Alaska Forest Stewardship Program

Alaska Department of Natural Resources

Division of Forestry

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The Forest Stewardship Program provides technical assistance to owners of forest land where good stewardship practices will enhance & sustain forest health, beauty, resilience, recovery, and productivity. We connect private landowners with the information and tools they need to manage their forests. Actively managed forests provide timber, fuel wood, wildlife habitat, watershed protection, recreational opportunities, and many other benefits.

With three full-time foresters working for the program, we have a limited ability to serve landowners in-person, but are always available for consultation by telephone or email. The Stewardship program manager can be reached by calling 761-6309, and can then put you in touch with the forester nearest your area. If we are able to conduct a site visit, we will walk your property with you to discuss your concerns and goals, and then develop a written Forest Stewardship Plan that will give you the tools you need to manage your woodlot. If we are not able to visit the property due to travel limitations, we can write a Forest Stewardship Plan remotely, using satellite imagery and consultations with you. All services are free of charge.

This document can serve as a starting point to learning more about your forest and how it affects wildlife habitat, wildfire risk, and forest health. Most of the information in this document is also in a Forest Stewardship Plan, which is tailored specifically to your property, your goals, and your concerns, unlike this document, which is for general information only.

Trees have the distinction of being among the most massive, longest-lived, and tallest organisms on the planet. They support more communities of living things than any other organism on Earth and are an integral part of a dynamic system on which all life depends.

From the human perspective, trees and forests are often recognized first for their aesthetic qualities. Look deeper and you will find that forests are responsible for numerous social benefits, economic opportunities, and environmental services on which we rely. From forests, we derive water, food, shelter, warmth, and fiber; trees improve air and water quality, help modify climate, and increase property values (Wolf, 2007).

Forests provide habitat for a wide variety of animals, from the iconic (bears, moose, bald eagles) to the inconspicuously helpful (green lacewings, a beneficial insect that feeds on destructive aphids) to the injurious (the spruce beetle, responsible for the destruction of hundreds of thousands of acres of Alaskan spruce trees, creating abundant fuel sources for wildfires). A healthy forest is one that can provide all the ecosystem services upon which we depend while also providing habitat and recreational or scenic opportunities.

Forests provide clean water by filtering runoff and reducing the amount of sediment that is delivered to water bodies. Vegetation growing near moving and stationary water bodies prevents or slows erosion and provides shade, keeping water cooler, which is critical for fish (Bowler, Mant, Orr, Hannah, & Pullin, 2012). More than 25% of the freshwater in the U.S. flows from and is filtered by privately owned forests (American Forest Foundation). Water can be thought of as the most valuable resource that our forests produce.

A Forest Stewardship Plan is a step towards understanding the forest resources that are on the property, and can lead to a better understanding of how our actions can shape the structure, function, and composition of the forest for years to come.

Common Trees of Alaska

White spruce is a conifer that grows most successfully on well-drained upland sites. This species is adapted to grow in the shade of an established forest because it is a shade tolerant tree; if left to follow the trajectory of succession, spruce will often take over a site given enough time. White spruce wood is valued for lumber in some areas with good timber markets and can be used to make paper, although no pulp market currently exists in southcentral Alaska and there are very few options for a private landowner to harvest timber and make a profit. White spruce are highly susceptible to spruce beetle infestation, root rot, wind throw, and fire.

Black spruce is a shade tolerant tree that usually grows on wet organic soils, but productive stands are found on a variety of soil types from deep humus through clays, loams, sands, coarse till, and shallow soil mantles over bedrock. In the north, black spruce sites are commonly underlain by permafrost; black spruce seems to be the best tree species adapted to growing on permafrost because of its shallow rooting habit. Often the annual thaw depth may be as little as 16 inches. On very good sites, black spruce may reach 65 feet tall and 9 inches diameter, but more often is found on poor site, with heights up to 40 feet and diameters of 5-6 inches.

Very few options exist for utilizing black spruce in Alaska; it is valued for pulp in some states but no pulp market exists in Alaska. Some specialty “value-added” products have historically been made from black spruce including beverages from twigs and needles.

Paper birch grows best on well-drained sites, along river bottoms, and in upland areas with good soils and soil moisture. Birch is shade intolerant and dies off when competition for sunlight becomes too great. Birch enters a growing space early in the successional path and can grow quickly until it becomes crowded by other plants; as soon as it starts getting too much shade, it starts to be replaced by more tolerant species such as spruce.

Birch are not long-lived; they generally reach economic maturity between 70-100 years of age. Once it reaches age 70, birch is more susceptible to decay and broken tops. Recently regenerated birch is an important winter source of moose browse, but birch lose browse value as they age.

Birch depend on clear-cut or group selection harvesting for regeneration since they are shade intolerant—the forest floor must be open to full sunlight to regenerate a new birch forest. Scarification is a site preparation method used during or just after logging that exposes mineral soil that birch seed can fall upon and germinate. Birch can produce stump sprouts following a harvest but these will typically be browsed by moose to the point where they are unable to adequately regenerate a large enough number of seedlings. Birch is an important source of firewood and can also be used for flooring and decorative wood products.

Black cottonwood and balsam poplar hybridize in southcentral Alaska and can be difficult to reliably identify separately because the ranges of the two trees overlap and they are nearly identical in appearance except for balsam poplar leaves usually being rust-colored on the undersides, while cottonwood leaves have whitish undersides. Cottonwood can be a fast-growing tree that is very shade intolerant, making it an early pioneer after wildfires or on freshly exposed soils. These two species are the largest broadleaf/deciduous trees in Alaska; they can be 18 inches in diameter by age 50 on good sites, and up to 3 feet in diameter by 200 years of age. The familiar smell of the sweetly aromatic leaf buds in the spring is indicative of warmer temperatures and nicer weather, as well as the start of allergy season and the upcoming drifts of tiny cottony seeds.

SOILS

Different types of soils have different characteristics that affect how trees and other plants grow. In Alaska, soil mapping is far from complete, and unfortunately only covers the main population centers. In other areas, soil types have not been well mapped. In general, there are some things to keep in mind, especially when it comes to planting trees.

1. Drainage. If an area is lower than surrounding areas, it might collect water, which can lead to de-oxygenated soils. This will stunt growth at best, or possibly kill the tree, unless you plant black spruce, which can often grow (albeit slowly) in these conditions.
2. Organic material. A healthy organic layer on top of the soil is important to prevent erosion, maintain shrub/herbaceous diversity, and regulate soil temperature. A healthy organic layer also means that there are high levels of nutrients being decomposed and recycled. Many mosses and small plants can germinate and thrive in this organic layer, which is usually full of tiny roots, insects, and fungi. However, birch seeds cannot germinate in this layer; they require bare mineral soil to successfully germinate. Disturbing this layer increases the risk of erosion, whether by wind or water, so it is

important not to remove this layer on steep slopes or in areas that are affected by wind. However, in order for birch to germinate, you will need to scarify, i.e. remove the organic layer, to give the very small birch seeds a receptive seed bed. If you have mature birch on the property, scarifying in areas within 100 feet of these trees in late summer can lead to birch germination. Moose will often devour these young seedlings so a fence may be necessary to make sure that enough seedlings survive to become the next generation of your forest.

Spruce can usually regenerate on organic layers without difficulty. Spruce seeds can travel around 100 feet from the parent tree.

3. Moisture availability. Trees & seedlings can be planted whenever the soil is frost-free, but some people have found that seedling survival is better if they are planted in late summer, when there is abundant soil moisture. If you plant earlier, make sure the seedlings receive enough water in spring and early summer.

FOREST INSECTS

Insects play a vital role in the breakdown of organic matter and formation of soil. Dead, dying, and recently fallen trees attract several species of insects that feed on and tunnel in the wood, thereby introducing fungi that decompose the wood. As the wood is broken down and increases in moisture content, it becomes increasingly habitable by other organisms. This continues the mechanical deconstruction of wood tissues. Eventually, the material and nutrients are incorporated into the soil to be used by other flora and fauna.

Pollinators

Many insects help the reproductive process for most of the world's flowering plants. This is vital not only for wildflowers, but also for most crops. Consider implementing some of these ideas on your property for enhanced pollinator habitat:

- Consider increasing the number and variety of flowering plants, especially natives, that bloom at different times of the year;
- Minimize, use least toxic, or eliminate the use of pesticides;
- Maintain dead and dying trees and branches for habitat.

Spruce Beetle (Dendroctonus rufipennis)

Probably the most notorious insect in Alaska, spruce beetles occur anywhere white spruce *(Picea glauca*), Lutz spruce (*Picea X lutzii*), Sitka spruce *(Picea sitchensis)* and in rare cases black spruce (*Picea mariana)* are present. Ecologically, the role of these beetles is to remove the overmature and stressed trees and open the canopy to allow light to the forest floor; therefore, it is normal to have some spruce beetle activity in a healthy forest. Endemic (natural low level) populations typically live in recently windthrown spruce or mature/overmature and stressed spruce. Unhealthy and overmature trees and dense stands of spruce are more susceptible to outbreaks; therefore, **maintaining a healthy forest is a good approach to keeping spruce beetle populations low.** Remove windthrown or damaged spruce as soon as possible to limit available host material. It is okay to leave the branches and tops (slash) smaller than five inches in diameter to maintain nutrient cycling. Avoid damaging the roots and trunks of trees and do not prune spruce between May and August, the active flight window of the spruce beetle.

Susceptible spruce are attacked by females between mid-May and August, and approximately two years later adults emerge and attack new host trees (United States Forest Service, 2009). On standing trees, the first sign of spruce beetle infestation is reddish-brown boring dust accumulating at the beetle's entrance holes (about 1/8 inch wide). Boring dust accumulates in bark crevices, and on the ground around the trunk of infested trees. Trees may try to "pitch out" beetles by producing large amounts of resin that can ooze out of entrance holes. Healthy trees with good soil moisture are more effective at fending off beetle attacks. Trees with one or a few attack sites may still survive so monitor those closely. Remove and debark trees that are still green and show evidence of heavy infestation as soon as feasible to interrupt the life cycle of the beetle. If the needles of an attacked tree are yellow or red, or there are no needles remaining, remove a strip of bark in an area that has been attacked. If white larvae are present, remove and debark the tree/log to interrupt the life cycle.

Trees debarked by woodpeckers are a good indication of a possible beetle infestation. Partially debarked trees are easily identified; however, on trees without significant debarking, one must be relatively close to see sawdust in bark crevices and around the tree base. The needles of infested trees do not usually fade or discolor within the first year following attack. However, during the second summer, most needles turn yellowish-green or orange-red. It usually takes two years for spruce beetles to complete their life cycle and therefore you have a wide window of opportunity to detect and react to attacked trees.

Engraver Beetles (*Ips sp.*)

Engraver beetles (*Ips sp.*) are a secondary concern and occur on the same sites as spruce beetles. These beetles tend to colonize damaged or stressed white spruce *(Picea glauca*), Lutz spruce (*Picea X lutzii*), Sitka spruce *(Picea sitchensis)* and in rare cases black spruce (*Picea mariana)*. Ecologically, the role of these beetles is to remove the overmature and stressed trees and open the canopy to allow light to the forest floor. Natural and human caused disturbances that produce large amounts of damaged, dead, or dying spruce coupled with favorable climatic conditions can lead to a rapid buildup of *Ips sp.* population and result in the mortality of apparently healthy trees. Preferred host material of *Ips sp.* is fresh cut logs and tops of weakened trees. **Prevention is the best line of defense against the rapid population buildup of this beetle**. Timber harvests should take place when beetles are inactive (September through April) and slash left in the forest should be limited to less than four inches in diameter. Logs should be decked and stored in areas of limited sunlight but not against residual host trees. (Christopher J. Fettig et al, 2013)

Engraver beetles are smaller than the spruce beetle, approximately 1/16 inch wide, but signs of their activity and detection methods are similar. Unlike the spruce beetle, *Ips sp.,* typically have a one-year life cycle and therefore can respond quickly to changes in stand conditions and availability of host material. Pitch tubes are rarely formed but reddish-brown boring dust accumulates under entrance holes in bark crevices and on the ground. The needles of dying, infested trees begin to fade from dark green to pale yellowish green to red as early as one month after attack. By the end of the summer most of the foliage has faded and dropped. During the fall, winter, and spring, woodpeckers may be attracted to infested trees and debark them while foraging. Adult *Ips sp.* primarily overwinter in forest litter beneath brood trees, and disperse short distances in search of fresh host material soon after emergence in spring, usually from May through August.

Bark Beetles and Firewood

If you plan to use spruce for firewood, follow these recommendations to reduce brood habitat and lessen the chances that firewood is the source of new infestations of bark beetles.

Fresh log with green needles when cut; bark peels away from wood smoothly; wood not split:

- Store only enough firewood for a single winter's use;
- Split into stove-size pieces to dry out; stack loosely or separate to allow maximum air circulation;
- Dry wood discourages new spruce beetle attacks;
- De-bark log to eliminate potential beetle habitat.

Fresh log with green needles when cut; visible beetle attacks on bark surface (reddish-brown boring dust and pitch globules); bark may peel smoothly; wood not split:

- Store only enough firewood for a single winter's use;
- Split into stove-size pieces to dry out; stack loosely or separate to allow maximum air circulation;
- This will dry out the larvae and their food source;
- De-bark log to eliminate larvae and habitat.

Dry log; rust colored or no needles present on tree when cut; some evidence of old beetle attacks or woodpecker activity; bark may adhere tightly or pull off in pieces:

- Split and use prior to next spring to kill adult beetles that will emerge at that time;
- Fire-scorch the outer portion of the bark, killing beetles beneath, but keep the bulk of the wood intact (messy, but intact) for future use;
- Consider preventive measures on surrounding live spruce trees.

Dry, old log or split wood; barks pulls off loosely:

- Spruce beetles will not attack well-seasoned wood and are normally gone from trees that have been dead for more than one year (though other beetles and insects may enter the wood). Old wood, free of spruce beetles, is not a potential spruce beetle infestation source.

WILDLIFE HABITAT ENHANCEMENT

Recommended Practices

- Increase diversity of habitats; include more native shrubs, flowers, and ground covers that bloom at different times of the year. Cluster similar species together;
- Incorporate features that capture rainwater;
- Create patch harvests in poplar, birch, and aspen stands to stimulate sapling regeneration to improve habitat for moose. Patch harvest width should be less than twice the height of mature trees (approximately 100 to 150 feet max;
- Avoid harvesting trees within 100 feet of water bodies or wetland perimeters to maintain habitat for fish and other riparian/wetland species;
- Create / maintain dense stands of evergreen trees;
- Maintain at least four standing dead snags per acre for cavity nesting animals;
- Piles of rock and brush from removed trees create shelter for small mammals;
- Maintain two or three tall dominant trees per acre for perching sites;
- Avoid any land clearing or timber harvests between **1 May and 15 July** to avoid disturbing nests of migratory birds and maintain compliance with the Migratory Bird Treaty Act;
- Remove invasive plants;

Avoid pesticides, or choose less harmful formulations and do not spray when flowers are in bloom.

Woody Debris

Be sure to leave some woody debris of varying species and size scattered on the forest floor. When a tree dies, it is beginning its second life in the forest. It becomes food and shelter for an increasing number of wildlife species, insects, and fungi. Over time branches will fall off and eventually the tree will fall. This debris plays an important role in the water and nutrient cycles of the forest, soaking up and storing moisture during wet times and releasing it to the soil during dry periods. As the woody debris decomposes, nutrients are released into the soil, maintaining a healthy community of soil dwelling microorganisms. They also serve as nurse logs—a place for seeds to establish and begin growing on. This can however increase fuels on the forest floor, so it is usually beneficial to maintain debris-free areas around structures and concentrate woody debris in areas outside of that perimeter.

ENCOURAGING REGENERATION THROUGH PLANTING

Regeneration of the next generation of trees is an important consideration following timber harvest. Spruce trees are often able to regenerate on their own following harvest because the seeds are primarily wind-dispersed, and can travel distances of 100 feet or occasionally further.

Birch is more difficult to regenerate naturally. Scarifying the soil (removing the organic layer and exposing mineral soil for seeds to fall upon) is required for birch to regenerate. This can be accomplished with a dozer or other equipment, or with hand tools on smaller areas. If grass takes over the growing space, you will have to remove the grass to give seedlings a chance to grow. Birch will sprout from stumps, but these sprouts are often not of high quality compared to planted seedlings—the resulting trees will be quite healthy but may be crooked or twisted.

There are relatively few options for buying seedlings in Alaska compared to other states. One place from which seedlings can be purchased is through the Society of American Foresters Cook Inlet Chapter annual seedling sale each spring. Information and an order form can be found at www.forestry.org/alaska/. You can find larger trees and shrubs at a local nursery, and some may have seedlings available as well. If you purchase seedlings in the spring, you can plant them soon after purchase or plant them in pots to let them develop a good root system over the summer and then plant them in forest in the fall. Often survival rates are better if you choose

the latter method, although this would be quite difficult when dealing with large numbers of seedlings.

Enhancing Planting Success

The first three years after planting are critical to survival, with adequate access to moisture being the most important factor. Waiting to plant later in the summer or early fall (August) can take advantage of more frequent precipitation. Generally, fertilizer is unnecessary unless the plants show symptoms of nutrient deficiencies; however, if you do fertilize, avoid it during the first year after planting and then use a slow release, low nitrogen formulation.

Take steps **to reduce competition** from grass and other vegetation to increase survival rate. **Mulch** added around trees and shrubs to a depth of 3 to 4 inches thick can help, but it is important to keep the mulch a couple inches away from the trunk. Mulch also helps moderate soil temperature fluctuations and aids in retention of soil moisture. Wood chips from a chipper make perfect mulch. You might also **consider mowing or string trimming** around the trees to keep grass down. Plants that are favored moose browse should be fenced either individually or in groups to protect them.

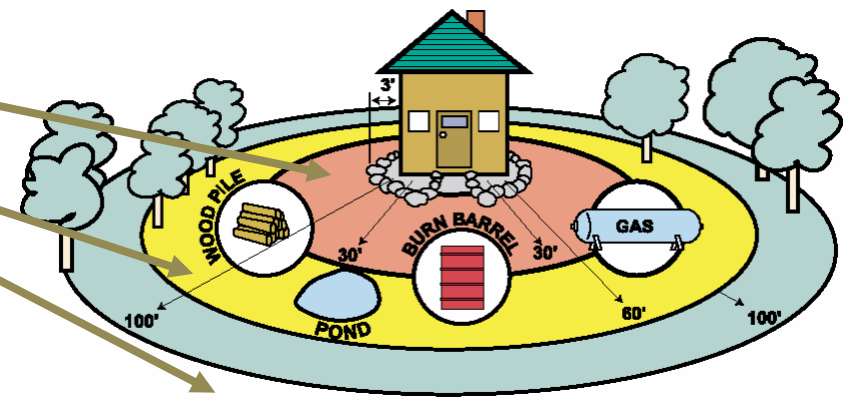
ENHANCE WILDFIRE PREPAREDNESS

Fire is an important part of the ecology of Alaska's boreal forest. In spring, after the snow melts and before plants start to green up is a particularly dangerous time. Dead grass from the previous season is dry and flammable and can easily ignite. Exercise great care when lighting fires outside before green up and control sparks from wood stoves. Being prepared well in advance of a fire event is important to your safety. Have a fire plan and identify multiple escape routes. Maintain a cache of tools for firefighting and store extra clothes and boots for each person in the house in another structure on the property in case of an emergency. A back-up electrical generator sufficient to power a well pump will provide water during electrical outages, which can occur during wildfires.

Maintaining a defensible space may help save the structures on the property. The primary goal for a defensible space is fuel reduction — limiting the level of flammable vegetation and materials like dense grass and spruce surrounding structures and increasing the moisture content of remaining vegetation. The following diagram and lists should be used as a guide to design and maintain defensible space around structures. The distances listed should be thought of as the minimum and adjusted for local conditions. These distances should be increased in hilly or steep terrain.

Zones of Defensible Space

Zone 1 is the 30 feet adjacent to structures;
Zone 2 is 30 to 60 feet from structures;
Zone 3 is 60 to 100 feet from structures.



Zone 1 (All Hazard Areas) *This well-irrigated area encircles the structure and all its attachments (wooden decks, fences, and boardwalks) for at least 30 feet on all sides.*

1) Plants should be carefully spaced, low-growing and free of resins, oils, and waxes that burn easily;
2) Mow the lawn regularly. Prune trees up six to ten feet from the ground, but do not remove more than 1/3 of the live foliage;
3) Space conifer trees 30 feet between crowns and away from structures. Prune back trees that overhang structures;
4) Create a 'fire-free' area within five feet of structures, using non-flammable landscaping materials and/or high-moisture-content annuals and perennials;
5) Remove dead vegetation from under decks and within 10 feet of structures;
6) Consider fire-resistant material for patio furniture, swing sets, etc.;
7) Firewood stacks and propane tanks should not be located in this zone;
8) Water plants, trees, and mulch regularly.

Zone 2 (Moderate and High Hazard Areas) Plants in this zone should be low-growing, well irrigated, and less flammable.

1) Leave 30 feet between clusters of two to three trees, or 20 feet between individual trees;
2) Encourage a mixture of deciduous and coniferous trees;
3) Create fuel breaks, like driveways, gravel walkways, and lawns;

4) Prune trees up six to ten feet from the ground, but do not remove more than 1/3 of the live foliage.

Zone 3 (High Hazard Areas) Thin this area, although less space is required than in **Zone 2**.

1) Remove smaller conifers that are growing between taller trees. Remove heavy accumulation of woody debris;

2) Reduce the density of tall trees so canopies are not touching.

Maintaining the Defensible Space

1) Keep trees and shrubs pruned six to ten feet from the ground, but do not remove more than 1/3 of the live foliage;

2) Remove leaf clutter and dead and overhanging branches;

3) Mow the lawn regularly and dispose of cutting and debris promptly;

4) Store firewood away from structures;

5) Maintain the irrigation system regularly;

6) Familiarize yourself with local regulations regarding vegetative clearance, debris disposal, and fire safety requirements for equipment.

Ten Year Action Plan

Action plans are useful tools that clearly define tasks and timelines. The table below includes recommended action items outlined in a Forest Stewardship Plan and suggests a period for completion. Use this table to help set priorities to achieve management goals for your property.

A complete Forest Stewardship Plan that is written specifically for your property will include a yearly schedule of forest management practices; the following table contains good general information to practice yearly on your property. For more information, contact us to have a Forest Stewardship Plan developed specifically for your property.

Annually	Expected results
Maintain Firewise defensible space around future structures	Increased protection of structures from wildfire
Leave decaying downed wood except near structures where it might pose a fire hazard	Promotes nutrient cycling and can provide a seed bed for tree regeneration
Retain at least 4 standing dead trees per acre	Creates wildlife habitat
Avoid use of pesticides which can have negative effects on beneficial insects	Maintain diversity of natural insect populations
Avoid damaging tree roots during road maintenance or building construction; do not prune or cut spruce trees between May and June	Prevents stress to trees which would otherwise result in increased populations of damaging insects

If you are interested in developing a Forest Stewardship Plan that has information specific to your property, get in touch with the Forest Stewardship Program. The statewide manager can be reached at 761-6309, and can put you in touch with the nearest forester who can assist you.