Recent History and Future Challenges and Opportunities of Forest Harvest Management in Interior Alaska Boreal Forests

BY MIHO MORIMOTO

Alaska is a large state with various ecoregions, and consists of two major forest types: coastal and boreal forests. Coastal forests exist along the coast of Southcentral and Southeast Alaska. The coastal forest is covered predominantly by coniferous forest, mainly Sitka spruce and western hemlock with a smaller amount of red and yellow cedar. Boreal forests lie between two major mountain regions from the Canadian border to the Chukchi Sea. Due to an extreme climate, only six tree species are native to the region, including white spruce, black spruce, Alaska birch, and quaking aspen, with a minor amount of balsam poplar and tamarack. Coniferous forests cover about two-thirds of the boreal forest with productive white spruce forest occurring on warm, permafrost-free sites, with unproductive black spruce on cold soils underlain by permafrost. Transitional forest exists between the Southcentral coastal forest and the interior boreal forest.

In Interior Alaska, systematic forest harvest management and record keeping began in the late 1960s to 1970s. However, relatively extensive logging occurred during the gold rush in the late 1800s to early 1900s, mainly for steamboat operations and development of urban areas. The logging during this period affected forests primarily along the Yukon drainage and near a few early populations. As information on early harvest activities is limited, this article will describe the systematic forest harvest management that occurred since the late 1960s up to 2012 in Interior Alaska.

Over the last half century, most productive forestlands have been managed by State of Alaska Department of Natural Resources, Division of Forestry, for sustainable wood production. Other major ownerships of productive forestland are municipality, individual Native allotments, and Native Corporations. Forest harvest management for all ownerships was low-input, which relies heavily on natural regeneration without any regeneration management, such as ground treatment and thinning. The primary reason for the low-input management is small profit margins due to distance from major markets, limited road access, low product value, and high cost of labor.

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A stand clearcut in 1985 (photo taken 28 years after harvest) without any application of post-harvest regeneration practices. This is the most common harvesting method used in interior Alaska boreal forests. Alaska birch is dominating with a few white spruce regeneration under the canopy.

Harvested areas and volume an operational scale in boreal forests since late 1960s were small, particularly considering the vast total area and large aggregate volume of forest. The total area harvested on state forestlands from the start of record collection in 1972 to 2012 is about 10,973 ha out of 871,263 ha, or 1.3% of total timberland. Most timber harvest since the late 1960s to 2012 occurred in mature white spruce stands, the most productive stand type in Interior Alaska, except for balsam poplar that covers a small area in floodplains.

Clearcutting became active in response to increased demand for white spruce sawlogs in the Asian market in the 1990s, but as the demand decreased near the end of the decade, harvest volume decreased and continued to be low. Even during the period of the highest harvest activity, the scale of clearcutting in Interior Alaska boreal forests were small compared to other boreal regions where large-scale, widespread clearcutting was common.

Overall, the most common harvesting methods on state forestlands were clearcutting and select cutting for white spruce in white spruce-dominated forest. It is important to note that even if the harvesting method is recorded as clearcutting, some undesirable stems, such as small diameter trees, might have been left—unlike other forest regions where clearcutting removes all stems from the stand.

Post-harvest regeneration management was applied to a limited extent. Regeneration management is aimed to

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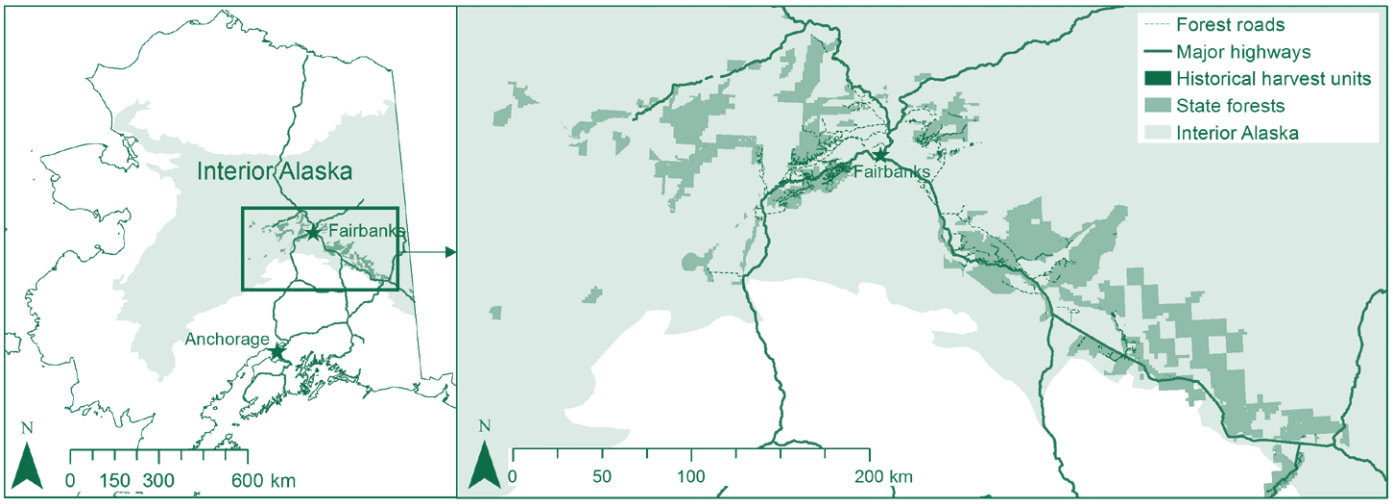

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Interior Alaska includes about 47 million hectares located between the Alaska Range in the south and Brooks Range in the north. The most productive commercial forests that are relatively easy to access are owned by the State of Alaska. Although boreal forests cover a large area in the interior, most lands are not road accessible, which is one of the major reasons for small-scale forest harvest management.

promote white spruce regeneration because of its higher economic value and limited regeneration ability compared to birch and aspen. The two most common post-harvest regeneration practices are mechanical site preparation and planting of seedlings. Prescribed burning and application of herbicide were limited to experimental purposes. Mechanical site preparation exposes mineral soil to enhance white spruce germination, but was used only on about 15% of area harvested on state forestlands. The predominant species for artificial reforestation is white spruce, but some introduced species, including lodgepole pine and Siberian larch, were planted for experimental purposes in a small area (less than 100 ha were planted exclusively with introduced species). Artificial reforestation treatment was applied on less than 30% of the harvested area.

Although harvest activity was small scale, it was concentrated on a small road-accessible area and on older (productive) white spruce types. As a result, continued harvest could deplete important forest structures in some areas. The road-accessible forest provides the public opportunities to obtain not only timber but also non-timber products, particularly subsistence wildlife and plant species. Mature white spruce stands are habitats for various species contributing to biodiversity in the boreal forest. As a result, harvest activities need to be distributed geographically and by species in a way that prevents reduction of forest productivity or loss of ecosystem services.

Rapid climate change is a relatively new challenge in sustainable timber production. Wildfire in Interior Alaska is becoming more intense and frequent under climate warming. Hardwood species are more resistant to wildfire than white spruce, which is more flammable. While white spruce has limitations in natural regeneration because of infrequent large and/or viable cone crops and a small seed dispersal distance, birch and aspen regeneration does not face the same limitations. Alaska birch and aspen also grow faster than white spruce. The projected rotation age for birch and aspen is 70 years, which is 50 years shorter than white spruce. These birch and aspen characteristics contribute to their resilience to intense and frequent fire under climate change and to also reduce the area required to sustain harvest volume. It is apparent that historical focus on white spruce harvest needs to be shifted if we aim to sustain white spruce forests.

In Alaska, the demand for woody biomass for energy generation is increasing, particularly in remote small villages. Although biomass energy generally uses logging residues in most US forest regions, due to the small scale of forest harvesting, woody biomass is harvested exclusively for biomass energy in Interior Alaska. Expansion of wood biomass energy is a new opportunity to use historically undesirable trees, such as small diameter stems and hardwood or black spruce. In fact, birch harvest has increased in the last few years. However, white spruce is still preferred for biomass energy because mature white spruce stands contain the highest volume and larger diameter trees, making harvest more profitable than other species. In addition, there is a limited number of equipment and facilities that utilize small diameter trees. Some species are also low in BTU or not desirable for burning without intensive processing and long drying periods. However, it is worthwhile to consider investing in equipment and facilities that optimize harvesting and processing of historically undesired trees to prevent depleting white spruce. Wood biomass energy also mitigates climate change impacts by reducing fossil fuel consumption and using local resources rather than importing fuels. Harvesting fuel wood around communities also reduces fire hazard.

Forest management in Alaska's boreal forests has been small scale and is now facing an unprecedented challenge, namely climate change. However, it is also an exciting time for forest harvest management with all the new opportunities the boreal forest presents. ◆

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