation opportunities are a good fit with timber management and timber harvests, and increase the long-term value of our State Forests and other public lands.

Key strategies for the successful integration of recreational uses on timber lands:

- “Expectation Management” – private and commercial recreation users need to understand and support the multi-use management of State Forest lands, and the primacy of on-going timber management. Locations like those referenced above show how this can be done through signage and web-based materials, including information on previous, current and planned harvests, and routes closed to recreation when active timber harvest is taking place.
- Education – signage, presentations and ongoing collaboration can help recreational users, as well as businesses that benefit from recreational use, better understand and support the recreational benefits of forest management, such as increased access to public lands for recreation, hunting, and other subsistence uses, the benefits of harvest and ecological disturbance for wildlife habitat, and fuels reduction that can decrease the severity of wildland fire and increase safety for firefighters.

This strategy can also benefit access to fishing, hunting, and other wildlife-based recreation. The Alaska Division of Forestry has worked in cooperation with the Alaska Department of Fish and Game, Division of Wildlife Conservation to improve hunter access on forestry roads in the Matanuska-Susitna Valley using cost-share grants funded by the Pittman-Robertson Act.

This strategy also overlaps with Alaska’s Statewide Comprehensive Outdoor Recreation Plan (DPOR 2015), which identifies two strategies that can also be applied to forest recreation:

- Goal 1. Increase participation in outdoor recreation, Strategy B. Improve and increase accessibility to outdoor recreation facilities and areas.
- Goal 2. Maintain sustainable outdoor recreation infrastructure, Strategy A. Design, build, and refurbish infrastructure using sustainable materials.



Figure 64. Road in the Rosie Creek management area of the Tanana Valley State Forest. ©2020 ADOF

4. Strategies for All Priorities

4.1. Increase fire and forest management capacity

This strategy includes attracting, retaining, and building a qualified, competent workforce of fire and forestry technicians, professionals, and laborers, as well as working amongst organizations to leverage resources.

4.1.1. Collaborate with partners to leverage resources

Collaborating with partners to leverage resources to achieve common goals helps extend capacity beyond any one organization. Building on existing collaboration and finding new ways to collaborate will help to keep the momentum going for worthy projects in Alaska's forests, even as the capacity of individual organizations remains static or shrinks. Partners are one of the main resources needed by the State Forester to implement the Forest Action Plan.

The Alaska Division of Forestry's work crosses ownership boundaries through leadership of all-risk incident management teams; management of national forests under the Good Neighbor Authority; inventory of statewide timber resources; cost-share projects with private landowners, nonprofit organizations, and soil and water conservation districts; and implementation of up-to-date best management practices that apply to all commercial forests. One excellent example of collaboration is the participation of Alaska State Parks staff to monitor Early Detection Rapid Response traps for invasive forest insects in areas of the State that would otherwise not have coverage. Other specific opportunities for collaboration are listed throughout the Alaska Forest Action Plan strategies.

As time and resources allow, developing a step-down plan for collaboration could help to implement this strategy.

4.1.2. Support training to build workforce at all levels

Training can be an effective way to build capacity even when the size of the workforce remains unchanged. The size of Alaska's forest industry workforce is limited at all levels in both the private and public sectors. This strategy includes but is not limited to:

- Working with professional organizations to develop trainings and set professional standards for employees.
- Promoting professional development and growth by participation in professional and technical associations and certification programs.
- Promoting continuing forestry workplace training and forest science education, including fire, forest products, silviculture, and habitat, within forestry agencies and organizations.
- Promoting continuing natural resource education within all natural resource fields.
- Alaska currently has no accredited forestry higher education program; partnering with an educational institution to provide forestry education is another potential part of this strategy.

Training is also a strategy in the Alaska Division of Forestry's 2018-2019 Strategic Plan. The Alaska Division of Forestry's Fire Training Program is an excellent example of the implementation of this strategy.

4.2. Educate and involve people regarding forest threats, benefits, and opportunities

Educating and involving people regarding forest threats, benefits, and opportunities takes many forms. Examples include Firewise for homeowners, Ready-Set-Go wildland fire evacuation education for communities, invasive species education, Arbor Day events, weed pulling events, small forest landowner education and Forest Stewardship Program outreach, forest insect and disease education and outreach, wood energy outreach, and participation in fairs and trade events. Cooperating with partners who have common goals for education and outreach helps increase the impact of this strategy.

4.2.1. Project Learning Tree

The nationally recognized Project Learning Tree environmental education curriculum recognizes the importance of teaching K-12 students about natural resources. Project Learning Tree is an initiative of the Sustainable Forestry Initiative (SFI).

4.3. Support forest science and new technology and methods to better understand and manage Alaska's forests

New forest- and fire-related technology and methods are often first developed outside of Alaska, and Alaska tends to be a late adopter due to complex logistics, higher cost of operations, lower levels of commercial timber harvest, and a relatively small population. However, the need and demand for updated technology continues to increase. The examples below are meant to illustrate the myriad applications of this strategy.

The Alaska Division of Forestry has been at the forefront in developing a dispatch system with real time display and a corresponding mobile application. In addition, a cost summary module is being developed to track costs.

The Division has been a leader in drone utilization in recent years. Drones are used by the Wildland Fire & Aviation Program and the Forest Stewardship Program. Updating equipment, qualifying pilots, and maintaining a program has been a struggle related to retention issues with trained employees and demands on these employees for other assignments. The Division has also been exploring possible future use of drones for identifying invasive tree species and forest inventory.

This strategy is particularly important to Alaska Division of Forestry and USDA Forest Service forest health staff working to accurately survey forest health conditions each year. With the size of the state, limited personnel, and unpredictable weather and fire activity, aerial surveys do not necessarily cover the same area year to year. This limits the capability of the resulting data for direct year to year trend comparisons. Changes to survey methodology and survey technologies have both been pursued to provide more consistent and repeatable survey coverage. Among these efforts has been a complete overhaul of the software and hardware associated with aerial survey, facilitated by the USDA Forest Service Forest Health Assessment and Applied Sciences Team (FHAASST), to bring these survey efforts in line with the latest technologies. These data are stored both locally and at a centralized location nationally and are collected consistently across the country. Additionally, improved remote sensing techniques provide possibilities for near real-time assessments of forest health issues that occur outside of the aerial survey time period, are ephemeral in nature, or may be undetectable by aerial surveyors but visible using certain imagery color band combinations or analyses. Efforts by FHP to evaluate remotely-sensed forest health monitoring are currently in process. Ground survey technology has also seen vast improvements over the last ten years, with numerous applications available now for mobile data collection, even in remote areas, and real-time or near real-time integration of the collected data with projects, reports, or outreach material.

Collaboration with partners with technological and research expertise, including the Alaska Fire Science Consortium and the USDA Forest Service Research Stations, is important to implementing this strategy.

4.4. Obtain better forest- and fire-related information

Alaska's forest- and fire-related information is sparse compared to the rest of the United States. Obtaining better forest- and fire-related information would improve the effectiveness of the other Forest Action Plan strategies. This strategy would help provide the inputs needed to use innovative tools for forest and fire management—tools which are currently often precluded by lack of geospatial data and other forest resource information. Sharing information is also part of this strategy, so that all partners can obtain forest- and fire-related information. For example, the Division of Forestry has a web mapping application for forest inventory data. Invasive species information sharing such as through AKEPIC is another example of this strategy.

4.4.1. Regularly inventory forest resources

This strategy includes continuing and expanding current inventories of forest resources as well as developing new inventories, including long-term plots. Additionally, this strategy includes regularly resampling existing sites to gain greater understanding of change over time and current conditions. Examples of existing monitoring efforts and inventories are the Forest Inventory and Analysis, Cooperative Alaska Forest Inventory, annual forest insect and disease monitoring, State Forest inventories, timber inventories of other state lands, biomass assessments, and hazard fuels assessments.

4.4.2. Obtain high resolution imagery and other geospatial data over greater areas

High resolution imagery is needed to address most of the topics in the Forest Action Plan. For example, sound fire management requires access to data from vegetation type to land ownership. Forest canopy assessments of Alaska's towns and cities are important for community forestry. This strategy is a crossover from the State Wildlife Action Plan, which directs identification of high-use terrestrial areas for wildlife, and notes that with good information on the forest types most important to certain wildlife species, better decisions can be made about minimizing impacts from logging, and other forest use activities.

Alaska Known Sites Database (AKSD)

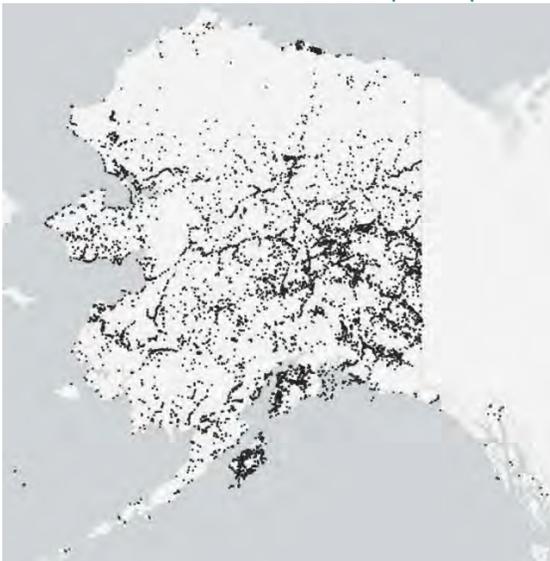


Figure 65. Locations in the Alaska Known Sites Database

The Alaska Known Sites Database contains geographic locations for infrastructure, cultural sites, and natural resource sites in order to inform fire management decisions. Maintaining, updating, and expanding this database requires field data acquisition and data entry—a monumental task on a statewide scale.

Department authority allows fire management decision making to include all values, not just the values of the natural resources threatened by wildland fires. Houses, cabins, commercial property, infrastructure, and other cultural resources can be considered when assessing the most appropriate and cost-effective fire management strategies, not just natural resources. Many of these values lie outside of organized boroughs and locations of these values at risk are not captured in any database. There is a steady revision of inventory for cabins, homes, businesses, etc. when trying to manage a fire. This necessitates a constant change of tactics due to these newly located values. In order to most effectively apply fire management strategies, identifying and inventorying those values must be done prior to the start of a wildland fire.

TESTING NEW TOOLS TO MANAGE SPRUCE BEETLE IN ALASKA

The Forest Health Program has been heavily involved since 2018 in projects to evaluate potential new tools to assist residents in protecting their trees from spruce beetle-caused tree mortality. The spruce beetle anti-aggregation pheromone (MCH) has been tested extensively to repel spruce beetle attacks, with some success in the lower 48 but very little success in Alaska. In 2018, a single-year MCH-based tree protection research project was completed in partnership with the USDA Forest Service Rocky Mountain Research Station, and the results were published in the *Journal of Economic Entomology* in 2019 (Hansen et al. 2019). The MCH-based treatments were coupled with tree host scents of maple trees. The combination was successful in the Rocky Mountains, but the treatments were not found to effectively protect white spruce from spruce beetle attack in Alaska.

A second trial evaluating SPLAT-MCH (ISCA Technologies, Inc), a biodegradable paste impregnated with spruce beetle anti-aggregation pheromones, was initiated in 2019 as part of a larger effort testing this product against spruce beetle in both white spruce and Engelmann spruce forest systems in the United States. Preliminary results in the fall of 2019 showed promise for the treatments in the forests of the Rocky Mountains and low treatment success in Alaska. A final assessment of the treatments was conducted in late 2020 and the data is currently being processed. This project is being conducted in partnership with the USDA Forest Service Pacific Southwest Research Station and USFS-FHP, as is a three-year systemic pesticide trial that was initiated in 2018. This study is evaluating the effectiveness of injectable systemic pesticides at protecting trees from spruce beetle attack. The study trees were assessed in late 2020 and data were being processed at the time of publication of the Alaska Forest Action Plan.

Resources Necessary for the State Forester

To sustain Alaska’s forest-related benefits and address the threats facing Alaska’s forests, the State Forester needs the following resources to implement the strategies outlined in this Forest Action Plan. These resources include Alaska Division of Forestry programs, various funding sources, and partners.

Alaska Division of Forestry

The mission of the Alaska Division of Forestry is to proudly serve Alaskans through forest management and wildland fire protection by:

- Managing a wildland fire program on public, private, and municipal land;
- Encouraging development of the timber industry and forest products markets;
- Conducting timber sales for commercial use, personal use, and fuel woods;
- Protecting water quality, fish and wildlife habitat, and other forest values through appropriate forest practices and administration of the Forest Resources and Practices Act;
- Managing the Southeast, Haines, and Tanana Valley State Forests, which cover a total of 2.1 million acres;
- Administering the federally funded Community Forestry, Forest Health Protection, and Forest Stewardship programs; and
- Giving technical assistance to owners and managers of forested land.

The Division has a Central Office in Anchorage to provide policy and program direction, two Regional Offices in Palmer and Fairbanks, and five Area Offices—Fairbanks/Delta Area, Mat-Su/Southwest Area, Tok/Copper River Area, Kenai/Kodiak Area, and Southeast Area—to provide program support and fieldwork. As of December 2019, the Division had 58 full-time, 201 part-time/seasonal, and five non-permanent positions, for a total of 264 positions.

The Division has two overarching programs: Wildland Fire & Aviation and Forest Resource Management & Development. Forest Resource Management & Development includes the cooperative forestry programs. Wildland Fire & Aviation includes two components: Fire Activity and Fire Preparedness, which includes administration of the cooperative fire programs.

Division-wide capacity challenges

Alaska Division of Forestry staff are leaders in wildland fire management, forest management, forest practices, and cooperative forestry programs across the state. However, the Division of Forestry finds itself in a “do more with less” mode that exacerbates forest- and fire-management challenges. Since the last Forest Action Plan update, the Division’s forest resources program budget was reduced by 42% and lost 12.5 full-time positions, a huge impact considering the entire Forest Resource Management & Development program has only 30 full-time positions currently. The Division of Forestry 2018-2019 Strategic Plan highlights training, knowledge transfer, and recruitment to deal with the loss of experienced staff due to retirements and budget cuts as the Division’s most important actions.

Competition for personnel from both municipal and Federal agencies offering significantly higher wages is no longer offset by the State of Alaska’s retirement benefit program since the advent of Tier III and Tier IV employment plans, which have reduced benefits from Tier I and II plans. Recruitment for both forester and firefighting positions is a major problem and openings continue to be recruited within Alaska and nationally with very poor results.



Figure 66. Members of the Pioneer Peak Interagency Hotshots line up as they prepare to move to a new task after clearing an indirect line along the Tetlin River Fire. ©2020 ADOF. Photo by Sam Harrel

Wildland Fire & Aviation Program

The Division of Forestry (DOF) is the State's lead agency for wildland fire management on 150 million acres of land, which includes most of the state's road system and urban population centers. The Wildland Fire & Aviation Program's primary goal is to protect life and property by keeping 90% of fires in critical and full management options at 10 acres or less. The wildland fire management program plays a critical role in emergency management activities, including Incident Management Teams essential to effective, prompt response to disasters of all types. The Alaska Division of Forestry provides protection from wildland fire and other destructive agents on private, state, and municipal land (AS 41.15.010) in a safe, efficient and cost-effective manner. The Division of Forestry works cooperatively with local fire departments, the BLM Alaska Fire Service, USDA Forest Service, and hundreds of seasonal workers to minimize the impacts of wildland fire on people, property, and natural resources in Alaska.

Cooperative Fire Programs

The Wildland Fire & Aviation Program carries out a wide variety of State and Private Forestry cooperative fire programs. Division of Forestry Prevention staff deliver Firewise and other fire prevention and education programs. Prevention staff also participate at public events, conferences, and schools. The Division implements wildland urban interface projects to create fuel breaks and help homeowners create defensible space.

The Fire Training Program provides training to maintain a qualified and safe workforce, ready to respond to wildland fires and other emergencies. The Division of Forestry participates in the Federal Excess Personal Property Program to provide equipment and supplies for wildland firefighting in Alaska and assigns equipment to cooperating volunteer and structural fire departments. The Division of Forestry administers Volunteer Fire Assistance to provide help with training, equipment, and fire prevention on a cost-share basis to fire departments with a service area of fewer than 10,000 people. Rural fire departments are the first line of defense in coping with fires and other emergencies in rural areas. The demand for rural fire assistance funding consistently exceeds the amount of funding available.

Capacity challenges specific to the Wildland Fire & Aviation Program

Vacancies in key fire management positions, unavailability of firefighting aircraft, decreased Federal capacity, decreased numbers of Emergency Firefighting (EFF) crews, and increased vendor and contractual costs are all impacting the Division's ability to effectively and safely fight fire.

Most noteworthy is a significant loss of emergency firefighters (EFF). These temporary hires can make up a large portion of the workforce, particularly crews, during intensive fire seasons. The numbers of 20 person crews has diminished from 76 at its peak to five in 2020. Historically, these crews were the backbone of the labor-intensive work in wildland firefighting.

Critical shortages in dispatch, logistics, and experienced, professional-level fire managers have necessitated national recruitment often without success. The loss of key personnel due to the retirement of two-thirds of the Division's fire managers, supervisors, and fire personnel in the lead technician class has caused significant loss in institutional knowledge, increased the workload in training, and lowered the level of experience and qualifications, which has in turn resulted in increased risk to firefighters.

Facilities replacement and maintenance challenges

Facilities at Alaska Division of Forestry Area offices in Fairbanks (including the State Fire Warehouse), Kenai/Kodiak, McGrath, and Delta are acquisitions of 1950s and 1960s BLM buildings. These buildings are in disrepair, not energy efficient, and inadequate for today's fire management environment. This contributes to and magnifies many of the challenges highlighted above, such as employee recruitment and retention of staff and providing adequate protection from wildland fire in a cost-effective and safe manner. Without upgrading or building new facilities, DOF will continue to struggle with providing the necessities for its wildland firefighting workforce, which will hinder the Division's primary mission of protecting life and property.

Forest Resource Management & Development Program

The Forest Resource Management & Development Program contributes to the Division of Forestry's mission to provide a sustainable supply of forest resources to Alaskans. The program's core services are:

- To provide state timber to meet local demand within the limit of sustainable supply.
- Ensure compliance with the Alaska Forest Resources and Practices Act on state, municipal, and private lands.
- Provide technical and financial forestry assistance to diverse landowners and managers through cost-effective non-regulatory partnerships.

The Forest Resource Management & Development Program manages forests for multiples uses and sustained yield of renewable resources on 20 million acres of state land, including the three State Forests as well as timber resources on General Use state lands. The Program conducts personal use, commercial timber, and fuelwood sales and ensures the Alaska Forest Resources and Practices Act (AS 41.17) is implemented and enforced on state, private, and municipal land.

The Program also conducts forest inventory and implements the cooperative forestry programs. Recent budget cuts along with reorganization, resignations, and difficulty recruiting and retaining qualified staff have reduced capacity to offer state timber sales in Southeast Alaska. The division continues to offer sales, however, some of which include federal timber under the Good Neighbor Authority.

Cooperative Forestry Programs

The Cooperative Forestry Programs include Community Forestry, Forest Health, and Forest Stewardship. These programs provide technical and financial assistance to diverse landowners and managers through cost-effective, non-regulatory partnerships. The programs are funded entirely by federal and other grants, mainly from the USDA Forest Service. This is made possible through the Consolidated Payments Grant, which allows the Division of Forestry's entire budget, which is largely for fire suppression, to count as match for the Cooperative Forestry Programs.

Over \$1 million in federal funds are infused annually into the state economy through these programs. In addition, local governments and organizations contribute matching funds for projects. The economic impact of the technical and financial assistance to Alaska Native Corporations, other private forest landowners and businesses, boroughs, and local governments is substantial.

Community Forestry Program

The national Urban and Community Forestry (UCF) Program was established by Congress to improve the condition and extent of community trees and forests in cities, suburbs, and towns nationwide. It encourages states to provide information and technical assistance to units of local government and others that will encourage cooperative efforts to plan urban forestry programs and to plant, protect, maintain, and utilize wood from trees in open spaces, greenbelts, roadside screens, parks, woodlands, curb areas, and residential developments in urban areas.

In 1991 Alaska joined this nationwide effort when the Division of Forestry partnered with the USDA Forest Service to receive federal funds to administer the Alaska Community Forestry Program. The Forest Service has four basic performance requirements for states to receive this funding:

1. An urban and community forestry program coordinator
2. Volunteer/partnership coordination
3. An urban and community forestry council
4. A state program strategic plan (five-year plan)

The Alaska Community Forestry Program fulfills these performance requirements with a full-time program coordinator, a community assistance forester, the volunteer Alaska Community Forest Council (ACFC), and a strategic plan. Staff provide technical and educational assistance to communities, tree care professionals, volunteer organizations, businesses, and universities. The ACFC helps set program priorities and provides expertise and advice to the division. The ACFC also raises funds from various sources as a 501(c)(3) nonprofit organization and provides grants in conjunction with State and Federal funding. The fifteen-member council represents the diversity and broad spectrum of interests and experiences in the state. The members are valuable partners in community forestry efforts.

Mission. The mission of the Alaska Community Forestry Program is to: **Help communities build effective, self-sustaining community forestry programs with strong local support.**

Supporting community forestry is important because:

- Community forests provide essential services and benefits that we cannot live without;
- A healthy community forest is the result of proper planning, management and community investment;
- Healthy community forests can help solve community problems; and
- Community forests and rural forests are connected and good management of one helps the other.

Trees and greenspaces confer many health, social, economic, and environmental benefits. The Community Forestry Program helps communities enhance these benefits through effective management. Focusing program delivery on sustainable management can help solve landscape-scale problems that affect thousands of Alaskans: air and water quality, climate change, energy consumption, loss of resources to urbanization and fragmentation, and natural disasters. Community forest sustainability is

Community Forestry Program Highlights

Since the inception of the Alaska Community Forestry program in 1991, 59 Alaska communities have received a grant for community tree plantings, green infrastructure projects, or tree inventories.

Celebrated the 50th Anniversary of Arbor Day in Alaska in May 2016.

Administered Landscape Scale Restoration grants in Fairbanks in 2015 and in Anchorage in 2016.

Assisted six communities, three utilities, and one university in either becoming or retaining their status as an Arbor Day Foundation Tree City USA, Tree Line USA, or Tree Campus USA respectively.

Updated the Anchorage Bowl Tree Canopy Assessment in 2018.

Contributed to the Municipality of Anchorage's 2019 Climate Action Plan, Urban Forest and Watershed sector.

Helped sponsor several International Association of Arboriculture classes taught by nationally recognized experts.

measured by how well the network of trees, forests, and related natural resources contribute to human quality of life in cities and villages.

The Alaska Community Forestry Program focuses its efforts on three areas of need. Each area requires a different approach and different kind and level of state service.

1. Communities that have initiated community forestry programs but need technical and financial assistance to survive and grow into sustainable and effective programs.
2. Communities with potential but currently no or limited management programs for trees and forests.
3. Communities where forest management is important to quality of life but local program establishment is unlikely due to the community's size, structure, or lack of resources.



Figure 67. The 2020 Run for Women raised awareness for the benefits of community trees and forests by giving away 100 trees donated by International Paper.

NATIONAL TEN-YEAR URBAN AND COMMUNITY FORESTRY ACTION PLAN 2016-2026

The national plan was created by and for the urban forestry community and serves as the framework for funding and recommendation priorities for the USDA Forest Service's National Urban and Community Forestry program and National Challenge Cost Share Grants.

Plan Vision: Urban and community forests increase sustainability, wellness, and resilience in all communities.

Plan Mission: Help all communities create urban and community forests that are diverse, healthy, and accessible for all citizens.

1. Integrate urban and community forestry into all scales of planning.
2. Promote the role of urban and community forestry in human health and wellness.
3. Cultivate diversity, equity, and leadership within the urban forestry community.
4. Strengthen urban and community forest health and biodiversity for long-term resilience.
5. Improve urban and community forest management, maintenance, and stewardship.
6. Diversify, leverage, and increase funding for urban and community forestry.
7. Increase public awareness and environmental education to promote stewardship of urban and community forests.

Forest Health Program

The Forest Health Program provides assistance to State, municipal, and private entities and individuals in the following areas:

- Forest health diagnostics—What is wrong with the trees?
- Forest insect mitigation—Can something be done about it?
- Investigation of forest insect impacts—Ecological and economical
- Surveys and monitoring—Native and invasive threats
- Outreach and education—Through presentations, reports, and other means

The Forest Health Program consists of the program manager, and currently, a nonpermanent forester. The major trends that have affected the implementation of the Forest Health Program over the last ten years include survey technologies and the changing climate. Program priorities focus on insect pests, forest pathogens, and abiotic stressors such as wind damage and flooding. Program activities include monitoring and surveying forest health conditions, supporting research, and providing technical and financial assistance to non-federal landowners.

Monitoring and Surveying Forest Health Conditions

The Forest Health Program, in cooperation with USDA Forest Service Region 10 – Forest Health Protection monitors forest health throughout Alaska across all landownerships through both ground-based and aerial surveys. Aerial surveys are the dominant means by which the program assesses statewide forest health each year, covering roughly 15% of the forested land in the state annually. Aerial detection surveys are an indispensable tool in documenting the location and extent of many active forest insect infestations, abiotic damage events, and some disease damage. The data recorded from the annual aerial detection surveys offer a snapshot of statewide conditions though they generally do not represent the acres affected by pathogens, many of which are not readily visible by aerial survey. The Forest Health Program puts significant effort into improving monitoring and surveying techniques and adopting new technology to better capture forest conditions.

The Forest Health Program also administers the Early Detection Rapid Response Program for invasive forest insects.

Supporting research

Forest Health Program staff are involved in cooperative research to develop new tools for forest insect management in Alaska. Alaska is far from much of the innovative research being conducted in forest health, and the Forest Health Program works to identify research opportunities and entice collaborators from across the country to address Alaska's most vexing forest health issues.

Technical and financial assistance for non-federal landowners

The Forest Health Program provides technical assistance to non-federal landowners. In 2018, the Forest Health Program took over administration of the Western Bark Beetle Initiative cost-share grant program from the USDA Forest Service Forest Health Program. The grants help non-federal landowners with bark beetle prevention, suppression, or restoration efforts. This program has been in extremely high demand because of the Southcentral spruce beetle outbreak.

Public outreach and education

Forest Health Program staff conduct public outreach and education about forest insects, disease, and abiotic stressors through presentations, publications, workshops, and media interviews.

Forest Stewardship Program



Figure 69. Perched high above Willow Creek, this cabin is on a property that received a Forest Stewardship Plan to help mitigate the spruce beetle outbreak. This area experienced over 90% mortality of white spruce. ©2020 ADOF. Photo by Trevor DoBell-Carlsson

The goal of the Forest Stewardship program is to provide landowners with professional technical forestry assistance to help guide their decisions about how to manage their forest land. The Forest Stewardship Program has a program manager and two stewardship foresters, one based in Fairbanks and the other on the Kenai Peninsula.

The Forest Stewardship foresters respond to the requests of individual private landowners to prepare Forest Stewardship Plans that include field visits and contain technical forestry advice. Stewardship Plans address forest health issues, reforestation, timber stand improvement, and defensible space from wildland fire. The Forest Stewardship program provides pass-through grants to Alaska Native Corporations, the largest private landowners in Alaska, to hire private consulting foresters to prepare Stewardship Plans.

The Forest Stewardship program receives guidance from the Forest Stewardship Committee, which is comprised of representatives from a broad range of Alaska landowner and land management interests. Areas of discussion include grant and cost-share rates, eligibility criteria, outreach methods, and Stewardship Plan requirements.

Assisting Alaska Native Corporations

Alaska Native Claims Settlement Act (ANCSA) corporations hold most of the private forest acreage in Alaska. Serving these groups contributes greatly to national program goals since these large land holdings more often experience active forest management (thinning, pruning, habitat restoration) than do smaller private ownerships due to economy of scale and lack of local timber markets accessible to small ownerships. Recently, ANCSA corporations have expressed interest in Forest Stewardship Plans for innovative forest uses such as carbon credit markets and wood energy/biomass fuels. Working with the Alaska Energy Authority and the Alaska Wood Energy Development Task Group, the Forest

Stewardship Program has developed Forest Stewardship Plans for ANCSA corporations that have entered the carbon credit market or developed community heating systems using sustainably harvested wood in modern wood boilers. Forest Stewardship Plans are also key to accessing funding for forest and fuels management through other programs, including Natural Resources Conservation Service (NRCS) funding through the Environmental Quality Incentives Program (EQIP).

Assisting Individual Landowners

Owners of forested land in Alaska are faced with few options for managing their forests; the timber industry in much of Alaska is geared towards timber sales on state-owned, trust-managed, or ANCSA land in areas of relative proximity to mills. Small private landowners often do not have the ability to enter the timber market and are thus not incentivized to manage their forests. Of the 1,085 plans written for private Alaskan landowners since 1992, the average property size has been 50 acres; however, the median property size is 15 acres—a few large outliers skew the perspective. For these owners, technical advice includes firewood harvesting, reforestation following spruce beetle outbreaks and wildfires, wildlife habitat enhancement, and reducing risk from wildland fire. The main outreach method used to reach private landowners is wildland fire mitigation through fuels management using funds from competitive Wildland Urban Interface grants funded by the USDA Forest Service and Council of Western State Foresters. This allows the program to provide cost-sharing to landowners to incentivize forest management (typically limited to ~1 acre thinning/pruning projects); often, Forest Stewardship Plans are written for these projects, resulting in more national program goal accomplishments including number of plans written and acreage treated.

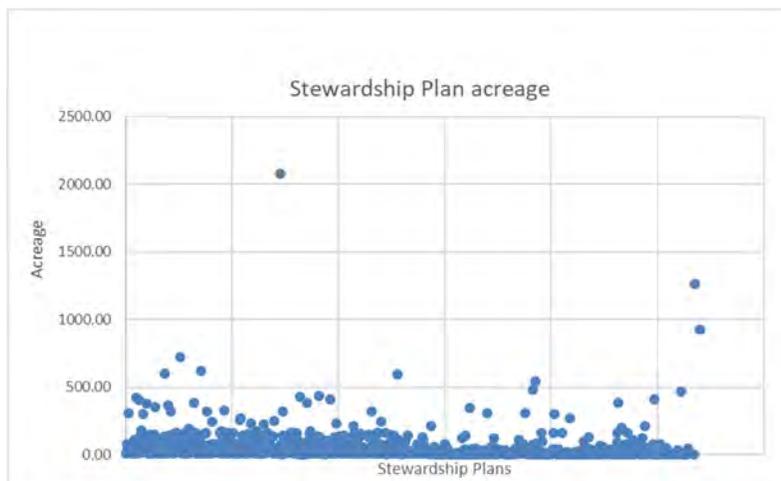


Figure 70. With the exception of large-acreage outliers, the median property size of Forest Stewardship Plans in Alaska since 1992 is 15 acres.

Cost-Share Assistance

In Alaska, the Forest Stewardship Program focuses much of its outreach on private forest landowners by providing advice on ways to mitigate the risk of wildfires. Cost-share funding for hazardous fuel reduction practices on private land has come from wildland urban interface (WUI) fuels reduction grants from the Council of Western State Foresters.

WUI grants are an important outreach method for increasing participation in the Forest Stewardship Program and are used to increase the conservation education delivered by the Division of Forestry. The small grants that are available through these programs typically represent the only financial incentive landowners have to manage their forests.

The Forest Stewardship Program also plays a role in ensuring that educators throughout the state have access to the nationally recognized Project Learning Tree environmental education curriculum, recognizing the importance of teaching K-12 students about natural resources. This has been accomplished through sub-grants to a variety of entities including University of Alaska Fairbanks Cooperative Extensive Service and the Alaska Association of Conservation Districts.

Program Delivery

With federal funding decreasing and no state funding ever having been made available for landowner assistance (an exception among the other states and territories which offer state funding to provide more effective help to landowners), prioritization will shift to working within the Forest Stewardship Priority Area, due for revision in 2021.

Funding for grants to Alaska Native Corporations for Stewardship Plan development will continue to be prioritized; accomplishments by these entities contribute to national goals.

From a high of \$600,000 in FY11 to FY20 funding at \$290,000, the Forest Stewardship Program has seen a downward trend in budget year after year. At current levels 12 months of staff payroll is not supported without other grant funding, which is not guaranteed.

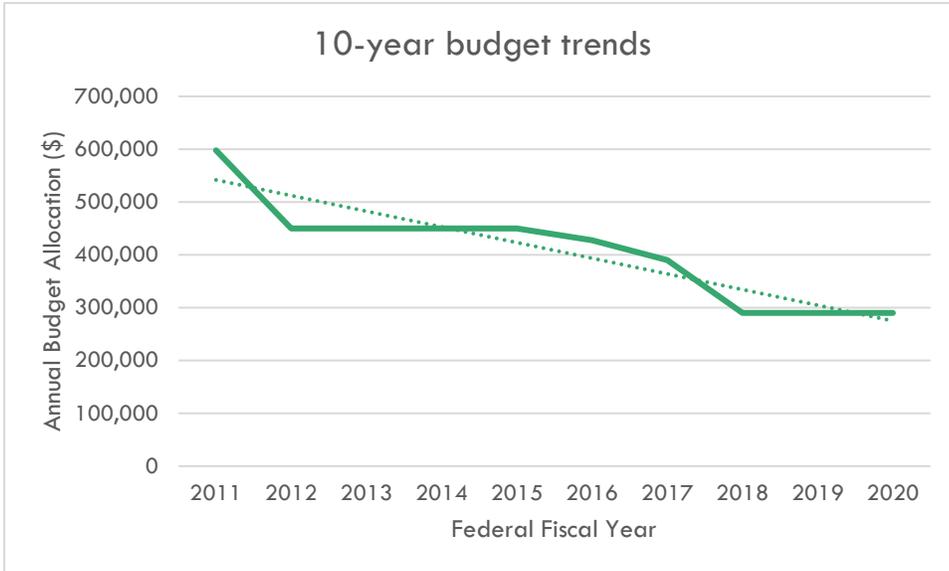


Figure 71. The annual federal allocation to the Forest Stewardship Program has declined by 50% in the last ten fiscal years. With no direct funding by the State of Alaska, the program operates at a minimal level at current funding levels.

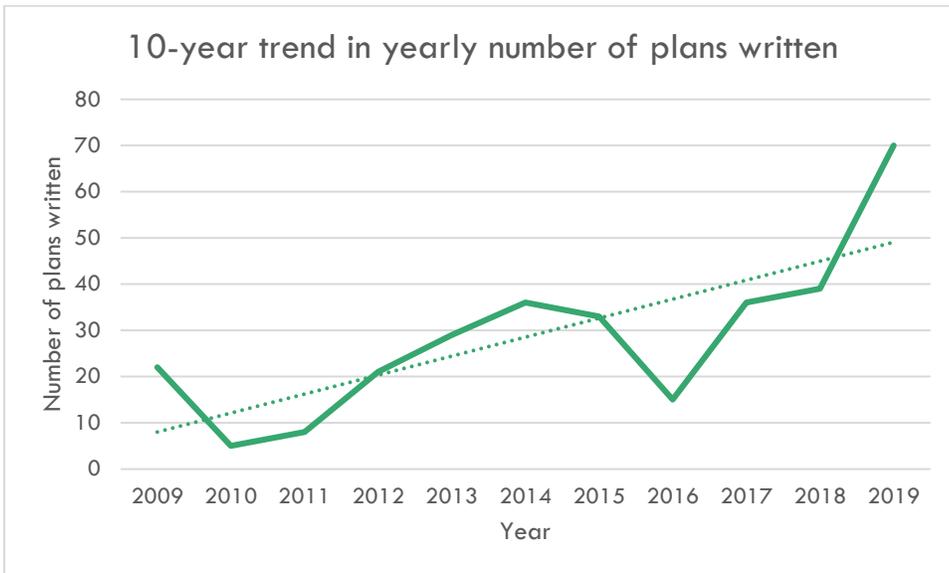


Figure 72. To accompany the trend of decreasing annual budget, there has been increasing demand for technical assistance, driven sharply since 2017 by a spruce beetle outbreak in Southcentral.

Private landowners in Alaska are seeking advice about their forests at an increasing rate, at a time when the program needs to limit how many people it can serve. Threats from destructive forest insects, wildfire, and a changing climate are driving more people to seek forest management advice, and the Alaska Division of Forestry is not well positioned to be able to serve these needs without more effective funding source and delivery.

Forest Inventory and Analysis

In Interior Alaska, since 2015 the Division of Forestry has partnered with the USDA Forest Service through a Joint Venture Agreement to extend the USDA Forest Service's Forest Inventory and Analysis (FIA) program into the boreal forest. The FIA program provides information to assess America's forests. As the nation's continuous forest census, the program projects how forests are likely to appear 10 to 40 years from now. This is especially important in Alaska where significant changes in temperature, permafrost, and plants are occurring and expected to increase. A suite of information is sampled at each plot including trees, soils, plants, and woody debris. The plots are remeasured at regular intervals. DOF field crews completed the fourth year of the Interior Forest Inventory and Analysis Program in partnership with the U.S. Forest Service. Crews completed the Tanana Valley unit in 2018 and the Susitna-Copper unit in 2020. Crews transitioned to the Southwest unit where they will spend the next few years.



Figure 73. An FIA crew navigates through a burned stand in the Tanana Unit. ©2020 ADOF. Photo by Chris Ferguson.

Forest Legacy Program

The State of Alaska lead agency for the Forest Legacy Program was the Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation from the Program's inception in Alaska through 2019. In December 2020, the Division of Forestry assumed the role of state lead agency. The purpose of the Forest Legacy Program is to ascertain and protect environmentally important forest areas that are threatened by conversion to non-forest uses and, through the use of conservation easements and other mechanisms, promote forest land protection and other conservation opportunities. The Forest Legacy Program relies exclusively on voluntary, willing sellers so that working forests remain working forests.

Between 2003 and 2008, five projects conserved nearly 5,000 acres of forest land adjacent to and near State Park units through acquisition of seven tracts of real property and one conservation easement. Currently, the Forest Legacy Program is in maintenance status and responsible for monitoring Forest Legacy parcels for compliance. The Forest Legacy Program 2002 Assessment of Need is attached as Appendix B. The Alaska Forest Stewardship Committee approved using the 2002 Assessment of Need as the Forest Legacy Program information for the 2020 Forest Action Plan. The 2020 Alaska Forest Action Plan updates the required topics in the 2002 Assessment of Need; however, should the Forest Legacy Program move into a phase of active project development, the Forest Legacy Program would need to update the Assessment of Need to reflect assumption of the Program by the Division of Forestry.

Funding sources

Consolidated Program Grant

Under the authority of the Cooperative Forestry Assistance Act, the USDA Forest Service provides the Consolidated Program Grant to the Division of Forestry annually. The Division of Forestry matches this grant through its total budget expenditures at a 1:1 ratio. Effectively, the Consolidated Program Grant funds the Cooperative Fire and Cooperative Forestry programs in their entirety.

Western Bark Beetle Initiative

The Western Bark Beetle Initiative is a federal grant program through the USDA Forest Service which funds bark beetle prevention, suppression, and restoration practices on non-federal lands. The program requires a 1:1 federal to non-federal match. In Alaska, Western Bark Beetle Initiative grants are typically for Ips or spruce beetle projects. Until 2018, this program was implemented by the USDA Forest Service in Alaska. In 2020, the Division of Forestry distributed its first pass-through grants to non-federal landowners.

Landscape Scale Restoration Grants

The Landscape Scale Restoration program is a competitive grant program through the USDA Forest Service State and Private Forestry that promotes collaborative, science-based restoration of priority forest landscapes and furthers priorities identified in State Forest Action Plans. Landscape Scale Restoration projects address large-scale issues including wildfire risk reduction, watershed protection and restoration, and the spread of invasive species, insect infestation, and disease. These grants can include multiple jurisdictions, including tribal, state and local governments, and private forest land.

State Fire Assistance Wildland Urban Interface Grant Program

Wildland Urban Interface Grants are awarded competitively each year through the Council of Western State Foresters. The Division of Forestry has used these grants to provide pass-through grants to homeowners in high-risk areas to reduce hazardous fuels on their properties.

Volunteer Fire Assistance

The Volunteer Fire Assistance program provides funds to increase firefighter safety, improve the firefighting capabilities of rural volunteer fire departments, and

enhance protection in the wildland urban interface. The funds come through the U.S. Forest Service and are administered by the Division of Forestry.

The Non-Fed Wildfire Hazard Mitigation Program

These USDA Forest Service grants support hazardous fuel reduction projects that incorporate treatments in landscapes on non-federal land, give priority to areas that pose the highest risk to communities and any priority areas identified in applicable State-wide forest resource assessments, shared stewardship priorities, or strategies under section 2(A) of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2101a(a)), as mutually agreed to by the State Forester and the Regional Forester. "Non-federal lands" include state, county, Tribal, private, and other non-federal lands.

Forest Legacy Program project funding

Forest Legacy Program project funding comes from the Land and Water Conservation Fund and is distributed by the USDA Forest Service. This funding supports land acquisition and conservation easements to keep working forests as forests and preserve important forest lands. Projects are funded at a 75:25 ratio of federal to non-federal match. In 2020, the Forest Legacy Program received permanent funding through the Great American Outdoors Act.

Good Neighbor Authority

The Good Neighbor Authority (GNA) program, established in 2014, allows the USDA Forest Service (USFS) and the Bureau of Land Management (BLM) to enter into cooperative agreements or contracts with states to restore watersheds and provide forest management on National Forest System and BLM-managed lands. The Alaska Region of the USDA Forest Service and the Division of Forestry signed a GNA master agreement in November 2016. The first sale under GNA was the 30 MMBF Kosciusko Island GNA timber sale on the Tongass National Forest in 2017. The second sale under GNA was the Vallenar Bay timber sale in 2019 for 16 MMBF on the Tongass National Forest (3 MMBF) and Southeast State Forest (13 MMBF). A GNA forest health improvement project agreement began on the Chugach National Forest in 2018.

The BLM also uses GNA authority to enter into mutually beneficial agreements with the Division of Forestry for fuels management and fire protection. The first GNA project agreement was entered into with the BLM in 2020 for the development of Community Wildfire Protection Plans in the Copper River communities.

Challenge Cost Share Agreements

Challenge Cost Share Agreements allow the USDA Forest Service to cooperatively develop, plan, and implement mutually beneficial projects with other parties. The Division of Forestry and the USDA Forest Service collaborated with Southeast communities and other partners through a Challenge Cost Share Agreement for the Tongass Young Growth Project, signed in 2015, to gather young-growth information and increase economic opportunities for communities in both the short- and long-term. The Division of Forestry was the lead partner in this effort, coordinating over \$5 million in federally funded activities. For the Tongass Young Growth Inventory, Division of Forestry crews have inventoried 30,000 acres of second growth timber on the Tongass National Forest, as well as installed plots on state forest and state general use lands ranging from Petersburg to Ketchikan and on Prince of Wales Island. The compiled dataset provides volume by species, sort and grade by individual sampled stand and strata. The Division of Forestry will use the data from State lands to refine the Southeast Area's Five-Year Schedule of Timber Sales and assist in old growth management. Reconnaissance of future timber sales will be more targeted with a focus on volume metrics, quality, and operability. A web mapping application will be created that holds the new data and will be available to industry and the public to query the timber resources within this area of Southeast.

Joint Venture Agreements

USDA Forest Service Joint Venture Agreements allow the Forest Service and other parties to pool resources and share costs for research activities of mutual interest.

Shared Stewardship

While not a direct funding source, Shared Stewardship can facilitate putting funding to efficient use. In 2018, the USDA Forest Service developed an outcome-based investment framework called "Shared Stewardship" to meet priorities across the shared landscape by targeting investments to areas where they will have the highest payoffs. Shared Stewardship uses existing tools and authorities to achieve mutually desired cross-boundary outcomes. While the Alaska Division of

Forestry and the Forest Service have not entered into a formal Shared Stewardship Agreement, there is longstanding cooperation between the two agencies.

The DOF and the USFS have a long history of cross-boundary cooperation for fire management through all-risk incident management teams, fuels reduction, and forest management. The DOF and USFS also cooperate statewide on forest resource inventory and through the Cooperative Forestry Assistance Act Programs for forest health monitoring and research, support for community forestry management, and technical and financial assistance to private forest landowners. Recently the DOF has implemented fuels reduction and Young Growth timber projects on National Forest System lands using the Good Neighbor Authority.

Joint Chiefs Landscape Restoration Partnership

The USDA Forest Service and the Natural Resources Conservation Service select new three-year joint projects each year to restore landscapes, reduce wildland fire threats to communities and landowners, protect water quality, and enhance wildlife habitat.

Natural Resources Conservation Service Cost-Share Programs

The Natural Resources Conservation Service (NRCS) provides cost-share funding for agricultural (including forestry) producers to improve resource conditions and implement conservation practices to address natural resource concerns on their land. The Environmental Quality Incentives Program (EQIP) provides funding for forestry practices, and private forest landowners who receive Forest Stewardship Plans from the Division of Forestry may be eligible for EQIP funding. The Forest Stewardship Program opens the door for forest landowners to seek financial assistance from NRCS for forestry projects.

Pittman-Robertson Act Funding for Access to Wildlife Resources

The Federal Aid in Wildlife Restoration Act, commonly referred to as the Pittman-Robertson Act, provides federal funds to provide public use and access to wildlife resources, direct habitat enhancement treatments (including prescribed fire), and fuel break development to allow for wildland fire management to benefit habitat; all of these can be paired with wildland fire mitigation and forest health activities to achieve multiple objectives. These funds are

administered by the Alaska Department of Fish and Game, Division of Wildlife Conservation, Hunter Access Program, which provides competitive grants based on a 75:25 federal to non-federal funding match.

Sikes Act Cooperation Funding

The Sikes Act provides for cooperation between military installations and state agencies. The Division of

Forestry has a funding agreement with U.S. Army Garrison Alaska (Fort Wainwright) and Joint Base Elmendorf-Richardson (JBER) for general forestry and wildfire hazard fuel reduction.



Figure 74. Mixed white spruce and paper birch forest in Southcentral. ©2020 ADOF

Partners

Partners with mutual goals are an invaluable resource in addressing the threats to Alaska's forests. Partners include, but are not limited to, federal agencies, state and local governments, soil and water conservation districts, organized partnerships, nonprofit organizations, volunteers and community-based organizations, academic institutions, tribal governments, Alaska Native Corporations, and professional and trade associations. The partners described below are meant to illustrate ways interested groups can work together to conserve Alaska's forests. This is not an exclusive or exhaustive list—Alaska's community of interested forest cooperators is large and hopefully will continue to grow. The Forest Action Plan can be thought of as a large tent where all are welcome to gather and work together for Alaska's forest resources.

Federal Agencies

The USDA Forest Service (USFS) is a crucial partner at the State and Private Forestry, Regional, and National Forest levels. USFS State and Private Forestry is the Division of Forestry's sister agency in the Cooperative Fire and Cooperative Forestry Programs and funds the Division of Forestry's cooperative programs in their entirety through the Consolidated Payment Grant. The USFS Pacific Northwest Research Station supports a wide-range of forestry research in Alaska and includes the Alaska Wood Utilization Research and Development Center, the Forestry Sciences Laboratory in Juneau and Anchorage, and the Boreal Ecology Cooperative Research Unit in Fairbanks. The U.S. Fish and Wildlife Service and National Park Service are also valuable partners in coordination for fire-related issues, as well as invasive plant issues. The Bureau of Land Management is working on wood energy projects in the Interior, an issue with substantial benefits from collaboration. The Natural Resources Conservation Service is a key partner in assisting private landowners, particularly through cost-share funding programs such as the Environmental Quality Incentives Program. The Department of Defense's military installation forestry and wildland fire staff are also valuable cooperators in fuels and fire management. The Bureau of Indian Affairs holds the federal government's trust responsibility for sustainably managing Tribal forests, which includes the Metlakatla Indian Community's Annette Island Reserve and native allotments throughout the state.

State Agencies

The Department of Natural Resources, Division of Agriculture is a key partner in addressing invasive plant and insect species, and in managing Alaska's native tree seed supply as well as native shrub and forb seeds through its Plant Materials Center in Palmer. In addition to seeds, the Plant Materials Center also provides cuttings and seedlings. The Alaska Department of Fish and Game is also an important partner in addressing invasive species, particularly aquatic vegetation such as elodea. Additionally, Alaska Department of Fish and Game supports maintaining and improving wildlife habitat through forest and fuels management. The Alaska Department of Fish and the Department of Environmental Conservation are crucial partners in implementing the Forest Resources and Practices Act to preserve fish habitat and water quality and quantity. The Alaska Energy Authority, a public corporation of the State of Alaska, is active in wood energy efforts. Soil and Water Conservation Districts are a subdivision of State government and are important partners for on-the-ground implementation of forestry projects. Project Learning Tree is currently administered by a Soil and Water Conservation District, and Soil and Water Conservation Districts help on diverse projects including tree seedling distribution and invasive species control through Cooperative Weed Management Areas.

Municipal Agencies

Borough and city governments are crucial partners in addressing a wide variety of issues, including wildland fire risk reduction through planning and zoning, mitigating the effects of spruce beetle outbreaks, public education including through the school districts, and improving the community benefits of trees and forests.

Alaska Native Tribes

Alaska Native people have been stewards of Alaska's forests for thousands of years and the importance of Alaska Native Tribes as partners cannot be overstated. Alaska Native Tribes and tribal members address forest-related issues affecting the areas traditionally used by the Tribe and collaborate in working groups and technical committees throughout Alaska on forest-related issues.

Alaska Native Corporations

As the largest private landowners in Alaska and active forest managers and producers of forest products, Alaska Native Corporations are vital partners in addressing cross-boundary forest threats. Alaska Native Corporations are an important source of professional forest worker capacity and professional knowledge because of their staff foresters, forestry technicians, and wildland firefighters. Alaska Native Corporations are the primary partners of the Forest Stewardship Program, with over 7 million acres in Forest Stewardship plans statewide. Alaska Native Corporations also work to maintain and improve fish and wildlife habitat through forest and fuels management. Additionally, they are Alaska's participants in the carbon credit markets.

Organized Partnerships

Partnerships organized around specific issues or certain geographic areas provide a way to leverage resources to achieve goals that would not be attainable by any one agency. The Alaska Fire Science Consortium is a regional consortium supported by the Joint Fire Science Program and is part of a national fire science knowledge exchange network. The Kenai Peninsula's All Lands All Hands group has long fostered cross-boundary cooperation on issues including wildland fire, wildlife habitat, and spruce beetle. The Alaska Invasive Species Partnership includes individuals representing agencies and organizations statewide to provide statewide leadership in the prevention and reduction of the impacts from invasive species in Alaska. The Alaska Wood Energy Development Task Group is a coalition of federal and state agencies and not-for-profit organizations that explores opportunities to increase the utilization of wood for energy and biofuels production in Alaska.

Non-Governmental Organizations

Alaska has a wide variety of committed citizens groups who work on forest-related issues. These groups help develop solutions to forest threats and implement forest-related projects. NGOs working on forest-related issues include conservation land trusts, trails and cabins groups, hiking/biking/skiing groups, hunter and angler groups, timber and forest products organizations, wood/renewable energy groups, professional societies, universities, commercial fishing groups, and fish and wildlife habitat conservation groups.

Alaska Forest Action Plan Strategies Matrix

This matrix is intended as a helpful guide to understanding how the forest benefits, threats, strategies and resources fit together. The items contained in the matrix are examples and not meant as an exhaustive list.

	Strategy	Division of Forestry Programs	Funding Sources	Partners	Affiliated NASF Performance Measures	Benefit/ Threat
1	CONSERVE AND MANAGE WORKING FORESTS					
1.1	Monitor and ensure sustainable forest practices	Forest Resource Management & Development		ADEC, ADF&G	Forests in Priority Watersheds are healthy	Watershed values, fish habitat, Forest products & timber management, Ecosystem services
1.2	Assist private landowners to conserve and manage their forests	Forest Stewardship	NRCS, CPG	Alaska Native corporations, NRCS, USFS SPF, SWCD, NGO	Stewardship investments align to Priority	Forest products & timber management, Non-timber forest products, Fish & wildlife habitat, Subsistence, Carbon storage, Wildland fire, Forest insects & disease
1.3	Maintain and improve fish and wildlife habitat	Forest Stewardship	NRCS, LSR, CPG	ADF&G, Alaska Native corporations, USFS SPF	Forests in Priority Watersheds are healthy	Fish and wildlife habitat, Subsistence, Ecosystem services, Watershed values
1.4	Support non-timber forest products	Forest Stewardship	NRCS	Alaska Native corporations, USFS, DNR/DMLW, UA CES		Non-timber forest products, Subsistence
1.5	Support wood products opportunities	Forest Stewardship, Forest Resource Management & Development	GNA, Challenge Cost Share, Joint Venture	NRCS, USFS, Alaska Native corporations, NGO, DNR/Ag. PMC	Jobs are maintained or increased	Forest products & timber management, Energy independence, Reduced forestry infrastructure
2	PROTECT FORESTS FROM THREATS					
2.1	Cultivate fire adapted communities	Wildland Fire & Aviation, Forest Stewardship	CWPP, VFA, SFA WUI Grants, NRCS, CPG	Local government, USFS SPF, DNR/DMLW, ADEC	Wildfire Risk is Reduced, Capacity is built with Responders	Wildland fire, Climate change
2.2	Manage fuels to reduce risks to communities and to benefit forest ecosystems	Wildland Fire & Aviation, Forest Stewardship, Forest Health	SFA WUI Grants, CPG, LSR	ADF&G, USFS SPF and R10, NRCS, Alaska Native corporations organized partnerships	Wildfire Risk is Reduced, Forests in Priority Watersheds are healthy	Forest products & timber management, Energy independence, Wildlife habitat, Wildland fire, Climate change, Forest insects & disease
2.3	Monitor and mitigate economic and ecological impacts of forest insects and disease	Forest Health, Forest Stewardship	WBBI, LSR, CPG	USFS SPF, DNR/Ag., UA CES		Ecosystem services, Forest products & timber management, Forest insects & disease, Wildland fire, Climate change

	Strategy	Division of Forestry Programs	Funding Sources	Partners	Affiliated NASF Performance Measures	Benefit/ Threat
2.4	Prevent, identify, and control invasive species	Forest Health, Community Forestry	EDRR, CPG	USFS SPF, DNR/Ag., UA CES, ADF&G, NGOs		Ecosystem services, Fish & wildlife habitat, Watershed values, Forest insects & disease, Climate change
2.5	Retain working forest and important forest land	Forest Legacy	Forest Legacy	Conservation land trusts		Ecosystem services, Forest products & timber management, Forest conversion & fragmentation, Reduced forestry infrastructure
3	ENHANCE PUBLIC BENEFITS FROM TREES AND FORESTS					
3.1	Maximize the benefits of trees and forests to communities	Community Forestry	CPG	SWCD, NGOs, USFS SPF	U&CF Programs target stormwater runoff mitigation	Community benefits, Ecosystem services, Fish habitat, Watershed values, Forest recreation, Forest conversion & fragmentation, Climate change
3.2	Provide sustainable forest recreation opportunities	Forest Resource Management & Development, Community Forestry	Pittman-Robertson	ADF&G, DNR/Div. of Outdoor Parks and Recreation		Forest recreation, Reduced forestry infrastructure
4	ALL PRIORITIES					
4.1	Increase fire and forest management capacity	All	VFA	All	Capacity is built with Responders	All
4.2	Educate and involve people regarding forest threats, benefits, and opportunities	All				All
4.3	Support forest science and new technology and methods to better understand and manage Alaska's forests	All		USFS, universities		All
4.4	Obtain better forest- and fire-related information	All				All

Acronyms Key:

- ADEC. Alaska Department of Environmental Conservation
- ADF&G. Alaska Department of Fish & Game
- NRCS. Natural Resources Conservation Service
- USFS SPF. USDA Forest Service State and Private Forestry
- SWCD. Soil and Water Conservation Districts
- NGO. Non-governmental organization
- LSR. Landscape Scale Restoration
- CPG. Consolidated Payment Grant
- DNR/DMLW. Department of Natural Resources/Division of Mining, Land, and Water
- UA CES. University of Alaska Cooperative Extension Service
- GNA. Good Neighbor Authority
- DNR/Ag. PMC. Department of Natural Resources/Division of Agriculture, Plant Materials Center
- CWPP. Community Wildfire Protection Plan
- VFA. Volunteer Fire Assistance
- SFA WUI. State Fire Assistance Wildland Urban Interface
- WBBI. Western Bark Beetle Initiative
- EDRR. Early Detection and Rapid Response

Evaluating Implementation of the Forest Action Plan

The implementation of the Forest Action Plan may be evaluated using the National Association of State Foresters (NASF) Performance Measures. To date, these performance measures include the following:

- **Wildfire Risk is Reduced** through active Forest Management
- **Capacity is built with Responders** in Highest Priority Districts
- **Forests in Priority Watersheds are healthy** and being sustained
- **U&CF Programs target stormwater runoff mitigation** to impervious communities
- Timber Product Output-linked **Jobs are maintained or increased** in Priority Counties
- **Stewardship investments align to Priority** Counties

The NASF Performance Measures applicable to each strategy are noted in the Strategies Matrix. Because the NASF Performance Measures are national, the date for Alaska is still being developed for some of the measures. Over the life of the Forest Action Plan, the Performance Measures application in Alaska is expected to improve.

Additionally, the USDA Forest Service and Alaska Division of Forestry Cooperative Programs each has its own performance reporting measures, which can be used to evaluate the effectiveness of the Cooperative Programs in implementing this plan.



Figure 75. The NASF Performance Measures are intended to make compelling, quantifiable, and nationally consistent cases about the value of federal investments in state and private forestry programs.

Stakeholder Coordination

Stakeholders are integral to the success of conserving Alaska’s forests, addressing threats, and making the most of the benefits of forests. Stakeholders for the 2020 Forest Action Plan were identified from the 2010 Forest Action Plan stakeholder list, regular cooperators on Division of Forestry projects, and the list of required stakeholders for Forest Action Plans. New stakeholders and issues were also identified by featuring the Forest Action Plan at the Alaska Division of Forestry booth at the 2020 Alaska Forum on the Environment.

Key Division of Forestry staff were interviewed to identify forest benefits, threats, and strategies. All Division of Forestry staff were invited to respond to a survey on those issues as well as the overall framework of the plan. The results were used to develop a stakeholder survey, which was distributed to potential stakeholders along with an invitation to be more involved with the development of the Forest Action Plan.

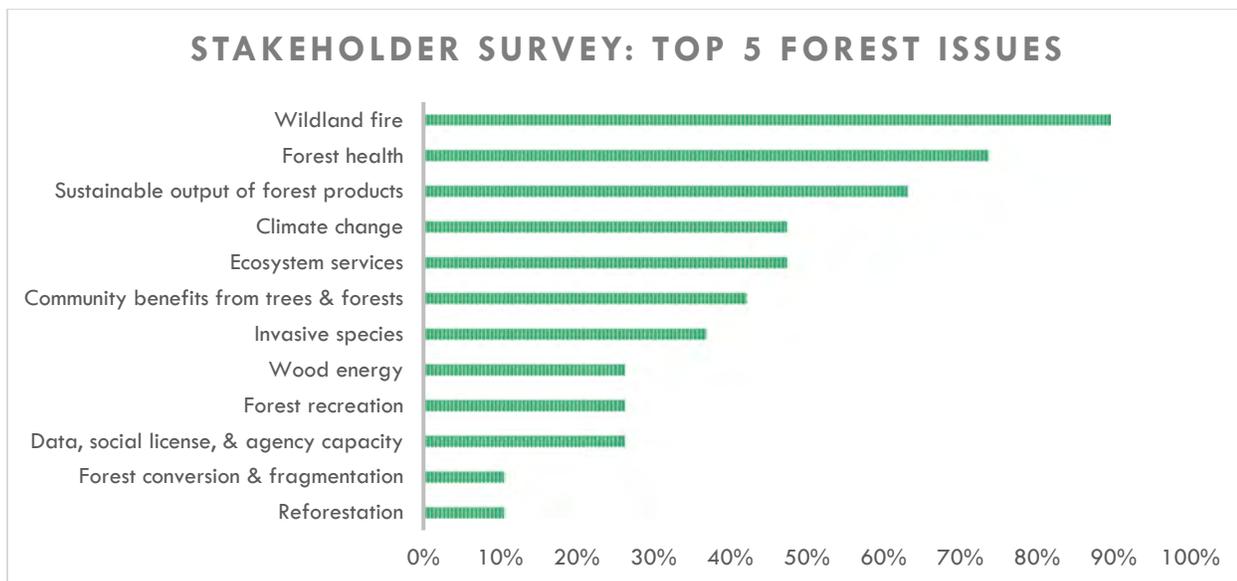


Figure 75. Stakeholder survey: Top 5 forest issues. Each responding stakeholder identified their top 5 forest issues.

All required stakeholders as well as additional identified stakeholders were invited via email to participate in the Forest Action Plan through a survey, working group meeting, and draft plan review. As needed, follow-up conversations took place via telephone, email, or in-person to discuss plan issues. A stakeholder working group met virtually to refine the draft forest threats and strategies and inform the Priority Landscape Area. Stakeholders were also invited to review the draft Forest Action Plan.

Stakeholders provided valuable input, including:

- Adding *Energy independence for communities* as a benefit.
- Expanding on public health as a benefit provided by community forests.
- Adding *Reduced forestry infrastructure* as a threat.
- Emphasizing the state workforce capacity limitations that reduce forest products opportunities.
- Improving *Cultivate fire-adapted communities* strategy.
- Adding *Support non-timber forest products* as a strategy.
- Cross-over strategies from the State Wildlife Action Plan for fish and wildlife habitat.
- Trade-offs involved in managing for carbon credits.
- Selection of input geospatial layers for the Landscape Priority Area.
- Additional partners needed for Forest Action Plan implementation.

Key Stakeholder Opportunities Summary

Stakeholder Name	Required Stakeholder	Presentation Date	Meeting Date	Working Group Participation	Draft Plan Review
Alaska Forest Stewardship Committee	Yes	11/12/2020		Yes	Yes
Alaska Department of Fish and Game	Yes			Yes	Yes
Natural Resources Conservation Service State Technical Committee	Yes	1/21/2020			
Forest Legacy Program, Division of Parks and Outdoor Recreation	Yes		6/16/2020		Yes
USDA Forest Service National Forest System Staff	Yes			Yes	Yes
USDA Forest Service Region 10 Staff	Yes				Yes
USDA Forest Service State and Private Forestry	Yes			Yes	Yes
Bureau of Land Management	Yes			Yes	
Bureau of Indian Affairs	Yes			Yes	
Military Installations	Encouraged			Yes	Yes
Alaska Community Forest Council	No	3/13/2020	11/2/2020	Yes	Yes
Alaska Board of Forestry	No	12/3/2019 12/8/2020			Yes

The Alaska Division of Forestry expresses its appreciation of the following stakeholder organizations and individuals who contributed to the 2020 Forest Action Plan.

Alaska Forest Stewardship Committee

Alaska Department of Environmental Conservation: Charley Palmer

Alaska Department of Fish and Game: Sue Rodman, Tom Paragi, Tracey Gotthardt

Natural Resources Conservation Service: Samia Savell, Chris Tcimpidis

Alaska Department of Natural Resources, Division of Mining, Land, and Water: Monica Alvarez

Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation: Matt Wedeking

Chugach National Forest: Tina Boucher, Bret Christensen, Sheila Spores, Wayne Owen

Tongass National Forest: Cathy Tighe, Monique Nelson

USDA Forest Service Region 10: Mark Cahur

USDA Forest Service State and Private Forestry Region 10/6: Michael Shephard, Priscilla Morris, Betty Charnon, Jay Anderson, Liz Graham, Kathy Sheehan

U.S. Fish and Wildlife Service: Myra Harris, Peter Butteri

Bureau of Land Management: Eric Geisler, Clint Albertson

Bureau of Indian Affairs: Josh Holte

Joint Base Elmendorf Richardson: Raymon Hedges

U.S. Army Garrison Alaska: Dan Rees

Eielson Air Force Base: Ron Gunderson

Alaska Community Forest Council: Mitch Michaud, Dan Rees, Meg Burgett

Alaska Board of Forestry

Chugachmiut: Nathan Lojewski

Tanana Chiefs Conference: Will Putman

Kenai Peninsula All Lands All Hands: Nathan Lojewski, Sue Rodman

University of Alaska Fairbanks Cooperative Extension Service: Gino Graziano

University of Alaska Land Management: Jerry Kilanowski

Metlakatla Indian Community: Genelle Winter, Dawn Pringle

Society of American Foresters: Mitch Michaud, Dan Rees

Soil and Water Conservation Districts: Mitch Michaud, Dan Rees

Tanana Valley State Forest Citizens Advisory Committee: Dan Rees

Alaska Mental Health Trust Authority, Trust Land Office: Paul Slenkamp

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Appendix B: Forest Legacy Program 2002 Assessment of Need

Available online at <http://forestry.alaska.gov/forestresources>