



United States Department of Agriculture

Forest Insects: Considerations for Successful Tree Regeneration in South-central and Interior Alaska.



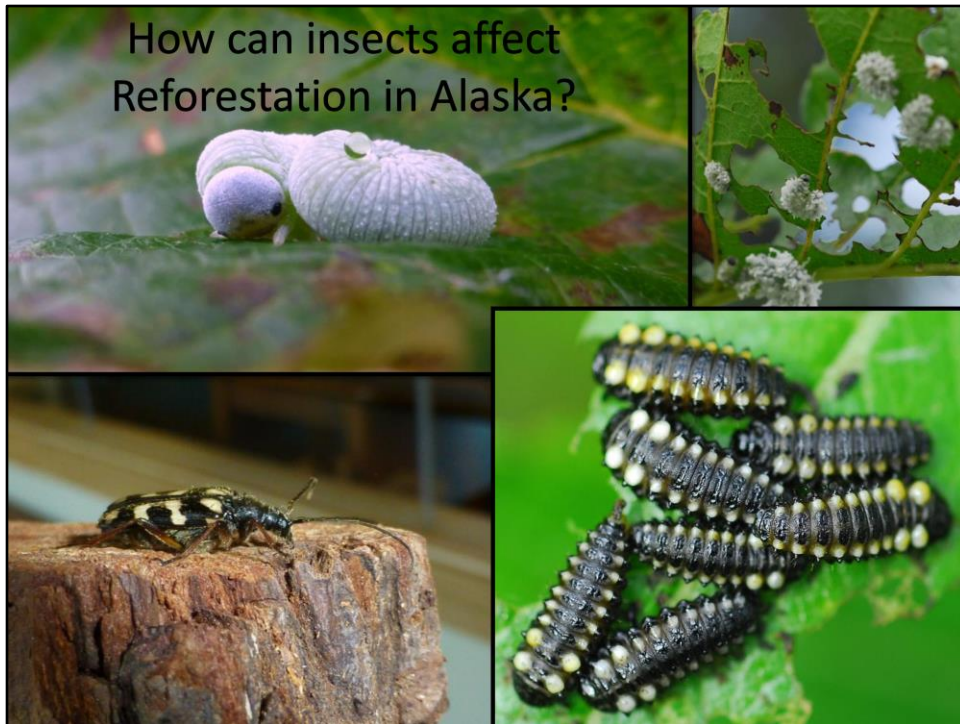
Forest Service
Alaska
Region

Today I am going to talk about some of the ways that insects can influence Alaska regeneration in Southcentral and Northern Alaska.



So we all know that insects are an important component of forest ecosystems, and that they affect almost every activity in a forest.

- They are an important food source for a wide variety of wildlife, from other invertebrates, to birds and rodents, to even our macro-fauna like bears. This is especially true during outbreaks.
- As disturbance agents, they are right there behind wild fire. Outbreaks can affect the productivity over millions of acres (defoliators), the merchantability (topkill and sawtimber), and mortality.
- And insects provide a wide variety of ecosystem services- Nutrient cycle, pollination, decomposition.



How do insects affect reforestation in Alaska?

1. There is the current exemption for insect and disease affected stands.
This is going to be primarily bark beetle killed stands.
2. They can directly affect seed production.
3. They can directly affect seedling productivity and survival.

With insects in Alaska there are a couple things to keep in mind:

- There is very little information on insects related to reforestation in Alaska
- There are very few reported regenerations problems attributed insects in Alaska
- Insect outbreaks can often be ephemeral and difficult to predict, in distribution, longevity and severity.
- Most of what we know is from other parts of the boreal forest (Canada, Minnesota, Scandanavia etc)



Bark Beetles are probably the forest insect that most people are aware of. They live in the phloem of the tree, and basically girdle them at high enough densities. Because they live in the phloem, larger beetles needed thicker phloem to live in, so large beetles like spruce bark beetle are usually found in larger diameter material, and smaller beetles like engravers can live in small diameter material. The phloem of seedlings is too thin for most of the tree-killing beetles we have, so they generally aren't a problem for seedlings.



Bark Beetles: Genus *Dendroctonus* literally means Tree –Murderers

Includes two important species native to Alaska Spruce Bark Beetle and Larch Bark Beetle.

Both have killed their host species across large geographic areas in Alaska in recent decades.

Northern Spruce Engraver = *Ips perturbatus*

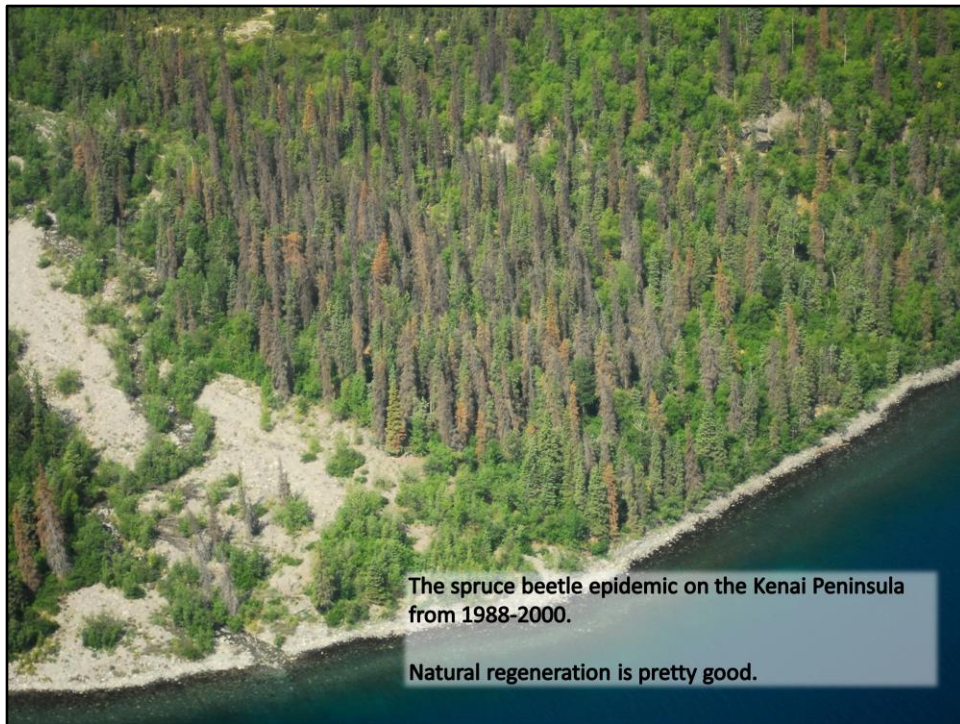


Northern Spruce engraver is the other tree killing bark beetle we have in large numbers in Alaska. These guys are quite a bit smaller than *Dendroctonus*, and are found in small diameter trees and slash.



Native bark beetles can impact post-harvest stocking levels which could be critical for meeting FRPA stocking/restocking standards. Data from the early 2000s on the Kenai Peninsula that suggests *Ips perturbatus* can impact reforestation by significantly reducing post-harvest non-merchantable spruce residuals. It's important to look at silvicultural practices, including spruce slash management practices, when designing reforestation/regeneration plans for a site.

- Post-harvest slash treatment is important. The idea is to mechanically destroy or burn the phloem or get it to dry as quickly as possible.
- Avoid cutting in the spring.
- Stack slash, etc away from residual trees, it will attract beetles and provide breeding habitat.
- Keep residuals as healthy as possible.



The spruce beetle epidemic on the Kenai Peninsula from 1988-2000.

Natural regeneration is pretty good.

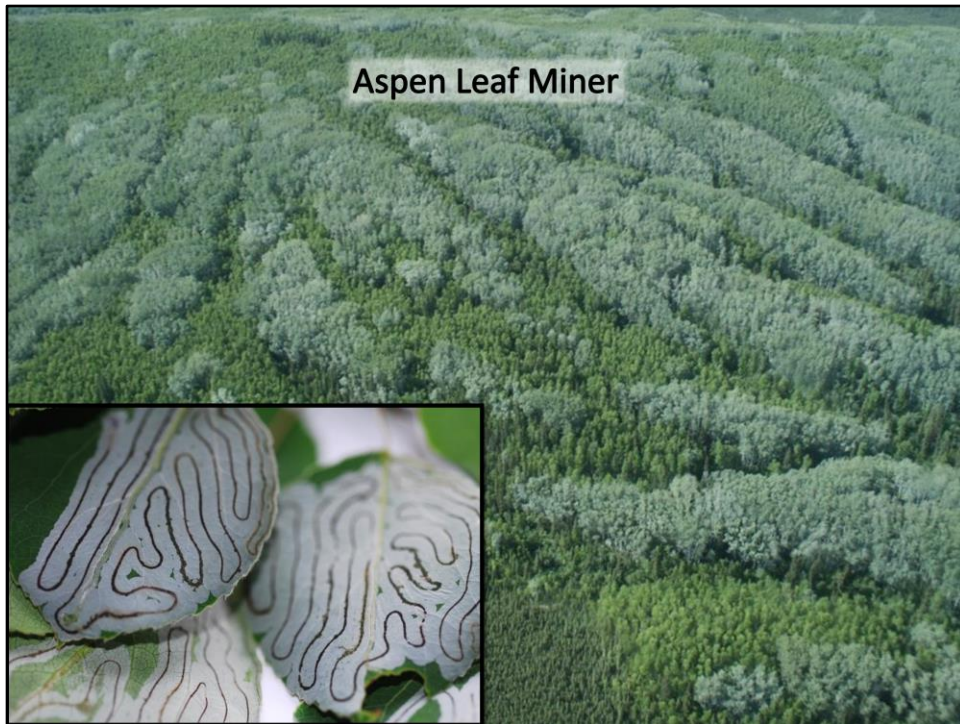
Several studies comparing areas before and after the spruce beetle epidemic have shown that regeneration is about the same in beetle-killed stands as in other stands. However there is not much published data on what harvested beetle kill stands have in the way of regen for comparison.



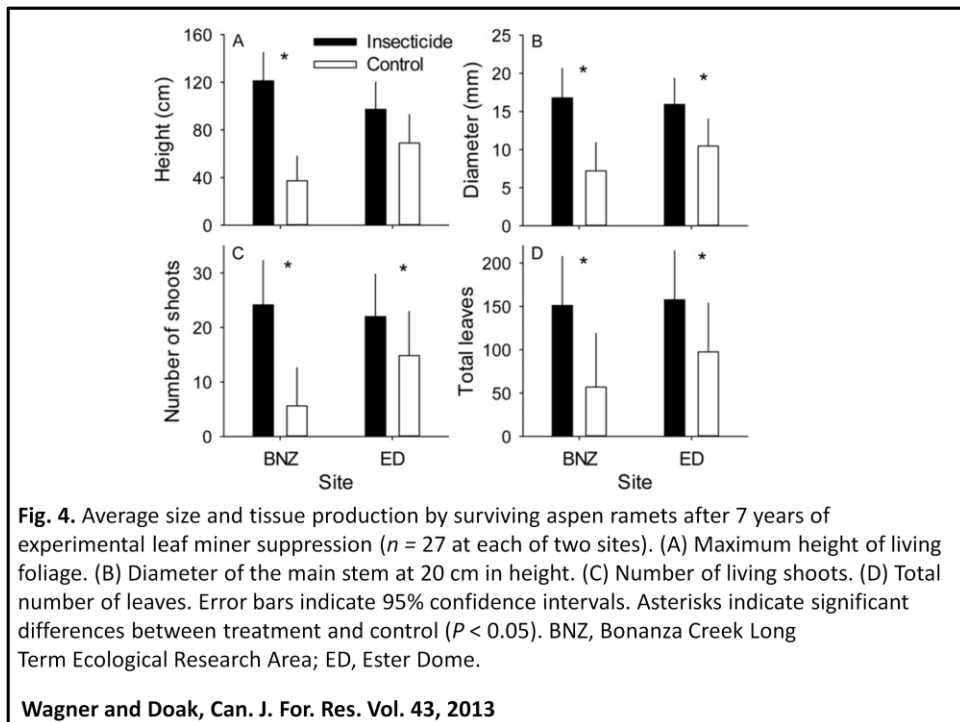
Some of the insects that could have a more direct effect on regeneration would be seed and cone feeding insects. Things like spruce cone maggot, seed worm, coneworms.

Not much data on these – outbreaks are highly ephemeral, but when they occur they can severely reduce seed production and viability. For example one recorded outbreak in Bonanza Creek Experimental Forest showed over 50% seed loss from spruce cone maggot alone, in a single year.

So these events are difficult to predict, fairly rare, but could cause problems if there is no residual seed source, and there was an outbreak the summer before harvest.



Defoliators – This should be a familiar site to most of us. Most of our seed-feeding pests and bark beetles of concern occur on spruce. Defoliators can have a big effect on seedlings –both conifer and the hardwoods. Aspen leaf miner has effected over 400,000 acres in a single year during the last decade. Reduced tree vigor is definitely a factor in stands repeatedly effected.



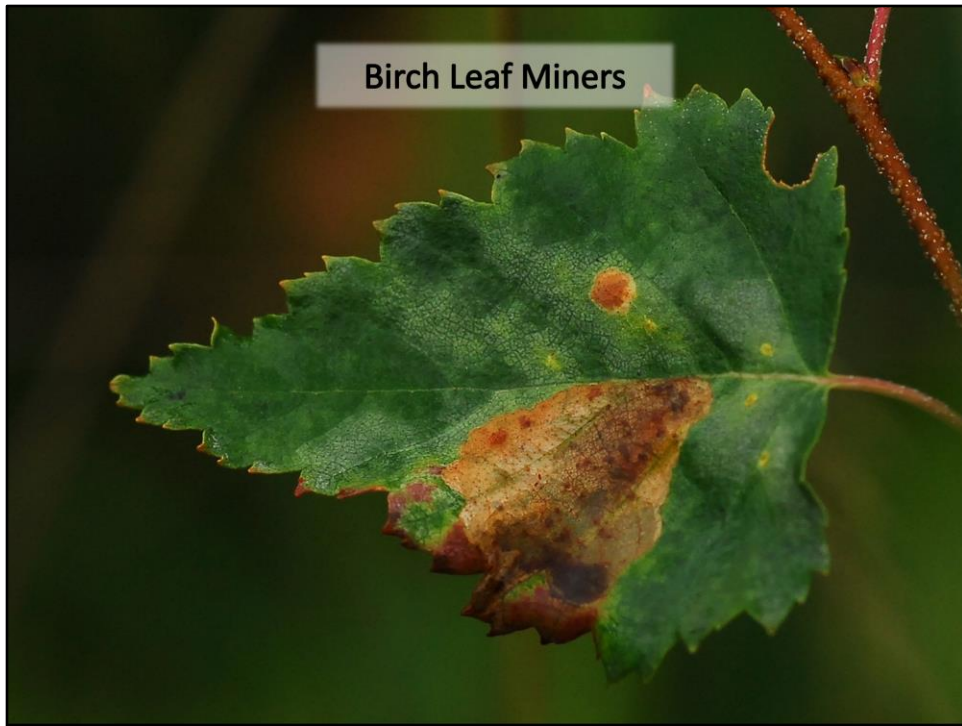
Diane Wagner and Pat Doak have been studying the impacts of Aspen Leaf Miner for almost a decade. They recent published a paper comparing the growth and productivity of aspen saplings that were and were not treated with insecticides to prevent ALM.

They selected saplings between 1 and 1.5 m tall at two sites. Half were treated with insecticide for 7 years, half were untreated. Aspen without ALM attacking them had more living stems, tall stems, more leaves and a large DBH than those attacked by ALM.

So in areas where there is active ALM you might see less regeneration than you would normally expect.



A major pest in other parts of the country. Could have an impact on regeneration. Last outbreak in Alaska was about 8 years ago, historically 1978, 1992. Roger Burnside and others from the Division of Forestry looked at seedling survivorship during the outbreak, they found 67% of seedlings had damage, but found no mortality associated with spruce budworm at a number of sites in the Tanana Valley State Forest. However in the eastern US and Canada it has caused mortality to seedlings.



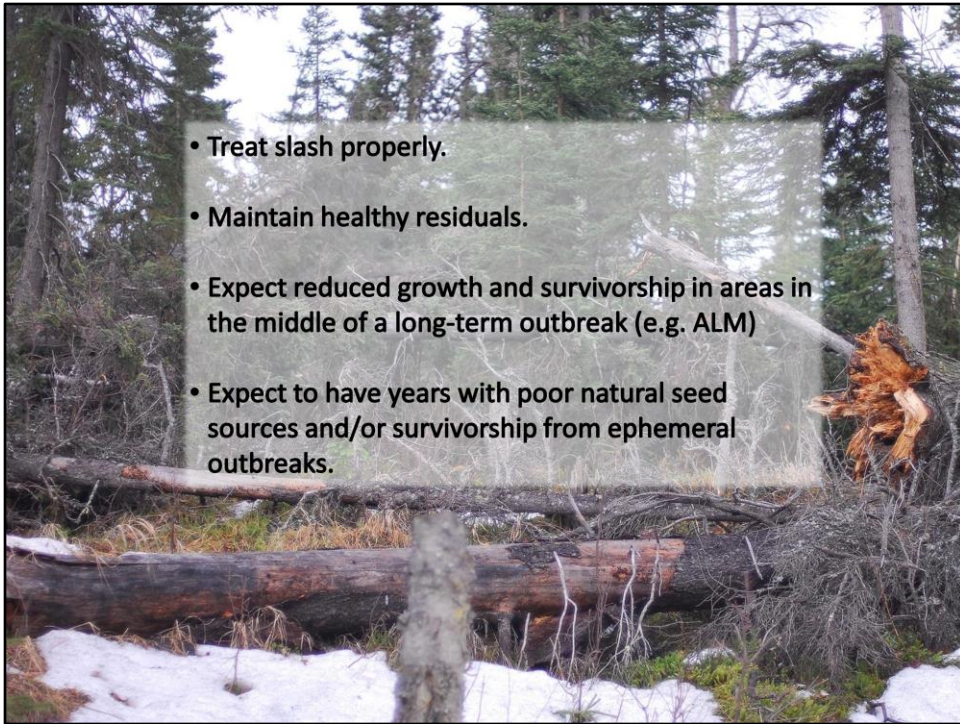
Several of these are not native to Alaska, and are causing a fair amount of damage to trees in Fairbanks and Anchorage. Mostly reduced growth and aesthetics.



This is a native pest of spruce trees. Found in Southcentral AK, it has been very noticeable feeding on street trees in Anchorage. It has not been much of a problem in natural settings.



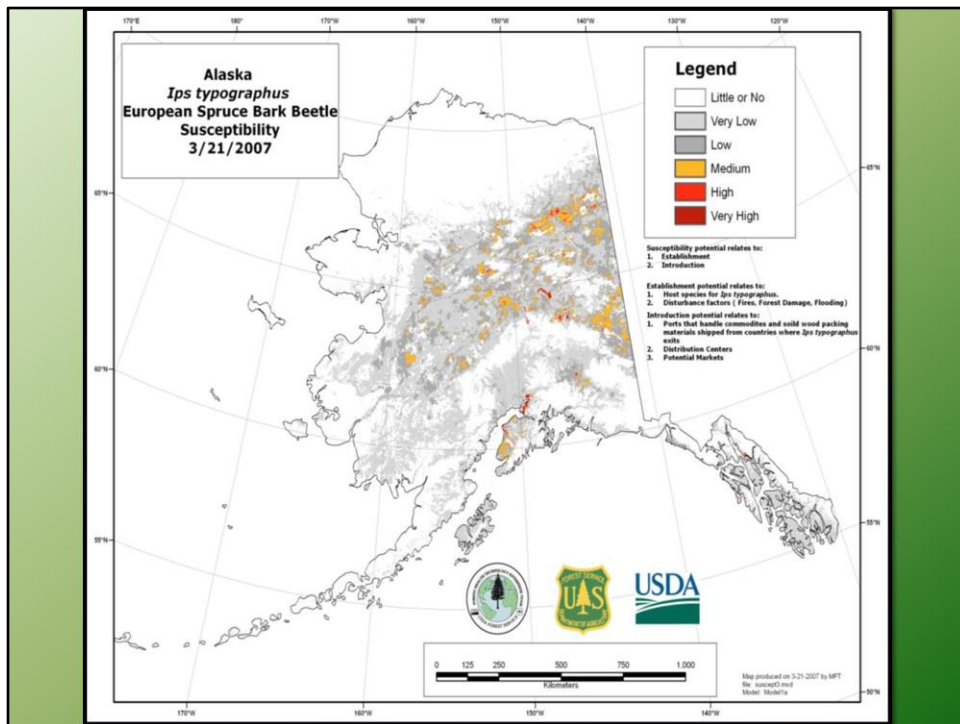
But in other parts of the country it is a pest on young spruce trees. It likes to feed in open, sunny areas, so leave so residual cover could mediate the damage from it. In Minnesota it has caused mortality of 3-20% of spruce trees planted in some studies. Because this is a problem in some places already, this could be a problem with climate change, or changes in forest composition and structure.



- Treat slash properly.
- Maintain healthy residuals.
- Expect reduced growth and survivorship in areas in the middle of a long-term outbreak (e.g. ALM)
- Expect to have years with poor natural seed sources and/or survivorship from ephemeral outbreaks.

Take Home Points:

- Treat slash properly.
- Maintain residuals nearby.
- Expect reduce growth and survivorship in areas in the middle of a long-term outbreak
- Expect to have years with poor seed sources and/or survivorship from ephemeral outbreaks.
- Some of our native insects (e.g. yellow headed spruce budworm) may act more aggressively if the climate continues to warm and the growing season extends.



Although there are not any major insect and reforestation issues that we are aware of at the moment, we do need to be concerned about potential non-native pests that could establish as a result of changing conditions in our forests ameliorated by climate change. We will include a review of any literature that addresses non-native and invasive pest risk mapping, modeling, monitoring and management as part of this reforestation S&TC review.

They are a threat to our native forests.

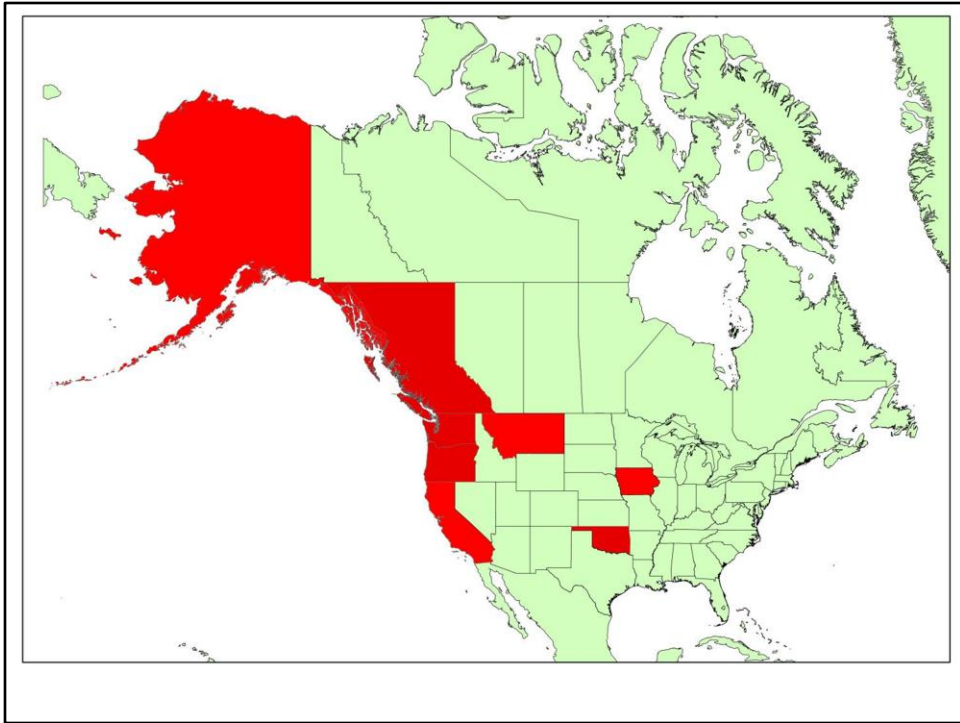
If we plant more species in the future (blue spruce, lodgepole etc.) take care not to bring problems with the nursery stock.

There are already pine feeding insects in Fairbanks that we are catching in our monitoring.



Ways Pests could get here. Seriously, why is Alaska importing firewood? Photos of firewood collected in Alaska curtesy of Alaska DNR and USDA Forest Service

Firewood
Nursery Stock
Wood Packing Materials



Alaska Department of Natural Resources Firewood Study from a few years back, demonstrated that it is a viable and important pathway for invasives into Alaska. Firewood was collected at:

Retail locations:

51 collections = 20 samples reared wood boring insects. Origin: WA*, OR*, MT, BC-Canada*

- Alcan border:

12 collections = 7 samples reared wood boring insects. Origin: WA*, OR, MT*, CA, IA, OK*, Canada*, Unknown,* Haines, AK*

*Origins reared wood boring insects

80 Scolytids, Order Coleoptera, Family Curculionidae, Subfamily Scolytinae
– Genera: Carphoborus, Dryocoetes, Pityogenes, Pityophthorus, Polygraphus, Scolytus