Alaska Forest Health Highlights

2010 Survey Year

Each year the United States Department of Agriculture Forest Service's State & Private Forestry, Forest Health Protection (FHP) program, together with Alaska Department of Natural Resources (AKDNR), conducts annual statewide aerial detection surveys across all land ownerships. In 2010, staff and cooperators identified over 1,280,000 acres of forest damage from insects, diseases, declines and selected abiotic agents on over 36.9 million acres surveyed (Map 1 and Map 2). This acreage is close to two times more aerially-observed forest disturbance as compared to last year, with only a slight bump in overall area flown. (Table 1 and Table 2).

The aerially-recorded damage numbers found in this report serve only as a sample of statewide conditions and generally do not represent the acres affected by pathogens, since many of the most destructive disease agents (i.e., wood decay fungi, root diseases, dwarf mistletoe, canker fungi, etc.) are not readily visible by aerial survey. Please see the aerial detection survey section of this report for a more insightful description of the survey methods and data limitations. Additional information regarding forest health provided by ground surveys and monitoring efforts is also included in this report, complementing the aerial survey findings. Forest Health Protection staff also continually work alongside many agency partners on invasive plant issues, including roadside and high-impact area surveys, public awareness campaigns, and general education efforts.

Insect and disease activity is commonly closely tied to weather conditions. Warmer-than-average temperatures occurred during 2010 for most of the world's surface, including Alaska and Canada (NOAA National Climatic Data Center, State of the Climate: Global Analysis for http://www.ncdc.noaa.gov/sotc/global/).

Insects

Synchronization of defoliating insects (especially Geometrids) with bud-break of their host species may have contributed to the expansion of their populations. The success of these defoliator populations in part depends upon their synchrony with bud-break, and Alaska's warm spring weather was likely responsible for an early bud-break creating close to ideal conditions for defoliators in 2010.

The greatest observed increase of defoliated trees or tree mortality between 2009 and 2010 can be attributed to spruce aphid-defoliated Sitka spruce. Good winter survival and warm spring temperatures allowed for the tremendous increase in aphid populations. The intensity of defoliation in some trees on the warmest sites may lead to tree mortality in 2011.

Similarly, willow leafblotch miner defoliation of willow increased dramatically in comparison to other insect pests when compared to 2009 surveys. Multiple years of defoliation in the same willows has resulted in noticeable branch mortality.

Over the last few years there has been a shift to lower leaf mining intensity of the birch leaf miners. There are three recognized leaf miners but two cause most of the leaf mining damage; birch leaf edge miner, and amber-marked birch leaf miner. Birch leaf edge miner has surpassed the once more aggressive amber-marked birch leaf miner in leaf mining intensity. An ongoing biocontrol project has introduced a parasitoid wasp that has exceeded 50% parasitism of the amber-marked birch leaf miner on release sites.

Aspen leaf miner is still affecting trees on a large number of acres, the second most recorded acres of any insect pest. The extent of affected stands nearly matches the extent of aspen in Alaska and the majority of aspen stands are affected, many at high intensity. The responsible leaf miner, *Phyllocnistis populiella* is also commonly occurring on balsam poplar and black cottonwood.

Spruce beetle continues to kill mostly white spruce with most of the activity in southwestern Alaska. There was a large increase in acres mapped in the Katmai National Park matched by an equally large decline of acres mapped in the Lake Iliamna region. The bulk of northern spruce engraver beetle activity occurred along the main river drainages of the upper Yukon River basin in northeast Alaska. Mortality between the Kantishna River and the north fork of the Kuskokwim River between Lake Minchumina and Medfra could not be mapped. Wildfire, smoke, and inclement weather during the aerial survey prevented mapping this area.

Diseases and Disorders

2010 marked the first time that the aerial detection survey attempted to map alder canker, and it was detected as the fourth greatest damage agent for the year. Alder canker is now known to be common throughout most of Alaska including urban, rural, and remote areas of western, interior, and south-central Alaska. Significant canker damage could be seen from sea level up to about about 1500 feet in elevation. The disease was not limited to riparian areas; some patches were found more than 2 miles from the nearest stream. Alder canker occurs in descending order of damage on thin-leaf alder (*Alnus tenufolia*), Siberian (AKA green)alder (*A. fruticosa*), and Sitka alder (*A. sinuata*), respectively. Although at least three species of sawfly can co-habit infected stems (Figure 1), the fungus that causes the disease (*Valsa melanodiscus*) is capable of killing thin-leaf and Siberian alder alone. In thin-leaf alder stands, we measured up to 58% loss of basal area due to canker. Whether it can also kill Sitka alder without a predisposing factor has not yet been evaluated.

Figure 1. Alder canker and sawfly damage on thin-leaf alder.

Hemlock dwarf mistletoe causes growth loss, top-kill, and mortality on an estimated 1 million acres in Southeast Alaska as far north as Haines. Most of the damage is concentrated below 500 ft. elevation, above which the parasite is less common. Heavily infected trees have unique branch proliferations (brooms) that function as high-quality wildlife habitat. Stem decays (heart rots) are found in virtually every old-growth forest of coastal Alaska where they cause substantial volume losses. Both dwarf mistletoe and stem decays are primarily diseases of old forests that do not fluctuate much from year to year.

Yellow-cedar decline has been mapped on approximately 500,000 acres over the years across an extensive portion of Southeast Alaska, especially from western Chichagof and Baranof Islands to the Ketchikan area. The broad-scale spatial extent does not increase much from year to year, with the exception of the northern margin. In 2010, active yellow-cedar decline (reddish dying trees) nearly doubled from the previous year to about 30,000 acres. Most of these areas of dying trees and recent mortality were found on the outer coast of Chichagof Island, indicating an apparent northward spreading of cedar decline.

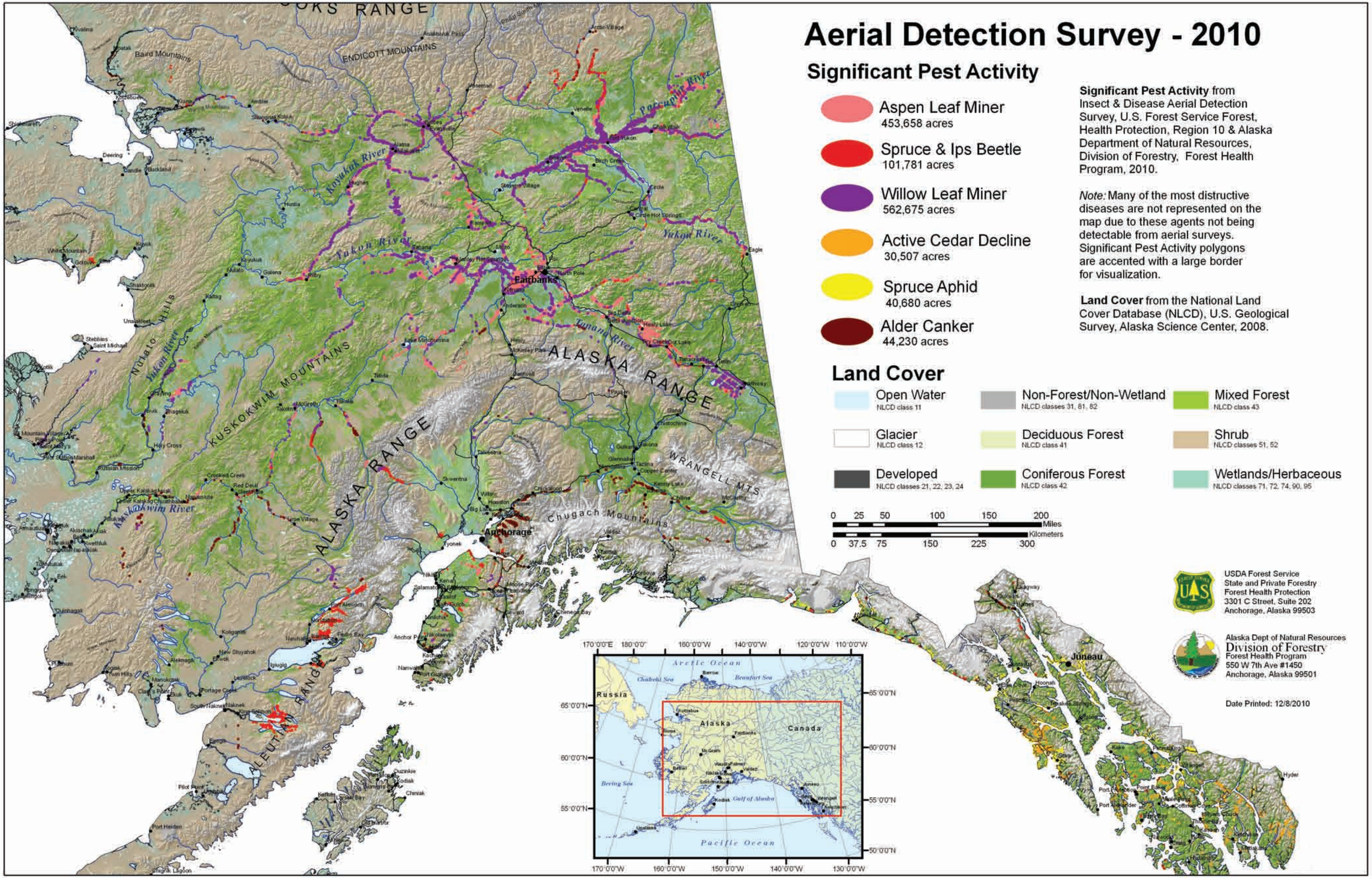
Invasive Plants

The year 2010 saw some significant events in the Alaska invasive plant world. An infestation of a federally-designated noxious weed was documented in Alaska for the first time. The weed, giant hogweed (*Heracleum mantegazzianum*), was reported by a resident of the tiny Southeast Alaskan village of Kake after she attended a presentation by FHP staff and cooperators. Holding the FHP-sponsored book Invasive Plants of Alaska in her hands, she pointed to the photo of giant hogweed and said "We've got this one in Kake." She was right. Within weeks, the Alaska Division of Agriculture was working with APHIS-PPQ and personnel from the Tongass National Forest to dig out and bag the small infestation.

A more ominous find this year was a substantial infestation of *Elodea canadensis*, or common waterweed, in the Fairbanks area. Although this species was found once near Cordova thirty years ago, it hadn't been seen since. The discovery near Fairbanks was the first time an invasive aquatic plant had been documented in Alaska. FHP staff found the infestation, then worked with National Park Service, US Fish and Wildlife Service, and University of Alaska Fairbanks biologists to verify it and organize an information meeting. A steering committee of federal, state and community groups will take on the complex task of organizing the response to this situation. If *Elodea* continues to spread in interior Alaska, it could have significant and irrevocable negative impacts on slow-moving stream and river systems, and on many interior Alaska lakes.

Alaska FHP has participated in two American Recovery and Reinvestment Act (ARRA) projects related to invasive plants this year. The "Alaska Weed Management" project went full steam ahead in 2010, resulting in 18 new term positions at the Alaska Association of Conservation Districts. This project significantly increased Alaska's invasive plant response capacity, particularly in remote locations of the state. The "Rural Village Seed Production" project will be a multi-year effort to encourage and support the production of native Alaskan plant materials for revegetation needs.

Map 1. Significant pest activity from 2010 aerial detection survey



Map 2. Survey flight paths from 2010 aerial survey and general ownership

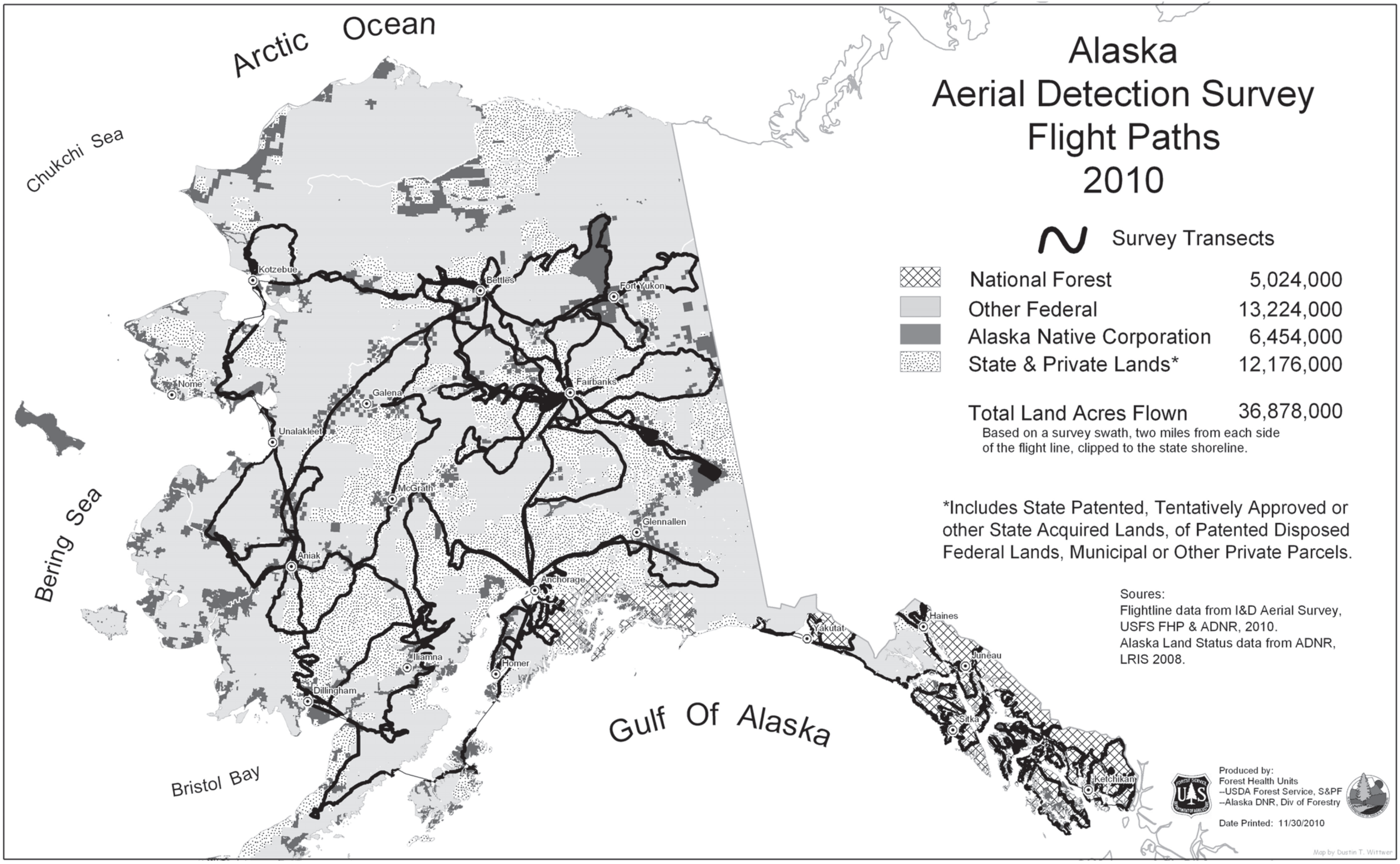


Table 1. 2010 forest insect and disease activity as detected during aerial surveys in Alaska by land ownership[1] and agent. All values are in acres[2].

TABLE 1	national forest	native	other federal	state & private	Total ACRES
Abiotic causes[3]	968	2,274	2,970	5,807	12,019
Alder canker	817	8,971	11,537	22,906	44,230
Alder defoliation[4]	635	24	244	6,092	6,995
Aspen defoliation[4]				1,750	1,750
Aspen Leaf Miner		108,295	144,395	200,967	453,658
Birch defoliation[4]		154	4,295	28,842	33,290
Black-headed budworm		252		91	343
Cedar decline faders[5]	28,666	630		1,212	30,507
Conifer defoliation	4,408	4,005	2,187	2,454	13,053
Cottonwood defoliation[4]	178	4,612	4,027	5,268	14,085
Hardwood defoliation		715	865	665	2,245
Hemlock canker	314	83			397
Hemlock sawfly	6,932	1,236	110	824	9,101
IPS and SPB[6]		1,550	470	178	2,198
Ips engraver beetle		7,866	11,663	2,071	21,600
Large aspen tortrix		1,517	2,088	4,986	8,592
Porcupine damage	638	12		269	919
Spruce aphid	20,331	1,543	5,120	13,686	40,680
Spruce beetle	1,567	6,648	56,317	13,452	77,983
Spruce needle rust	61	144	501	50	756
Willow defoliation[4]	178	231,270	233,900	97,328	562,675
Willow dieback		37	199	489	725

[1] Ownership derived from 2008 version of Land Status GIS coverage, State of Alaska, DNR/Land records Information Section. State & private lands include: state patented, tentatively approved, or other state acquired lands, and of patented disposed federal lands, municipal, or other private parcels.

[2] Acre values are only relative to survey transects and do not represent the total possible area affected. The affected acreage is much more extensive then can be mapped. Table entries do not include many of the most destructive diseases (e.g., wood decays and dwarf mistletoe) which are not readily detectable in aerial surveys.

[3] Acres recorded from abiotics include windthrow, freezing injury, flooding, snow slides and landslides.

[4] Significant contributors include sawflies, leaf miners, and leaf rollers for the respective host. Drought stress and unrecognized diseases may also cause reduced foliation or premature foliage loss.

[5] Acres represent only spots where current faders were noticed. Cumulative cedar decline acres can be found in Table 8.

[6] These acreage values are a cumulative effect from *Ips* engraver beetle (*Ips perturbatus*) and spruce bark beetle (*Dendroctonus rufipennis*) working in tandem on the same stand of trees.

Table 2. Affected area (in thousands of acres) for each host group and damage type over the prior five years and a 10-year cumulative sum. For detailed list of species that compose the following categories see appendix II.

Host Group / Damage Type[1]	2006	2007	2008	2009	2010	Ten Year Cumulative[2]
Alder Defoliation	10.7	10.0	0.7	3.4	7.0	55.4
Alder Mortality	0.0	0.0	15.0	1.3	44.2	69.0
Aspen Defoliation	509.5	796.0	219.7	310.8	464.0	3394.9
Birch Defoliation	13.2	1.5	0.1	14.3	33.3	490.9
Cottonwood Defoliation	24.6	11.5	13.2	11.2	14.1	131.9
Hemlock Defoliation	0.0	0.1	0.1	3.6	9.1	15.6
Hemlock Mortality	0.0	0.0	2.0	2.1	0.4	4.9
Larch Defoliation	2.7	0.1	0.2	0.1	0.0	52.9
Larch Mortality	0.0	0.0	0.2	0.1	0.0	39.6
Spruce Defoliation	68.1	41.9	6.9	0.8	40.9	383.5
Spruce Mortality	130.6	183.9	129.1	138.9	101.8	968.8
Spruce/Hemlock Defoliation	1.5	10.3	2.8	1.1	0.3	82.5
Spruce/Larch Defoliation	2.8	0.0	0.0	13.2	0.0	16.6
Sub Alpine Fir Mortality	0.5	0.1	0.0	0.0	0.0	1.7
Willow Defoliation	50.7	92.7	76.8	139.7	562.7	1081.4
Total damage acres - thousands	**814.9**	**1148.1**	**466.8**	**640.6**	**1277.8**	
Total acres surveyed	32,991	38,365	36,402	33,571	36,878	
Percent of acres surveyed showing damage	2.5	3.0	1.3	1.9	3.5	

[1] Summaries identify damage, mostly from insect agents. Foliar disease agents contribute to the totals for spruce defoliation, hemlock mortality and alder mortality. Damage agents such as fire, wind, flooding, slides and animal damage are not included. Cedar mortality is summarized in Tables 1 and 8.

[2] The same stand can have active infestation for several years. The cumulative total is a union of all areas from 2001 through 2010 and does not double count acres.