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.

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). 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. 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). Based on aerial survey data, this insect has impacted an estimated 600,000-700,000 acres. Mortality of larch within the sawfly defoliated stands has been documented by aerial surveys to reach 80% or more. With float-planes being the most practical means to reach fully 95% of Alaska's interior larch areas, cost, and logistical considerations for gathering ground plot data in these remote areas has resulted in very little historical data.

METHODS

IKONOS imagery was used to find larch stand with mortality in the Fairbanks area (Fig. 1 & 2). Seven larch stands were surveyed in 2008 near roads leading from Fairbanks [(Fig. 3)]. In 2009, six larch stands were surveyed 60+mi. west of Fairbanks (via floatplane) and one stand 60+ mi SE of Fairbanks (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 overstory vegetation 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 dominant and co-dominant spruce and larch (dead and healthy) at all sites for post-mortem examination and stand aging.

RESULTS

Data from the 14 study sites suggest a strong, inverse relationship between site productivity and larch regeneration estimates (< 1 in. stem diameter at breast height (DBH)), at least on an area basis along the transects (see table). Using the relative abundance of paper birch as an indicator species for more "productive" sites, the 14 sites were divided into two groups: more and less productive. Compared to the less productive sites, the more productive sites contained three times the number of birch per acre on average. Both groups have a comparable number of stems per acre, however, the DBH's for the higher productivity sites are about 20% larger than those from lower productivity sites. Larch mortality was 7% greater on more productive than less productive sites. Approximately 28% of the dead larch were found to be killed by larch beetle.

Stringing the transect.

Fig. 2. Northland Lumber IKONOS photo.

Looking for cones.

Tallying regeneration.

Fall colors and larch cones.

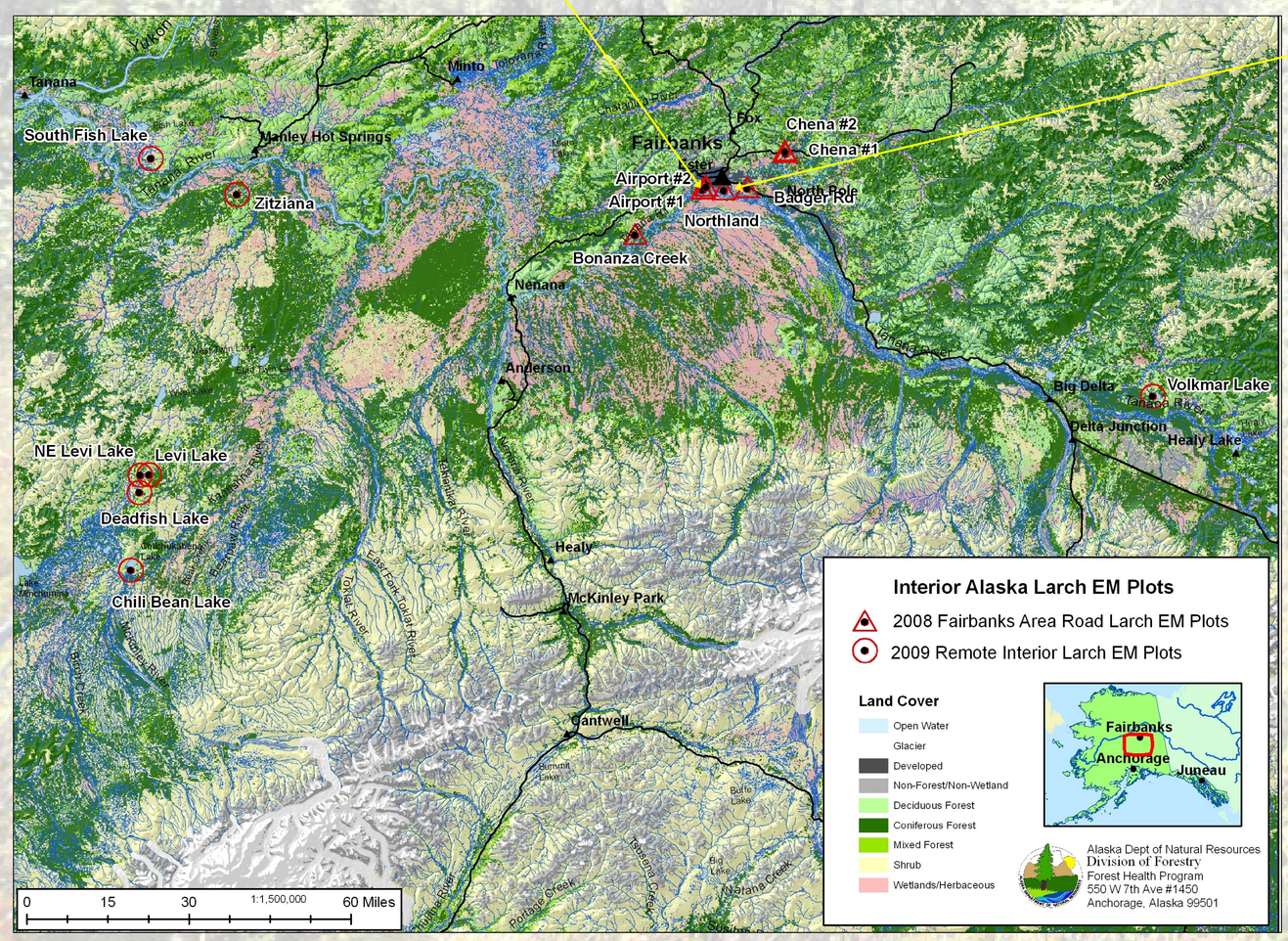

Figure 3. Larch sites evaluated on the ground during 2008 and 2009.

	Total Larch per Acre	%Larch	Dead Larch per Acre	Larch Dead from Beetles per Acre	%Larch dead	Larch Seedlings per acre	Total Birch per Acre	Total Spruce per Acre	Total Stems per Acre
More Productive Sites									
Airport 1	712	24	172	88	24	500	224	1920	2952
Airport 2	672	23	227	93	34	667	133	2064	2891
Badger	2528	54	508	100	20	100	80	1144	4688
Chena Hotsprings 1	240	6	93	9	39	0	151	3476	3867
Levi Lake	784	16	260	56	33	400	96	4016	4896
Northland Wood	918	26	14	12	2	150	36	2122	3488
Zitziana	885	42	91	40	10	600	133	1109	2128
Average	**962.8**	**27.3**	195.0	56.9	**23.1**	**345.2**	122.0	**2264.4**	**3558.5**
Less Productive Sites									
Bonanza Creek	1659	84	189	61	11	1867	11	219	1973
Chena Hotsprings 2	600	16	96	4	16	3700	24	3120	3744
Chili Bean	379	13	67	32	18	2267	0	2608	2987
Deadfish	2232	57	460	96	21	700	16	1616	3896
Northeast of Levi	368	7	64	21	17	867	0	4901	5269
South Fish Lake	571	74	99	43	17	3733	21	176	768
Volkmar Lake	613	72	45	27	7	1600	176	59	848
Average	**917.3**	**46.2**	145.7	40.6	**15.4**	**2104.8**	35.4	**1814.1**	**2783.6**

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