2012 Alaska State Highlights

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The Forest Health Protection (FHP) Program (State and Private Forestry, USDA Forest Service), together with the Alaska Department of Natural Resources Division of Forestry, conducts an annual, statewide Aerial Detection Survey across all land ownerships.

In 2012, staff and cooperators identified over 490,000 acres of forest damage from insects, diseases, declines and selected abiotic agents on the 28.5 million acres surveyed (Maps 1 and 2, Tables 1 and 2). The total damaged acreage observed is down by 24% from 2011 levels (adjusted for acreage flown), and down significantly compared to 2010. Much of the change since 2010 is due to substantial decreases in aspen and willow leaf mining and defoliation, less activity by spruce aphid in Southeast Alaska, and reduced acreage of newly-killed spruce by bark beetles (Table 2). However, defoliator damage to birch, cottonwood and other hardwood species is escalating. Although less alder dieback from alder canker was mapped in 2012 for a variety of reasons, this fungal disease, which was one of the top damage agents in 2011, remains a significant concern in Southcentral and Interior Alaska.

The acreage of aerially-detected damage reported here serves only as a sample of statewide conditions in a state with 127 million acres of forested land. Generally, the acreage affected by pathogens is not accurately represented by the aerial survey, since many of the most destructive disease agents (e.g., wood decay fungi, root diseases, and dwarf mistletoe) are not readily visible from the air. Additional forest health information is acquired through ground surveys, monitoring plots, site visits, qualitative observations, and reports from forestry professionals and the general public. This information is included in the report, where possible, to complement the aerial survey findings.

Forest Health Protection staff work alongside many agency partners on invasive plant issues, conducting roadside and urban surveys, public awareness campaigns, and general outreach and education efforts.

Insects

The amount of insect damage detected by aerial survey in 2012 decreased from 2011 for alder, aspen, willow, and hemlock. The aspen leaf miner, which was previously ranked as the number one pest in terms of acreage damaged, continued to decrease in activity with a 50% reduction in acreage detected from last year. There was also >50% reduction in the acreage of alder defoliation. Defoliated acreage for birch, cottonwood, and spruce increased. The greatest amount of defoliation occurred on birch (177,800 acres affected); about half on birch trees and half on dwarf birch shrubs. A variety of insects contributed to this defoliation, including several geometrid moth species, the rusty tussock moth, leaf rollers, and leaf beetles. The greatest amount of birch defoliation occurred on the Kenai and Alaska Peninsulas and in Interior Alaska.

Spruce defoliation from insects and disease increased slightly in 2012, mostly attributed to an increase in spruce budworm activity. The acreage affected by spruce aphid continues to decrease; another cold winter may push this pest to undetectable levels next year. A moderately sized outbreak of spruce budworm near Ninemile Slough (Yukon River) may indicate that the population of this species is on an upward trend; however, if cool, wet weather persists over the next few years may help to control their population. Spruce beetle damage has continued to decrease to the lowest level in decades, with fewer than 17,000 acres detected. Nonetheless, there was an increase in spruce beetle activity in Southeast Alaska, especially on Kupreanof Island. Beyond Kupreanof, outbreaks in Southeast Alaska were scattered in patches of less than a hundred acres.

Customs and Border Protection continues to intercept Asian gypsy moth (AGM) to prevent its introduction to Alaska. A bulk carrier vessel was intercepted near Ketchikan that was transporting AGM egg masses. The ship was not allowed into port until all egg masses were destroyed. AGM are an extremely destructive forest pest, feeding on over 600 different species of trees, and could be devastating to Alaskan forests if established.

Hemlock defoliation (Figure 4) appears to be increasing in Southeast Alaska. Large areas of defoliation were reported in September that were not detected during the aerial survey; ground checks confirmed large populations of hemlock sawfly, as well as geometrid caterpillars and other Lepidopteran species. A hemlock feeding geometrid moth, *Enypia venata*, was detected defoliating hemlocks and firs during early summer across the Pacific Northwest. Many of the stands in Southeast Alaska that were heavily defoliated by sawflies in 2011 had recovered by 2012. A species of sawfly was also found feeding on shore pine in Southeast Alaska. There has been little research on pests of shore pine, so this is a potentially new host record. Specimens have been sent to the Smithsonian for identification.

Figure 4. Hemlock sawfly defoliation observed in Southeast Alaska during the 2012 Aerial Detection Survey.

Diseases

A project funded by the USFS Forest Health Monitoring Grant Program was initiated in 2012 to investigate the insect and disease agents and health status of shore pine, a lodgepole pine subspecies typically found on peatland sites in Southeast Alaska. Recent Forest Inventory Analysis data has shown that shore pine was the only tree species in Alaska with a significant decline in biomass between the two most recent measurements, highlighting critical knowledge gaps for this non-timber species. FHP is installing a network of 50 permanent plots across five locations in Southeast Alaska; plot installation will be completed in 2013. Surveys in 2012 found that western gall rust, foliage disease, and bole wounding were important damage agents of shore pine. Secondary insects and fungi caused extensive localized mortality of western gall rust infected boles and branches (Figure 5). Work is needed to determine the key causes of bole wounding, which probably include a variety of animals (porcupines, beavers, bears and deer) and mechanical breakage from snow loading. Damage to shore pine observed from the air and ground near Gustavus and Glacier Bay National Park may be caused by severe foliage disease, and warrants further attention in 2013.

Figure 5. Topkill, dieback and active flagging of western gall rust-infected branches of shore pine, commonly observed during the 2012 field season. Western gall rust causes spherical swellings to develop on branches, and gall tissue is prone to attack by secondary insects and fungi.

A hemlock canker outbreak occurred along roadsides and riparian areas of Prince of Wales Island in 2012. Hemlock canker causes periodic mortality and branch dieback of western hemlock in Southeast Alaska, but the causal fungus is unconfirmed. Samples were collected and sent to Gerry Adams (Associate Professor of Practice, University of Nebraska) for culturing and genetic sequencing, which yielded three potential canker pathogens: *Pezicula livida*, *Alternaria porri*, and a species of *Collophora*. Inoculation trials with these species may be initiated in spring 2013. If inoculations result in symptom development and the fungi can be reliably reisolated from infected tissue, we will have identified the causal fungus and will gain valuable insight into hemlock canker epidemiology.

Alder canker dieback and mortality, caused by *Valsa melanodiscus* and other canker fungi, remains a serious concern in Southcentral and Interior Alaska. The acreage of alder dieback detected in the Aerial Detection Survey was down from 2011 levels. This is largely due to differences in detection methodologies over time, since many stands affected by alder dieback

during the past decade were mapped for the first time in 2011. Drought-stress has been shown to increase susceptibility to this pathogen in greenhouse experiments; therefore, climate trends may impact disease levels.

Dwarf mistletoe and stem decays are predominantly diseases of old forests with little annual fluctuation, and play important roles in gap-creation, wildlife habitat, and ecological processes in coastal rainforests. These important damage agents cannot be mapped through aerial survey. Hemlock dwarf mistletoe affects about one million acres of western hemlock in Southeast Alaska. Its occurrence is apparently limited by climate, becoming uncommon or absent above 500 ft in elevation and 59°N latitude (Haines, AK) despite the continued distribution of it host. Recent modeling efforts project that both hemlock and dwarf mistletoe will be "climate winners," with increases in suitable habitat over the next century. Stem decays (heart rots) are primary disturbance agents in virtually every old-growth forest of coastal Alaska, where they cause substantial losses in timber volume. In stands managed for wildlife and other non-timber objectives, silvicultural practices can promote stem decay for wildlife benefits.

Moderate to severe outbreaks of spruce needle rust (*Chrysomyxa ledicola*) occurred in many regions of Alaska in 2012, including Lake Clark to Katmai National Parks, the western Kenai Peninsula, and peatland sites across Southeast Alaska. Aerially dispersed rust spores from spruce trees coated miles of lake and coastal water surfaces and washed up on shorelines in heavily affected areas, similar to the event reported in Kivalina (NW Alaska) in 2011. Levels of disease fluctuate significantly from year to year depending on weather conditions.

Noninfectious Disorders

Yellow-cedar decline has been mapped on more than 400,000 acres over the years across an extensive portion of Southeast Alaska, and the 2012 aerial survey mapped over 17,000 acres of active yellow-cedar decline (reddish dying trees). This climate-driven decline is associated with freezing injury to fine cedar roots that occurs where snowpack in early spring is insufficient to protect roots from late-season cold events. A comprehensive yellow-cedar strategy is being developed in collaboration with the Regional Office, the National Forest System and other cooperators (expected 2013). This document will provide information on yellow-cedar biology and decline, and guidance on yellow-cedar management for specific regions and Ranger Districts in Alaska.

Significant windthrow occurred in Southcentral and Interior Alaska during a mid-September storm, affecting an estimated 1.4 million acres of forest along the upper Tanana Valley. The most severe damage (about 30,000 acres with >50% downed trees) occurred between Delta Junction (Little Salcha River) and Tanacross. The combination of wind and heavy snowloads in winter 2011/2012 caused extensive damage (Figure 6) along a 20 mile stretch of the Seward Highway on the Kenai Peninsula, affecting spruce, birch and other hardwoods. No increase in northern spruce engraver has been detected in traps in response to the Kenai disturbance. The two events were not detected in the Aerial Detection Survey; the event in Interior Alaska occurred after the survey, and leafout obscured the windthrow damage on the Kenai. The majority of windthrow damage detected in the aerial survey (~6,000 acres) was mapped in Interior Alaska, south of McKinley Crossing.

Figure 6. Wind damage to aspen near Summit Lake on the Kenai Peninsula resulting from storms in Winter 2011/12. Damage was common to spruce and hardwoods along a 20-mile stretch of the Seward Highway.

Invasive Plants

A new Southeast Alaska Soil and Water Conservation District was established. New pesticide permitting regulations under consideration by the Alaska Department of Environmental Conservation will have a significant, positive impact on invasive plant management efforts in Alaska. Meanwhile, the Alaska Division of Agriculture initiated a new weed-free gravel program.

In 2012, the staff of the Alaska Cooperative Extension Service (CES) led a series of live webinars on invasive plant management topics, using Elluminate Live (E-live) software. Three webinars addressed specific species and their control practices and were worth one Continuing Education Unit each for Alaska certified pesticide applicators. CES hopes to continue this webinar series in 2013.

A Field Guide to Alaska Grasses was completed this year, and has already proven popular among Alaska's resource professionals. FHP support ensured that several grass species that are invasive in Alaska were included in this guide.

The invasive waterweed, *Elodea* spp., has now been found in 13 lakes or waterways in Alaska. The most recent finds, in September, were Stormy and Daniels Lakes on the Kenai Peninsula. This year the Fairbanks Cooperative Weed Management Area (FCWMA) tested the use of a small suction dredge for removing *Elodea* from Chena Slough. In September, the Fairbanks Soil and Water Conservation District hosted an *Elodea* information session for the State of Alaska, an event which prompted the state to determine which state agency has responsibility for managing this damaging aquatic invasive plant.

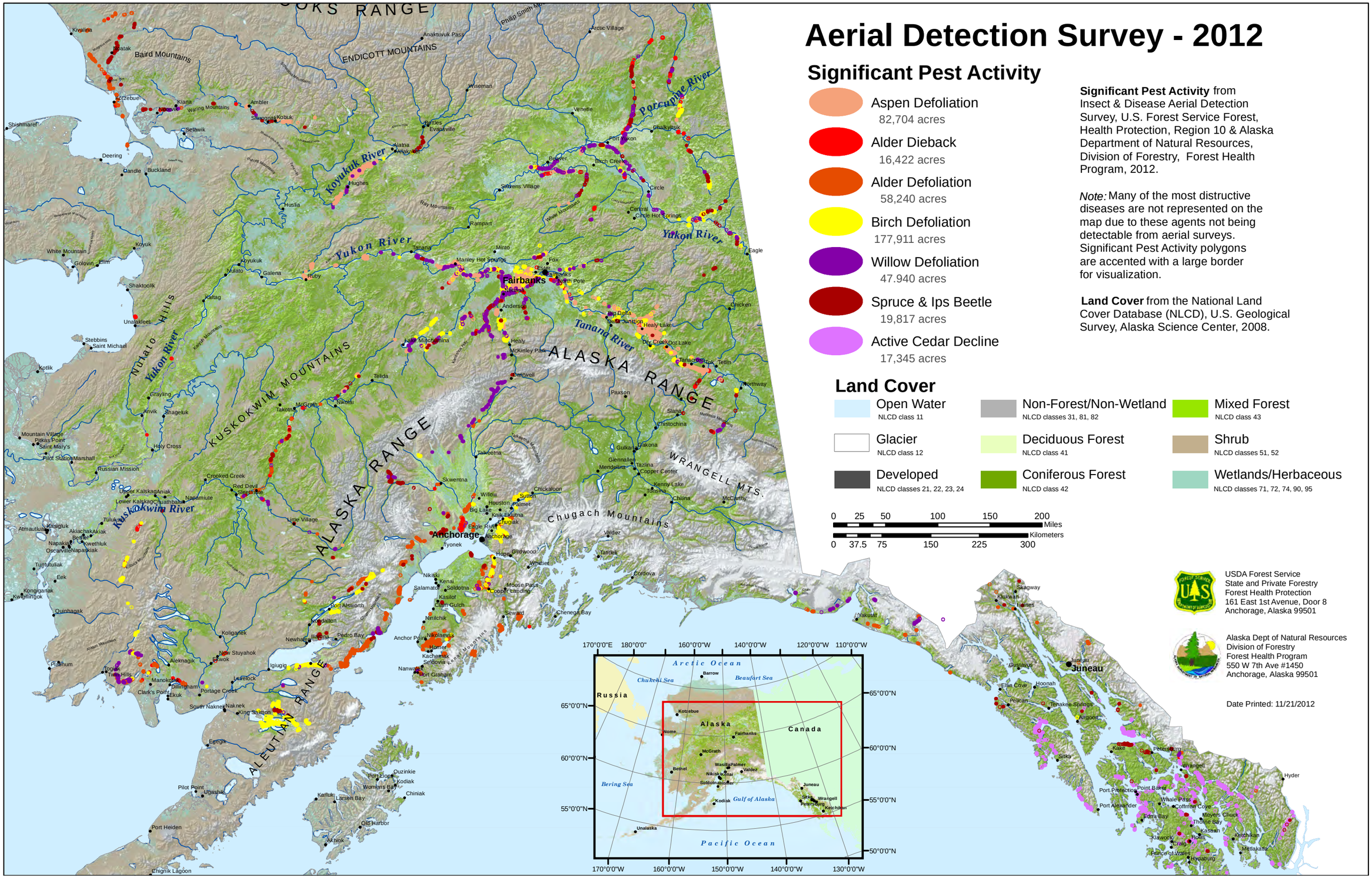
State and federal mandates increasingly require that native plant materials are used in revegetation projects. The purpose of the Rural Village Seed Production Project (RVSPP) is to stimulate low-tech native plant production in several rural Alaskan communities. The five villages involved are Aniak, Hooper Bay, Manley Hot Springs, Metlakatla, and Pedro Bay. The Rural Village Seed Production Project is scheduled to end in 2013.

The Alaska Invasive Species Meeting was held for the first time in Kodiak. Region 10 FHP personnel presented at the meeting and co-sponsored an Invasive Plant Curriculum Workshop for southwestern Alaska teachers, in partnership with the University of Alaska Fairbanks and the Center for Alaska Coastal Studies.

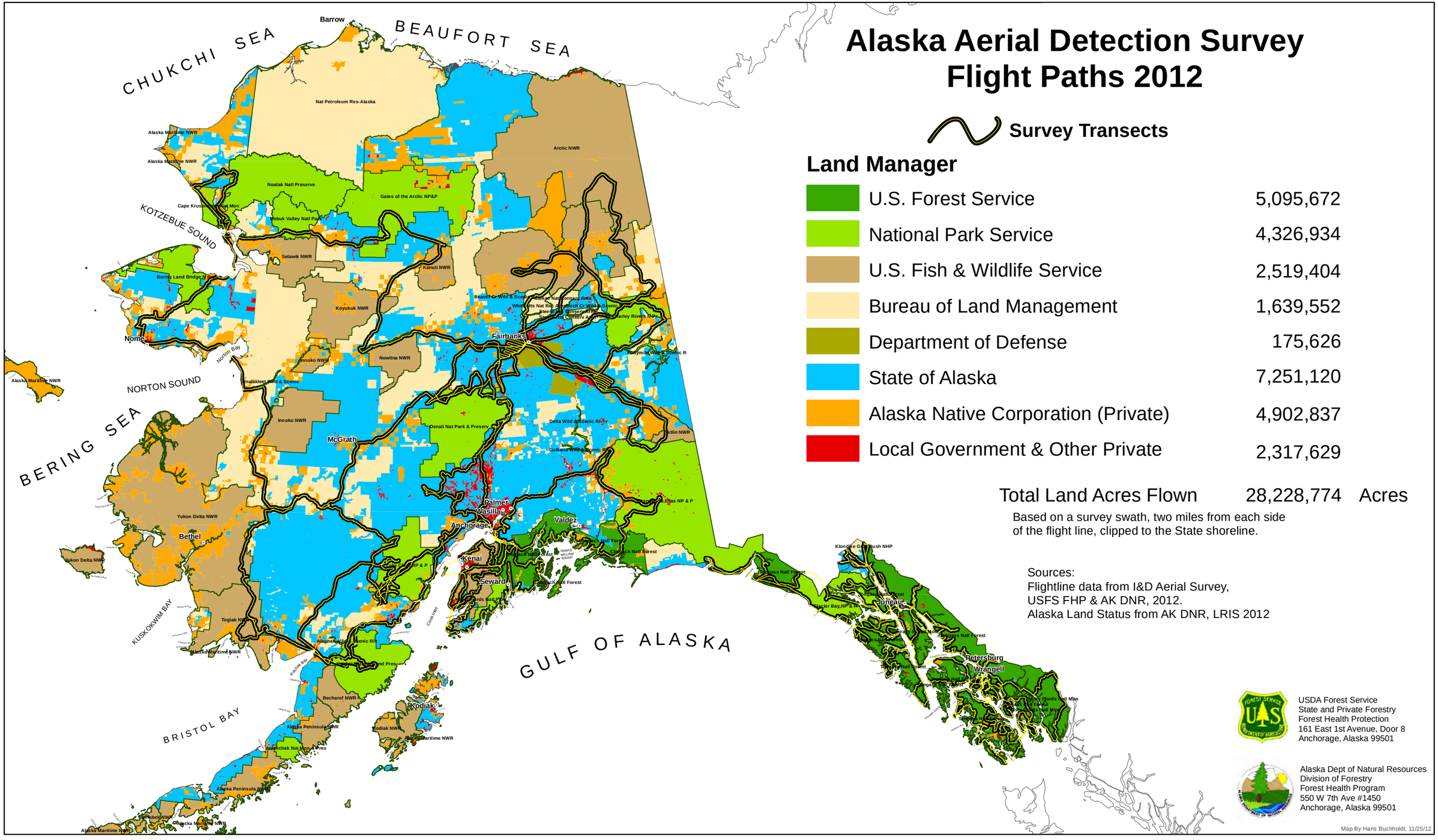
FHP partnered with CES and the Fairbanks Cooperative Weed Management Area to host a public forum on the bird vetch problem in Fairbanks. In contrast to a similar public meeting on bird vetch four years ago that was attended by only four members of the public, this meeting attracted forty people, indicating that many more citizens are recognizing the threat of this invader. Attendees described their efforts to battle severe bird vetch infestations (Figure 7) on their own properties. A new publication on bird vetch control was distributed, and managers described a new program to prevent the spread of bird vetch into new subdivisions.

A significant new infestation of spotted knapweed was detected near Haines, and the large infestation near Sutton (NE of Palmer) was chemically and mechanically treated. A growing creeping thistle problem in the Anchorage Borough has been taken on by the Alaska Division of Agriculture. FHP support allowed the Division of Agriculture to treat over 24 acres of infested land across approximately 30 sites. The Fairbanks Soil and Water Conservation District treated a small creeping thistle infestation found at the Stevens Village airport in 2011. Treating this infestation was critical because it was the only documented creeping thistle infestation north of the Alaska Range.

Figure 7. A mixed infestation of bird vetch (*Vicia cracca*) and sweetclover (*Melilotus alba*).



Map 1. Aerial Detection Survey- 2012 significant pest activity. See table 1 and footnote 6 on page 7 for more information on birch defoliation. Map composition by Hans Buchholdt, AK DNR.



Map 2. Survey flight paths from 2012 aerial survey and general ownership. Map composition by Hans Buchholdt, AK DNR.

Table 1. Forest insect and disease activity detected during aerial surveys in Alaska in 2012 by land ownership[1] and agent. All values are in acres.

Agent	National Forest	Native	Other Federal	State & Private	Total
Abiotic causes[3]	1,345	177	2,244	12,023	15,789
Alder defoliation[4]	1,004	14,089	20,260	23,114	58,467
Alder dieback[5]	4	2,392	8,965	5,062	16,423
Aspen defoliation[4]			46	1,255	1,301
Aspen leaf miner		18,272	12,002	38,930	69,204
Birch aphid		966	3,199	6,579	10,744
Birch defoliation[6]	476	5,838	56,559	18,085	80,958
Black-headed budworm	80				80
Cedar decline (current)[7]	16,067	294		984	17,346
Conifer defoliation	1,061	1,554	50	68	2,734
Cottonwood defoliation[4]	2,831	2,740	16,829	4,770	27,169
Dwarf birch defoliation[6]		5,292	60,559	20,278	86,129
Hardwood defoliation	123	1,738	0	825	2,687
Hemlock sawfly	5,056	21	64	340	5,480
Large aspen tortrix		6,138	603	5,459	12,199
Porcupine damage	30				30
Shore pine foliar damage	129	60	706	437	1,332
Spruce beetle	1,780	1,518	2,931	2,023	8,252
Spruce broom rust		40	31	17	87
Spruce budworm	85	11,587	1,415	53	13,140
Spruce engraver beetle		1,337	3,427	2,460	7,224
Spruce engraver and spruce beetle[8]		1,324	2,003	1,015	4,342
Spruce needle aphid	796		3	74	873
Spruce needle cast				93	93
Spruce needle rust			32		32
Spruce/larch budmoth				10	10
Willow defoliation[4]	727	4,471	13,327	8,044	26,569
Willow leaf blotch miner		4,263	7,698	9,184	21,145

1 Ownership derived from the 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 patented disposed federal lands, municipal lands, or other private parcels.

2 Acre values are only relative to survey transects and do not represent the total possible area affected. 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 Damage acres from some types of animals and abiotic agents are also shown in this table. Mapped abiotic damage can include windthrow, snow loading, freezing injury, flooding snow slides and landslides.

4 Significant contributors include alder sawfly, some internal leaf miners, and leaf rollers for the respective host. Acreage affected by aspen leaf miner is listed separately and not included in this total.

5 Alder dieback is the new description used to label alder stem mortality mapped during the survey. Past reports have referred to it as alder canker, but verification of alder canker requires ground-checks and dieback symptoms are the damage signature observed from the air.

6 Defoliation to birch trees and dwarf birch has been reported separately. “Dwarf birch defoliation” primarily represents defoliation of dwarf birch, but also includes defoliation of Labrador tea, small willows, spirea and other woody shrubs, and is attributable to several external leaf-feeding insects. In contrast, birch tree defoliation is caused by a combination of internal and external leaf-feeding insects.

7 Acres represent only areas with actively dying yellow-cedars. More than 400,000 acres of cedar decline have been mapped over the years in Southeast Alaska.

8 Acres on which Northern spruce engraver beetle (*Ips perturbatus*) and spruce bark beetle (*Dendroctonus rufipennis*) activity occurred in the same stands.

Table 2. Affected area (in thousands of acres) for each host group and damage type from 2008 to 2012 and a 10-year cumulative sum.

Host Group / Damage Type[1]	2008	2009	2010	2011	2012	10-year Cumulative[2]
Abiotic Damage	3.9	1.8	12	16.3	15.8	**66.0**
Alder Defoliation	0.7	3.4	7	123	58.5	**217.4**
Alder Dieback	15	1.3	44.2	142	16.4	**226.7**
Aspen Defoliation	219.7	310.8	464	145.6	82.7	**3043.3**
Birch Defoliation	0.1	14.3	33.3	76.7	177.8	**717.4**
Cedar Mortality	9	16.3	30.5	26.8	17.3	**166.0**
Cottonwood Defoliation	13.2	11.2	14.1	23.4	27.1	**166.9**
Hemlock Defoliation	0.1	3.6	9.1	11.1	5.5	**30.2**
Hemlock Mortality	2	2.1	0.4	6.2	0	**11.0**
Larch Defoliation[3]	0.2	0.1	0	0.1	0	**18.6**
Larch Mortality	0.2	0.1	0	0	0	**39.5**
Other Defoliation[4]	-	-	15.5	10.9	5.4	**-**
Shore Pine Damage	4.1	0	0	0	2.9	**7.0**
Spruce Damage	6.9	0.8	40.9	5.5	14.2	**327.4**
Spruce Mortality	129.1	138.9	101.8	55.5	19.8	**878.6**
Spruce/Hemlock Defoliation	2.8	1.1	0.3	0	0	**35.2**
Spruce/Larch Defoliation	0	13.2	0	0	0	**16.6**
Subalpine Fir Mortality	0	0	0	0	0	**0.9**
Willow Defoliation[3]	76.8	139.7	562.7	63.9	47.7	**1132.6**
Total damage acres - thousands	**479.9**	**656.9**	**1336.8**	**707.0**	**491.1**	
Total acres surveyed - thousands	36,402	33,571	36,878	31,392	28,498	
Percent of acres surveyed showing damage	1.3%	2.0%	3.6%	2.2%	1.7%	

1 Values summarize similar types of damage, mostly from insect agents, by host group. Disease agents contribute to the totals for alder dieback, hemlock mortality, shore pine damage and spruce defoliation. Acres damaged by fire, wind, flooding, slides and animal damage are not included.

2 The same stand can have an active infestation for several years. The cumulative total combines all impacted areas from 2003 through 2012 and does not double count acres.

3 Although these acreage sums are due to defoliating agents, a large portion of the affected area has resulted in mortality.

4 This category includes conifer and hardwood defoliation for which a specific pest or host could not be determined.