Alaska's Forest Health Issues

Aspen Leaf Miner Activity, 1996-2006

Aspen leaf miner, *Phyllocnistis populiella Chambers,* is a native moth in the family *Gracillariidae* that feeds on quaking aspen and balsam poplar. Before 1999, this insect was at endemic population levels and hardly visible on the landscape. In recent years the infestation ballooned, reaching 659,500 acres in 2005. Areas most severely affected included along the Alaska Highway between Delta Junction and Tok, Fairbanks area, Yukon Flats, Yukon River Valley, and the Tanana River Valley. Aspen was also affected by severe drought in 2004 and 2005, and many aspen already on dry or marginal sites succumbed to the combined effects of leaf miner and drought.

Spruce Beetle Activity, 1980-2006

The spruce beetle, *Dendroctonus rufipennis*, is the major tree-killing insect of Alaska's spruce forests. Most spruce beetle outbreaks have been and are occurring throughout south central and interior Alaska's Lutz and white spruce forests. Spruce stands have been infested to varying degrees since the beetle was first observed in the 1920's along the lower Yukon River. More than 4 million acres of on-going and new infestations were detected from aerial surveys between 1980 and 2005.

The spruce beetle is responsible for over 90% of the total insect-caused mortality on the Kenai Peninsula, up from 57% during the five-year period before 1987. More than 70% of the insect-caused mortality is on forest lands producing, or capable of producing, at least 20 cubic feet per acre per year.

The epidemic infestations on the Kenai Peninsula and in the Copper River Basin are now declining because the beetle has killed much of the mature spruce in these areas, thus eating itself out of house and home. Current management focuses on removing dead trees to minimize wildfire hazards. White, Sitka,and Lutz spruce are commonly attacked by the spruce beetle. Black spruce is rarely attacked.

Infestations have occurred primarily in older, slower growing spruce. Small diameter, rapidly growing trees are least susceptible to attack. Susceptibility to infestations increases when a forest is composed of more than 70% spruce over 10" in diameter, and with a slower than average growth rate. Net 10-year average annual growth of many Kenai Peninsula Lutz spruce stands is negative, indicating that mortality exceeds annual growth.

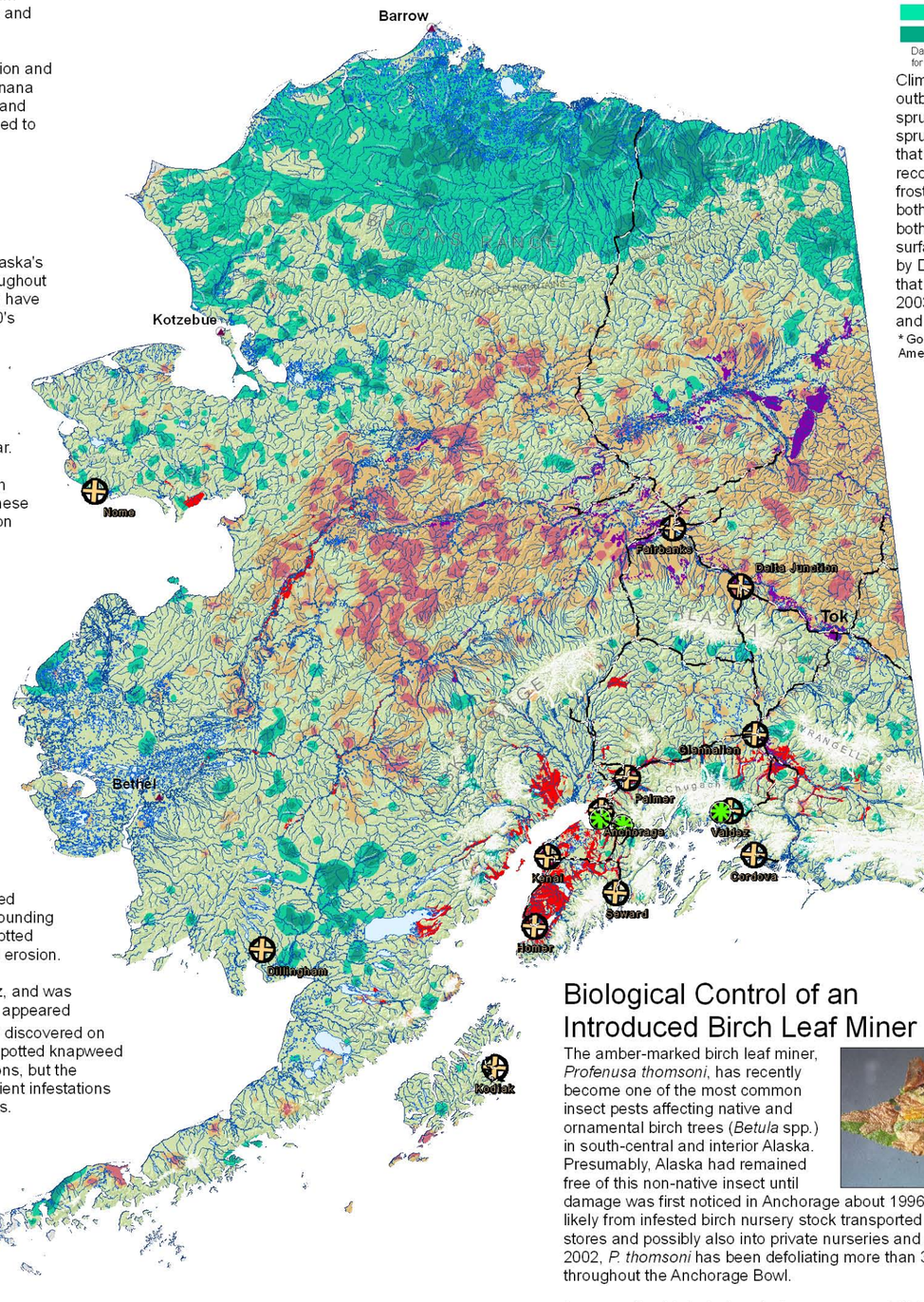
Early Detection and Eradication of Spotted Knapweed

Spotted Knapweed,*Centaurea biebersteinii* DC., a notorious problem in many western states, is a prime candidate for early detection and rapid response in Alaska. Although small patches of this species have been discovered in several locations, it has not yet become widespread in Alaska. Spotted knapweed is listed as noxious in at least 15 states, and is known to spread rapidly, eliminating surrounding vegetation through the production of allelopathic chemicals. Monocultures of spotted knapweed displace native vegetation, degrade wildlife habitat, and increase soil erosion.

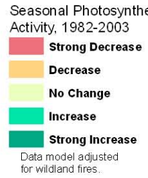
In 2002, an infestation of spotted knapweed was discovered in the city of Valdez, and was subsequently hand-pulled in 2003 and 2004. The site was revisited in 2005 and appeared to be free of knapweed, but regular scouting will be necessary for several years. A single plant was recently discovered on the Kenai Peninsula, and was pulled and pressed as an educational specimen. Two known infestations of spotted knapweed occur south of Anchorage, along Turnagain Arm. Continued pulling has greatly reduced one of the infestations, but the second is expanding rapidly. Regular monitoring and continued control efforts will be essential if these incipient infestations are to be eliminated. Spotted Knapweed is one of the many invasive plants threatening Alaska's ecosystems.

Early Detection and Monitoring for Exotic Insects

In Alaska, increasing tourism and international trade elevates the risk to forested ecosystems from exotic insect introductions. It is widely accepted that the most effective and lowest cost defense against exotic species introductions is to have an effective monitoring system designed to detect introductions early and that allows for rapid response control actions. The recent introduction of the amber-marked birch leaf miner has served to highlight the increasing risk to Alaskan forests and emphasizes the need to further develop an early warning system with a wider scope for detecting introductions.



Climate Change and Forest Health



Alaska, like other arctic and subarctic regions, is experiencing a change in its climate, with well-documented increases in mean annual temperatures, maximum daily temperatures, minimum daily temperatures, growing degree days, and the frost-free season. Changes in the health of Alaska's forests are expected because both the living components of an ecosystem, such as trees and insects, and non-living components, such as fire, respond to climate.

Climate-related forest health problems have already been documented in Alaska. The spruce beetle outbreak on the Kenai Peninsula has been linked to a warmer and drier climate, which caused the spruce beetle to shift from a two- to a one-year reproductive cycle. In interior Alaska, the first recorded spruce budworm outbreak, 1993-1995, may have resulted from elevated summer temperatures that produced drought stress in the host white spruce trees. The 2004 wildfire season, the largest on record, was a direct result of record temperatures and little precipitation. In the discontinuous permafrost regions of southcentral and interior Alaska, increasing temperatures have been associated with both the loss of wetland habitats and increasing rates of the development of thermokarst topography, both of which result from permafrost thawing. Thermokarsting—the collapsing of ice-rich ground surfaces—in forested landscapes can lead to the loss of forested land area. In addition, data provided by Dr. Scott Goetz and his colleagues* (see map - data interpolated for visual representation), indicate that much of Alaska's boreal forest demonstrated reduced photosynthetic activity from1982 through 2003, possibly due to factors such as fire disturbance, drought stress, nutrient limitation, and insect and disease damage.

* Goetz, S.J., A.G. Bunn, G.J. Fiske, and R.A. Houghton. 2005. Satellite-observed photosynthetic trends across boreal North America associated with climate and fire disturbance. Proceedings of the National Academy of Sciences 102: 13521-13525.

Yellow-cedar Decline

Decline and mortality of yellow-cedar persists as one of the most spectacular forest problems in Alaska. Approximately 500,000 acres of decline have been mapped during aerial detection surveys since 1986. Extensive mortality occurs in a wide band from north of Sitka to the Ketchikan area.

In 2004, it was discovered that yellow-cedar decline extends approximately 100 miles south into British Columbia, Canada. The entire distribution hints at a change in climate as a trigger for initiating the forest decline.

All research suggests that contagious organisms are not the primary cause of this extensive mortality. Some site factor, probably associated with poorly drained anaerobic soils, appears to be responsible for initiating and continuing cedar decline. A leading hypothesis to explain the primary cause of tree death is the lack of snowpack at lower elevations in late winter that allows solar radiation to penetrate open-canopy forests, triggering a premature loss of cold tolerance in cedars, thereby predisposing trees to freezing injury in spring during cold periods.

Research continues; other tree species are largely unaffected. Yellow-cedar wood is extremely valuable; thus the problem has considerable economic impact. This tree species also has ecological importance. Yellow-cedar wood and bark have long been used by Native people, most recognizable is its use in totem poles.

Biological Control of an Introduced Birch Leaf Miner in Alaska

The amber-marked birch leaf miner, *Profenusa thomsoni*, has recently become one of the most common insect pests affecting native and ornamental birch trees (*Betula* spp.) in south-central and interior Alaska. Presumably, Alaska had remained free of this non-native insect until damage was first noticed in Anchorage about 1996. Introduction was likely from infested birch nursery stock transported into the local big box stores and possibly also into private nurseries and greenhouses. Since 2002, *P. thomsoni* has been defoliating more than 35,000 acres annually throughout the Anchorage Bowl.

A cooperative biological control program was initiated in early 2003 to establish a parasitic ichneumonid wasp, *Lathrolestes luteolator*, in the Anchorage municipality. This wasp attacks only late-stage larvae of *P. thomsoni.* Biological control is preferred because it is long-term, perceived as "natural", and should reduce the use levels of chemical pesticides which provide only a short term solution for control. This project has entailed the collection of parasitized larvae and parasitoid adults in Canada, importing the biological material to Alaska, then rearing adults from these collections and releasing emerged adults in Anchorage during 2003-2006.

Maps produced by the
Alaska Dept of Natural Resources
Division of Forestry