Assessing mortality and regeneration of larch (*Larix laricina*) in Alaska.

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Healthy larch needles

Adult larch sawfly

Mature sawfly larva

Larval damage of older needles.

Fig. 1. Airport IKONOS photo.

Fig. 2. Northland Lumber IKONOS photo.

INTRODUCTION

This project was initiated to better assess the causes of mortality of Eastern larch or "tamarack", *Larix laricina* (Du Roi) K Koch, between 1999 and 2004, associated with a landscape-level infestation of the larch sawfly, *Pristiphora erichsonii* (Hartig) (LSF). It builds on information gained from a previously funded, and completed, evaluation monitoring project (EM project #WC-FHM-05-02; see 2007 project report) that refined the extent and distribution of Alaska's native larch and identified stands which survived the massive larch sawfly outbreak first observed from Aerial Detection Monitoring in 1999. Tamarack is a minor component in most of Interior Alaska, associated with black spruce in the lowland floodplain stands and white spruce on the better sites. Mortality observed during the LSF outbreak approached 80% based on aerial survey mapping completed through 2006. Prior to the early 1970s it was largely assumed that severe sawfly defoliation predisposed larch to attack by its primary mortality agent, the larch beetle (*Dendroctonus simplex* LeConte). Other reports have speculated that LSF is the likely causal agent of larch mortality during successive years of moderate to severe defoliation. Most of these earlier reports have been based on only limited ground checks. Stands were selected for ground sampling during 2008 using; 1. GIS analysis of archived forest inventory layers, 2. previously acquired LSF data layers from the annual Aerial Detection Survey (ADS), and 3. a "healthy" larch survey completed in 2006 and 2007 across the known extent of larch north of the Alaska Range in Alaska's interior boreal forest. Because of the confusion about causal agent, key questions we hope to provide answers for with this project are: 1) Is larch beetle the primary mortality agent during landscape level larch stand disturbances?, and (2) Are larch stands regenerating after these large-scale forest defoliator disturbances?

METHODS

We used AKDOF's GIS'd land cover layers, GIS mapping data from the AK Aerial Detection Survey, and 2006-2007 "healthy larch" surveys to create a pool of potential "larch" stands for 2008 field plot locations. Current aerial photography, outside of population centers is rarely available. IKONOS imagery, however, was available for the Fairbanks area (Fig. 1 & 2), which, along with good road access, enabled relatively easy reconnaisance and selection of target stands. Larch stands were visited during July and August, 2008 and data collected in representative plots from seven discrete larch stands near Fairbanks, North Pole, and along the Tanana River floodplain below the Nenana Ridge (Fig. 3). Tree species, shrub cover, seedling & tree size classes, and mortality (e.g., larch beetle) and other insect and disease agents (e.g., wood borers and fungal mycelia evidence of *Armillaria* on all dead larch) were tallied along the plot transects. Site conditions were noted within and between sites visited: aspect, and assessment of general soils/understory vegetation, and groups/classifications were noted. Regeneration potential of larch and other trees, understory composition (shrub cover/species), presence/absence of tamarack cones, and wildfire evidence were also recorded. Basal wood discs were also collected from site trees (larch and spruce) at all sites for post-mortem examination and stand aging.

RESULTS

Seven sites selected for stand exams were quite distinct both in species composition and number of dead trees (Fig. 4). Bark beetle mortality agents (e.g., larch beetle) were important for the Tower and Cartwright sites (Fig 4.a.). Regeneration was quite variable across sites (Fig. 4.b.). Larch regeneration after landscape level insect disturbances (e.g., larch sawfly infestation) was quite good on three of the seven sites. Spruce regeneration was successful on all sites. Results from this project will help land and resource managers to more accurately assess potential stand mortality associated with LSF outbreaks across the extent of larch in Interior Alaska.

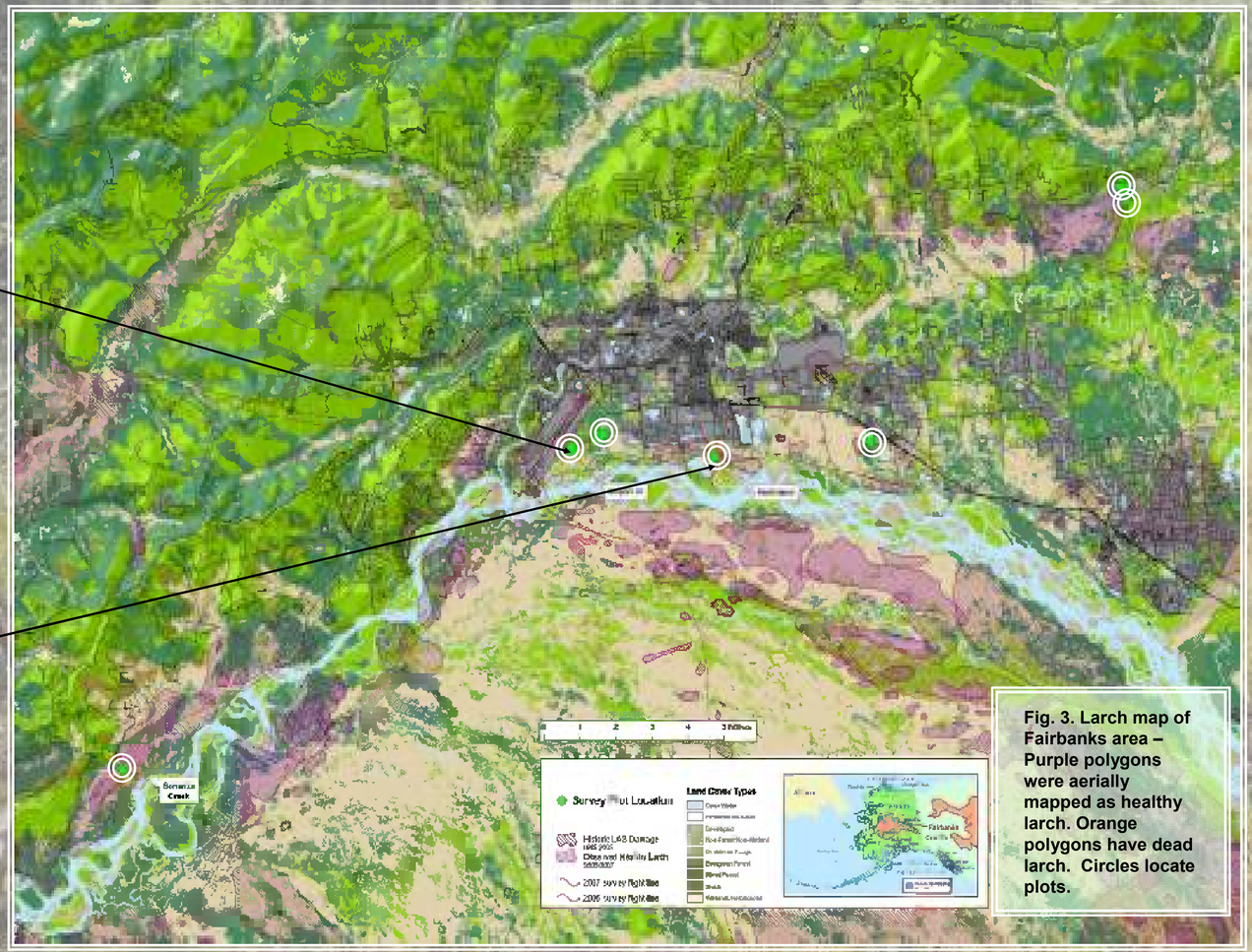


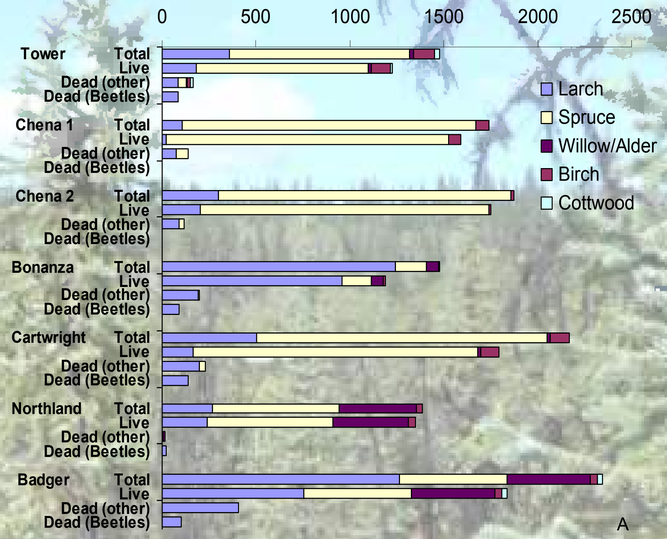
Fig. 3. Larch map of Fairbanks area – Purple polygons were aerially mapped as healthy larch. Orange polygons have dead larch. Circles locate plots.

Stringing the transect.

Fall colors and larch cones.

Looking for cones.

Tallying regeneration.



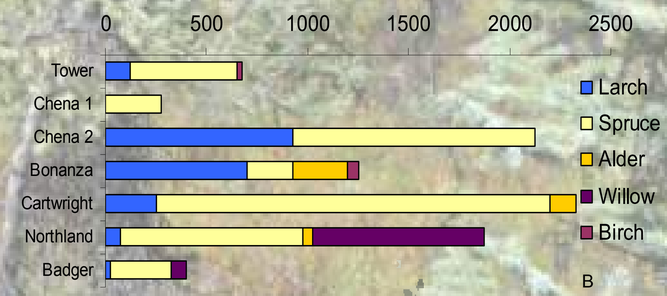


Fig. 4 .
a.Tree species composition (total, live, dead (other cause), and dead (larch beetle-killed) per acre for seven sites.

b. Tree/shrub regeneration at each site (per acre).

REMAINING PROJECT WORK:

1. Visit and establish permanent plot transects in 6-8 additional stands in remote (roadless) areas across the known extent and distribution of interior Alaska larch.

2. Summarize the collective data from 2008 and 2009, including appropriate output maps.

3. Compare this information with the only existing "post sawfly outbreak" ground plot data available, collected by USFS/FHP on the Innoko River (SW Interior Alaska) between 2000 and 2007.

4. Present a poster of the project results at the national 2010 Forest Health Monitoring Working Group Meeting.

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