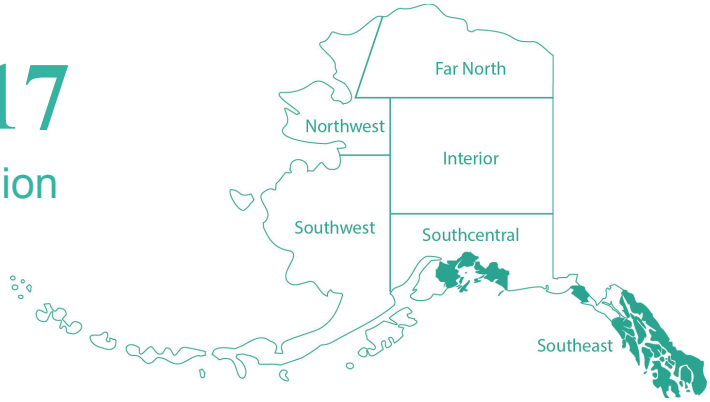
Highlights *for* 2017

State & Private Forestry, Alaska Region



In 2017, aerial surveyors mapped over 840,000 acres of forest damage from insects, diseases, declines and abiotic agents on 27.5 million acres (Map 1 and Map 2); (Table 1 and Table 2). The number of acres surveyed in 2017 increased slightly (2%) compared to 2016, but the total recorded damage decreased 12% from the previous year (Table 3). While mapped damage of multiple damage agents decreased from 2016 to 2017, mortality due to spruce beetle increased substantially over this time period (Map 1).

Diseases

Gemmamyces bud blight is a recently detected disease of spruce in Southcentral and Interior Alaska caused by the fungal pathogen *Gemmamyces piceae* (Figure 1). It was initially detected in 2013 near Homer and the causal agent identified in 2016. We are closely monitoring the distribution of the disease in Alaska and have partnered with experts at the University of Nebraska to evaluate the population structure and native/nonnative status. This collaboration has revealed that there are actually three different fungi causing bud blight of spruce in Alaska: *G. piceae*, *Dichomera gemmicola*, and a species of *Camarosporium*. These fungi are virtually indistinguishable in the field and have identical signs and symptoms. In 2017, plot-based surveys were implemented throughout the state to determine presence/absence and severity of *G. piceae*. While *G. piceae* was found on over 40% of the Southcentral/Interior plots, only *D. gemmicola* was found in Southeast. To date, over 200 locations with spruce bud blight caused by the three fungi have been detected in Southcentral and Interior Alaska.

Figure 1. *Gemmamyces piceae* on white spruce near Anchorage.

Shore pine mortality associated with the severe Dothistroma needle blight outbreak that began around 2010 near Gustavus and Glacier Bay National Park has slowed and few fungal fruiting structures were observed in 2017. This suggests that the outbreak may have run its course. Analysis of weather data has allowed us to pinpoint a wet, warm period in late July 2009 that likely precipitated the outbreak. Damage mapped near Haines, Klukwan, and Skagway in recent years has subsided without significant mortality. Permanent monitoring plots have been established near Gustavus and Haines.

An outbreak of hemlock canker disease that began in 2012 has caused mortality of western hemlock along more than 70 miles of roadside forest on Prince of Wales Island. Hemlock canker has also flared up in many other locations in Southeast Alaska, including locations farther north than previously reported (Juneau and Cordova). On Prince of Wales Island, this disease has caused mortality of crop trees in some managed stands closest to the main outbreak area near Naukati Bay and Staney Creek, indicating a severe but not unprecedented outbreak for this island.

Aspen running canker is caused by an unknown fungus that rapidly kills the cambium as it expands along much of the bole (Figure 2). Most trees die within the year as the tree is girdled. To gain a better understanding of its distribution and the factors influencing its spread, we initiated a joint venture agreement with Dr. Roger Ruess (University of Alaska Fairbanks). In 2017, we evaluated 32 Cooperative Alaska Forest Inventory sites, 5 Long Term Ecological Research sites, and 26 ad-hoc sites. We found canker at 51 of the 63 sites (81%). The percentage of infected trees at the sites with canker ranged from 1.5% - 64%.

Figure 2. Debarked lesion of aspen running canker. The darker the tissue the longer it has been dead. As the canker expanded toward the left, more recent lesion margins formed. Each of the three margins were numbered and sampled in an attempt to identify the fungus.

Noninfectious Diseases & Disorders

2017 was another significant year for active yellow-cedar decline (dying trees with red-yellow crowns) in Southeast Alaska, with 47,500 acres mapped. Yellow-cedar decline in young-growth is an emerging issue that we are tracking to understand the key risk factors, extent, and management impacts. We have compiled a database of young-growth stands that contain yellow-cedar to facilitate monitoring. Decline has been confirmed in multiple managed stands on Zarembo Island, and fewer stands on Kupreanof, Mitkof, Wrangell, and Prince of Wales Islands. Many young-growth stands with crown discoloration symptoms identified by aerial survey and low-altitude imagery were ground-checked in 2016 and 2017. Porcupine damage to crop trees, rather than yellow-cedar decline, was the most significant cause of mortality in young-growth forests on Mitkof, Kupreanof and Wrangell Islands, while hemlock canker disease and flooding were the most common causes on Prince of Wales Island. Also on Prince of Wales Island, widespread topkill of western redcedar was reported in 2017.

Invasive Plant Program

After years of studying, testing, applying for permits, and planning, the Fairbanks Soil and Water Conservation District made the first chemical application to Chena Slough, with a goal of eradicating the invasive aquatic plant elodea (*Elodea* spp.) from that waterbody. Herbicides with the active ingredient fluridone were applied in both liquid and pelleted forms. The majority of slough water samples collected during the summer had fluridone concentrations that fell within the target zone of 4 to 8 parts per billion. Within three weeks of the start of treatment, the elodea in the slough was showing signs of being affected by the herbicide. Well-water samples collected from five residences along the slough were uncontaminated with fluridone. The Fairbanks Soil and Water Conservation District has received a $500,000 grant from the Alaska Sustainable Salmon Fund to continue treating Chena Slough and begin treating another infestation in Totchaket Slough.

With Aspen running canker, most trees die within the year as the tree is girdled.

About forty people attended a training session on invasive species organized by the Alaska Department of Natural Resources, a part of the Division of Mining, Land and Water's continuing education series. It included an hour-long presentation on "Invasive species: why you should care," and the chance to examine fresh specimens of about 20 invasive plant species that are spreading in Interior Alaska. For comparison, a number of similar-looking native plant species were also available for viewing.

In August, an infestation of creeping thistle (*Cirsium arvense*) was discovered in Alaska about 75 miles north of the Arctic Circle, by John Morton of the US Fish and Wildlife Service. This find was a shock to Alaska's invasive species community; the farthest-north known infestations of this plant were previously several hundred miles to the south. Conversations have begun on treatment options for this site.

In 2017, the Anchorage Assembly made a significant contribution to the fight against the invasive European birdcherry (*Prunus padus*) when it enacted an ordinance to prohibit the sale of this ornamental tree in the municipality. Sponsored by Assemblyman Forrest Dunbar, the ordinance passed unanimously on August 8.

The Alaska Invasive Species Workshop, the annual meeting of the Alaska Committee for Noxious and Invasive Pest Management (CNIPM), was held in Anchorage in 2017. A keynote address, on the Arctic Invasive Alien Species Strategy and Action Plan, was given by Jamie Reaser, Executive Director of the National Invasive Species Council. Representatives of the Alaska legislature and the Anchorage Assembly spoke during a session on policy and planning. Two major foci of the meeting were elodea research and management, and environmental DNA. For the first time, student scholarships were offered to attend the meeting.

R10 FHP has joined forces with the Copper River Watershed Project (CRWP) to manage the Alaska Invasive Plant mini-grant project over the next two years. The mini-grant program is a source of small-grant funding for people and community groups anywhere in Alaska to manage invasive plants.

Insects

A spruce beetle outbreak is occurring in Southcentral Alaska, over 400,000 acres of spruce beetle damage were observed, which is more than double the damage detected in 2016. It is the most damage recorded for spruce beetle since 1997, when the last major outbreak occurred. The majority of the damage (337,000 acres) is located in the Susitna Valley and adjacent drainages. Spruce beetle activity continued to build in the northwestern portion of the Kenai Peninsula and scattered small pockets of spruce beetle damage were noted in the area of Kenai, Soldotna, and Kasilof. Trap catches of spruce beetle are increasing in the Interior however increased damage is not yet apparent.

Spruce aphid activity drastically decreased throughout the Kenai Peninsula and Southeast Alaska after the cold winter of 2016/2017. Heavily impacted trees appear to be recovering, although a small number of trees in Homer have died. As an additional side benefit of the intensive spruce aphid surveys, several other damage agents of Sitka spruce that are not typically noted were observed. A spruce shoot gall midge was found throughout Southeast Alaska as well as several species of spruce sawfly, bud moths, and other gall makers.

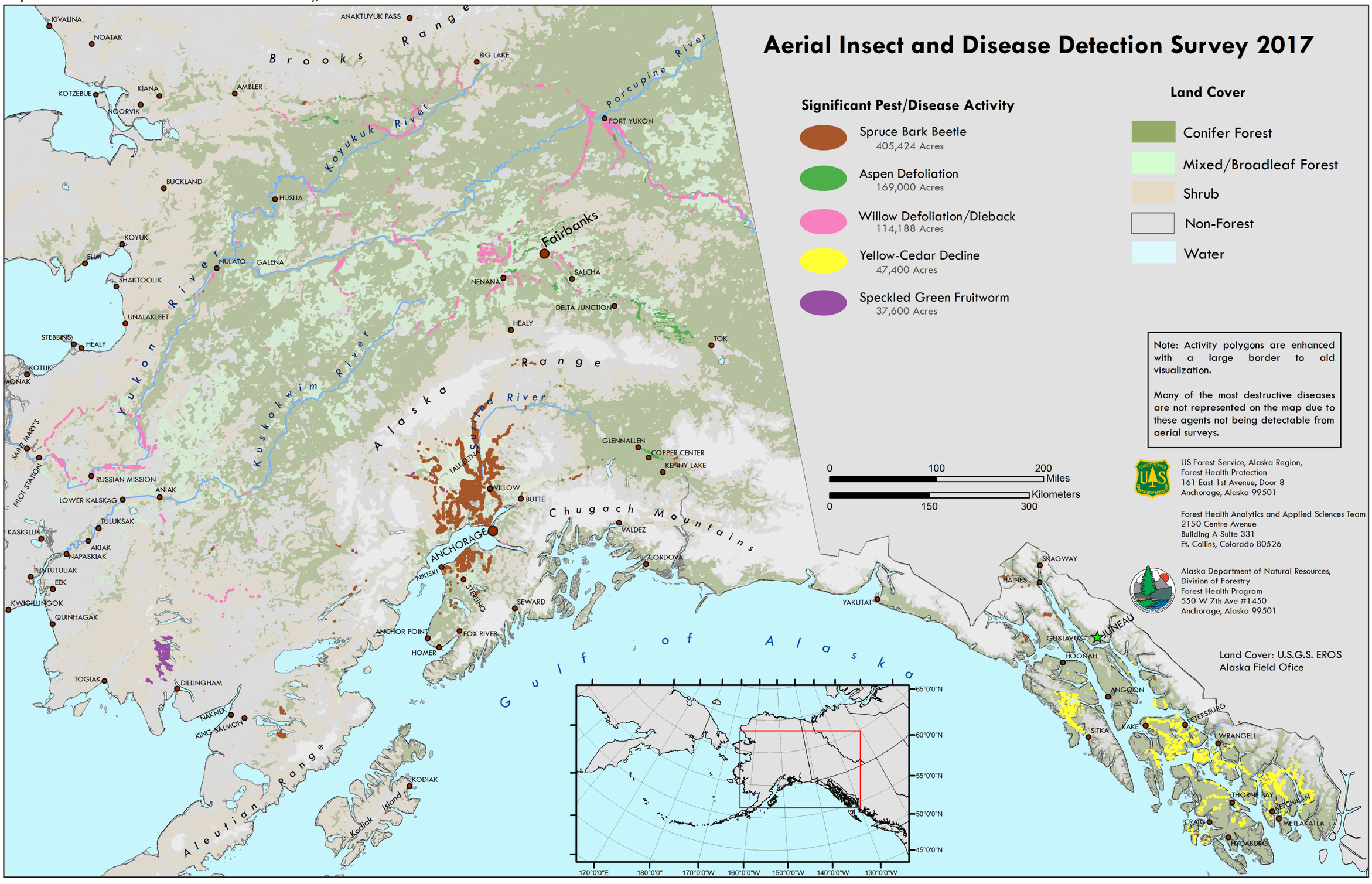
Internal leaf feeding by leaf mining insects was generally lower in 2017, however aspen leaf miner was detected on approximately 148,000 acres in the Interior. Birch leaf miner activity was noted in Eagle River, Chugiak, Palmer and Wasilla however activity was low in Anchorage. Amber-marked birch leaf miner activity was high in Fairbanks and North Pole (Figure 4), and late birch leaf edge miner was detected for the first time in the Interior: five locations in Fairbanks, two locations north of Healy.

External leaf feeding on hardwoods was more prevalent than internal feeding. Late-season defoliation of alder by several species of sawflies and caterpillars was common throughout Southeast but not apparent during the aerial survey. Considerable hardwood defoliation by *Sunira verberata* was observed along the Richardson Highway between Valdez and Glennallen.

Figure 3. Inside a spruce tree attacked by spruce beetles. The cream colored larvae (left) feed under the bark creating the galleries illed with sawdust. They then create chambers where they turn into pupae (right) and complete their development.

Figure 4. Amber-markerd birch leaf miner scouting oviposition sites in Fairbanks.

Map 1. Alaska aerial insect and disease detection survey, 2017.



Map 2. Alaska aerial insect and disease detection survey flight paths, 2017.

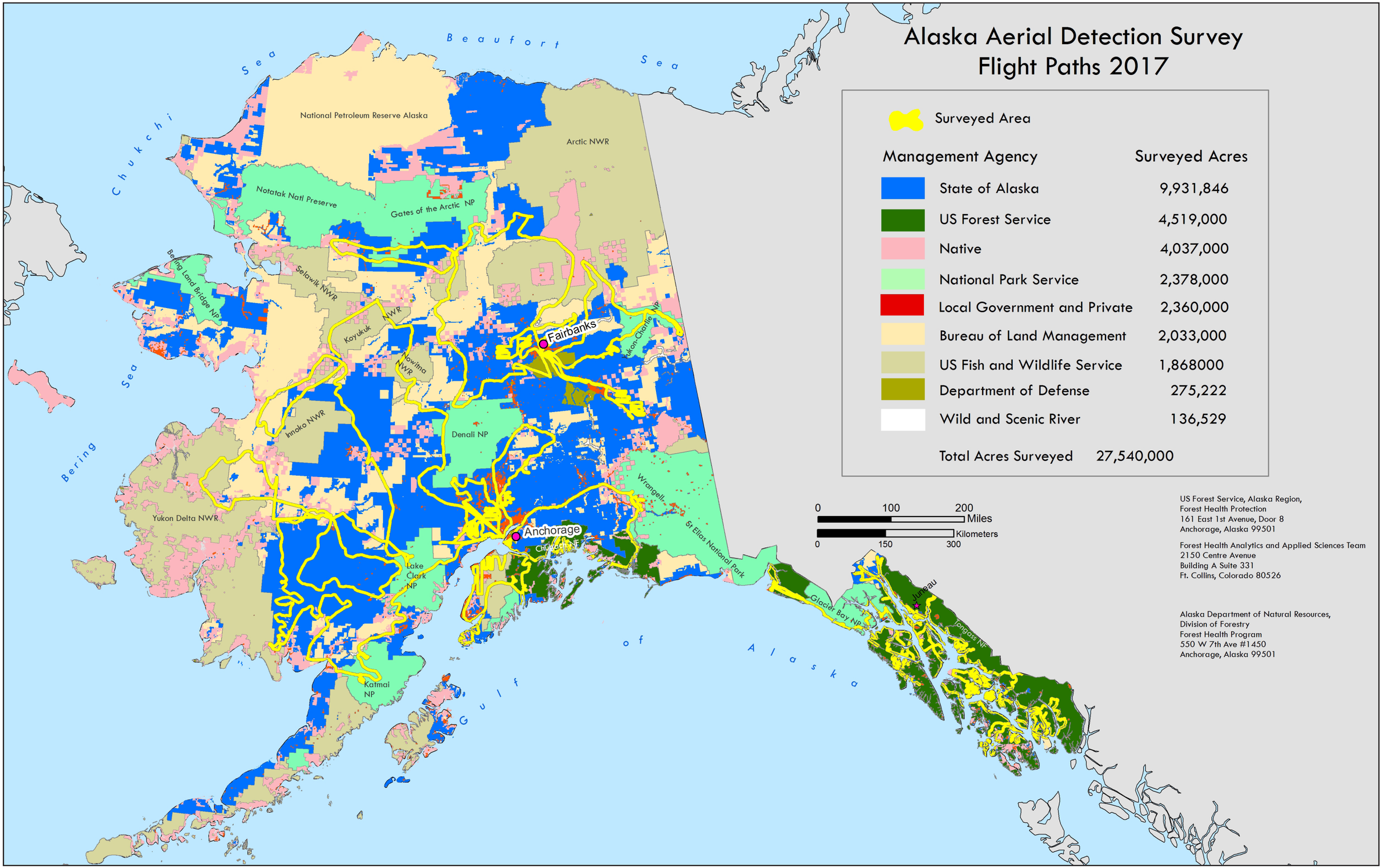


Table 1. Forest insect and disease activity detected during aerial surveys in Alaska 2017 by land ownership and agent. All values are in acres[1].

Category	*AGENT*	*Total Acres*	*National Forest*	*Native*	*Other Federal*	*State & Private*
Forest Diseases	Hemlock canker	2,632	2,602	0	0	30
	Willow dieback	1,038	0	70	383	585
	Alder dieback	972	189	407	65	310
	Dothistroma needle blight	325	104	0	135	87
	Spruce broom rust	189	0	79	108	3
	Spruce needle rust	76	0	0	0	76
Defoliators	Aspen leaf miner	147,554	0	27,088	23,082	97,383
	Willow leafblotch miner	72,986	0	31,810	21,064	20,111
	Willow defoliation	40,165	155	14,024	16,456	9,529
	Speckled green fruitworm	37,622	0	3,360	241	34,022
	Spruce defoliation	35,405	31,892	109	3,368	37
	Aspen defoliation	20,728	0	1,182	7,582	11,964
	Hardwood defoliation	5,533	0	3,623	1,112	798
	Alder defoliation	3,419	372	921	371	1,755
	Birch aphid	3,256	0	0	0	3,256
	Birch defoliation	2,899	0	690	1,672	537
	Conifer defoliation	1,130	497	34	34	564
	Cottonwood defoliation	979	0	672	235	72
	Birch leaf roller	607	0	78	398	131
	Birch leaf miner	450	0	0	0	450
	Spruce aphid	408	166	0	0	242
	Spruce budworm	331	0	201	66	64
	Large aspen tortrix	225	0	0	225	0
	Alder sawfly	2	0	0	0	2
Mortality	Spruce beetle	405,384	929	39,542	31,551	333,361
	Northern spruce engraver beetle	6,012	0	408	537	5,066
	Hemlock mortality	97	82	15	0	0
	Western balsam bark beetle	39	6	0	0	33
Abiotic and Animal Mortality	Yellow-cedar decline	47,406	43,052	1,650	0	2,703
	Flooding/high-water damage	2,830	450	133	517	1,730
	Porcupine damage	1,525	986	233	0	306
	Birch crown thinning	1,245	0	0	0	1,245
	Hemlock branch flagging	1,066	764	93	0	208
	Windthrow/blowdown	368	368	0	0	0
	Landslide/avalanche	114	101	8	0	5
	Aspen discoloration	19	0	0	0	19

[1] Acre values are only relative to survey transects and do not represent the total possible area affected. Table entries do not include many diseases (e.g. decays and dwarf mistletoe), which are not detectable in aerial surveys.

Table 2. Mapped affected area (in thousands of acres) from 2013-2017 from aerial survey. Note that the same stand can have an active infestation for several years. For a detailed list of species and damage types that compose the following categories, see Appendix II on page 61.

Abiotic damage	6.2	13.6	11	3	5.6
Alder defoliation	83.9	51.5	26	2.9	3.4
Alder dieback	15.7	125.4	12	8.4	1.0
Aspen defoliation	53.4	138.6	118	229.3	168.5
Birch defoliation	278.2	586.7	42	85.5	7.2
Cottonwood defoliation	9.4	53.4	9.2	2.3	1.0
Fir mortality	0	0.2	0	0.027	0.0
Hardwood defoliation	2.8	42.1	190	161.9	38.7
Hemlock defoliation	13.3	46	0.1	0	0.0
Hemlock mortality/dieback	0	0	0.5	0	2.7
Porcupine damage	0.5	1.8	1	3.5	1.5
Shore pine damage	4.8	4.5	3.4	4.9	0.3
Spruce damage	7.5	60.1	8.8	36	36.1
Spruce mortality	35.1	22.1	42.3	204.5	411.4
Spruce/hemlock defoliation	121.2	4.1	3.1	3.1	1.1
Willow defoliation	16.2	146.1	67	156.3	113.2
Willow dieback	0	3.4	1.2	2.8	1.0
Yellow-cedar decline	13.4	19.9	39	39	47.4
Total damage acres	**661.6**	**1320**	**574.6**	**949.8**	**840.3**
Total acres surveyed	31,497	32,172	32,938	26,876	27,540
Percent of acres surveyed showing damage	2.10%	4.10%	1.70%	3.50%	3.05%