2022 Highlights

Forest health issues, like insect and disease outbreaks and invasive plant infestations, do not adhere to management boundaries. Alaska's expansive forests encompass diverse ecoregions and ownership. Nested within the State & Private Forestry branch of the U.S. Forest Service, Forest Health Protection monitors across all lands to meet the needs of federal, state, and private stakeholders and Tribal Nations.

Of the 126 million acres of forestland in Alaska, nearly 11 million forested acres are contained within the United States' two largest National Forests: the Chugach (1.1 million acres) and the Tongass (9.8 million acres). Alaska contains one-quarter of all federal forestland and 43 percent of all state-owned forestland in the country. Completely outside National Forest boundaries, there are 115 million acres of boreal forest. Another unique aspect of Alaska's forest management is that more than 200 Alaska Native corporations own 35 million acres of non-industrial private forestland.

In 2022, approximately 874,800 acres of forest damage (Table 1) were mapped across the 16.3 million acres aerially surveyed (Table 2). In addition, our forest health team made more than 1,550 ground observations of forest damage from diseases (452 records), insects (1,038 records), and noninfectious agents (62 records), which can be accessed through the interactive data dashboard at https://arcg.is/1SH58a. Ground survey observations are summarized in Table 4, alongside research grade observations mined from the records of our citizen science project in iNaturalist. The Alaska Forest Health Observations iNaturalist project received 1,330 research grade observations from over 2,350 total observations in 2022. Organisms that commonly damage trees and plants in Alaska are automatically filtered into the project. Learn more at: https://www.inaturalist.org/projects/alaska-forest-health-observations.

Pathology Highlights

Aspen running canker (Figure 8) was first detected in 2015 and taxonomically described as a new fungal pathogen last year. Now documented throughout Alaska's boreal forest, the highest disease occurrence is in the Tanana-Kuskokwim Lowland Ecoregion. There, an average of 30% of aspen trees are infected across study sites, and most cankered trees die within a year or two. Collaborators Drs. Schuette and Drown have sequenced and assembled the pathogen's genome into 18 putative chromosomes. A transcriptomics project is underway investigating how drought and carbon stress from aspen leafminer defoliation and shading influence gene expression and susceptibility to aspen running canker.

Phellinus species produce perennial conks and cause white trunk rot of hardwoods. Recently, *Phellinus igniarius* has been

Figure 8. Aspen running canker (*Neodothiora populina*) on the Resurrection Pass Trail on the Kenai Peninsula. USDA Forest Service photo by Steve Swenson.

TABLE 1. Forest insect and disease activity detected during aerial detection surveys in Alaska in 2022 by land ownership and agent. All values are rounded to the nearest whole acre*.

Category	Agent	Total Acres	National Forest	Native	Other Federal	State & Private
Disease	Alder dieback	**993**	35	500	128	331
Disease	Aspen running canker	**49**	0	0	0	49
Disease	Dothistroma needle blight	**242**	0	18	0	223
Disease	Spruce broom rust	**48**	0	6	10	32
Disease	Western gall rust dieback	**373**	279	6	5	82
Noninfectious	Drought	**3**	0	3	0	0
Noninfectious	Flooding/high-water damage	**977**	93	8	509	366
Noninfectious	Hemlock flagging	**1**	1	0	0	0
Noninfectious	Landslide/avalanche	**6**	6	0	0	0
Noninfectious	Porcupine damage	**1**	0	0	1	0
Noninfectious	Windthrow/blowdown	**271**	251	10	0	9
Noninfectious	Winter damage	**2,120**	0	18	1,751	351
Noninfectious	Yellow-cedar decline	**11,677**	11,257	133	82	205
General Damage	Alder defoliation	**12,669**	635	6,165	2,728	3,142
General Damage	Aspen defoliation	**963**	0	182	45	736
General Damage	Birch defoliation	**1,073**	0	42	63	968
General Damage	Conifer defoliation	**11**	0	6	0	6
General Damage	Cottonwood defoliation	**5**	0	0	5	0
General Damage	Hardwood defoliation	**1,033**	9	778	4	242
General Damage	Willow defoliation	**938**	3	890	0	45
General Damage	Willow dieback	**8**	0	8	0	0
Insects	Aspen leafminer	**38,079**	0	3,977	2,260	31,842
Insects	Birch leafminer	**21,523**	0	181	4,016	17,327
Insects	Cottonwood leafminer	**701**	0	54	0	647
Insects	Hemlock mortality - past year	**73,542**	70,240	990	0	2,313
Insects	Hemlock sawfly defoliation	**1,335**	702	13	4	615
Insects	Northern spruce engraver	**841**	0	139	150	552
Insects	Spruce beetle	**48,778**	11,859	6,369	13,063	17,487
Insects	Western balsam bark beetle	**4**	1	0	1	2
Insects	Western blackheaded budworm	**684,860**	581,466	36,558	15,105	51,730
Insects	Willow leafblotch miner	**16,095**	0	10,773	4,688	635

*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.

**General Damage is tree damage that cannot be attributed to a particular agent because more than one agent is known to similarly damage the same host. Either or both insects and pathogens may cause the damage. Damage caused by a currently unidentified agent is also included in this category.

Figure 9. An uncommon *Phellinus* sp. conk on willow at Pt. Bridget State Park north of Juneau. USDA Forest Service photo by Robin Mulvey.

reclassified as eight distinct species. We have initiated a project in partnership with Research Plant Pathologist Dr. Mee-Sook Kim (PNW Research Station) to explore the diversity of *Phellinus* species on willow, alder, and birch in Alaska. We recorded 29 observations of *Phellinus* spp. on hardwoods throughout Alaska in 2022 (Figure 9) and preserved conk tissue collections using FTA cards, which are used to preserve sample DNA for molecular identification.

Noninfectous Highlights

Mortality from yellow-cedar decline was mapped across 11,700 acres in Southeast Alaska in 2022, a moderate amount compared to recent years. Decline detection was hindered by the western blackheaded budworm outbreak, since both types of damage cause tree crowns to appear reddish-brown. The highest concentration of mapped yellow-cedar decline (one-third of the decline acreage) occurred on Kuiu Island. Kuiu was surveyed in 2021, but the detection of conifer defoliation was emphasized. We confirmed yellow-cedar mortality observed last year along the outer coast of Glacier Bay National Park near Finger and La Perouse Glaciers. Ground assessments are needed to determine if mortality was caused by yellow-cedar decline or other factors. Yellow-cedar forests in this area have been considered healthy and will be closely tracked. Yellow-cedar decline in young-growth stands, which was first identified as a management concern in 2012, is another monitoring priority.

Western redcedar topkill (Figure 10), which is associated with girdling stem wounds, was investigated with roadside surveys and destructive sampling. We sampled 15 affected trees on Prince of Wales Island, documenting the number, height, and size of wounds, and collected wounded stem sections. Wounds occurred seven to 31 feet from the ground on parts of the stem less than 4 inches in diameter. Apparent toothmark grooves were visible on fresh wounds (Figure 11), which are most likely caused by feeding or bark collection activity of northern flying squirrels. The cause is still under investigation. Although the island hosts a distinct squirrel subspecies, the Prince of Wales flying squirrel, the damage has also been noted on Revillagigedo and Wrangell Islands where the broader species occurs.

Figure 10. Western redcedar trees with topkill damage in a managed young-growth stand near Rush Creek on Prince of Wales Island. There were numerous topkilled and wounded trees in this unit initially harvested in 1992. USDA Forest Service photo by Robin Mulvey.

Figure 11. A fresh, fibrous wound on a 30-year-old western redcedar crop tree near Rush Creek on Prince of Wales Island. USDA Forest Service photo by Robin Mulvey.

TABLE 2. Mapped affected area (in thousands of acres) from 2018 to 2022 from aerial detection survey.					
Damage Category *	2018	2019	2020 **	2021	2022
Abiotic damage	5.0	10.8	0.2	16.7	3.4
Alder defoliation	0.9	2.6	1.0	3.1	12.7
Alder dieback	3.2	1.2	0.0	0.1	1.0
Aspen defoliation	259.7	132.4	38.8	150.5	39.0
Aspen mortality	5.7	0.1	0.0	0.1	0.05
Birch defoliation	132.8	283.4	3.9	55.6	22.6
Cottonwood defoliation	3.6	1.7	0.7	0.7	0.7
Fir mortality	0.1	0.1	0.0	0.1	0.0
Hardwood defoliation	15	3.9	0.1	0.4	1.0
Hemlock defoliation	48.6	381	124.4	520.0	1.3
Hemlock mortality	0.1	0.0	80.0	21.0	73.5
Larch mortality	0.01	0.0	0.0	0.0	0.0
Porcupine damage	2.5	1.9	0.1	0.2	0.0
Shore pine damage	3.7	0.4	0.0	0.5	0.6
Spruce damage	2.5	117.8	0.7	7.6	4.2
Spruce mortality	594.3	140.6	145.3	193.7	49.6
Spruce/hemlock defoliation	4.2	0.0	0.0	0.0	685.8
Willow defoliation	39.9	32.7	0.5	58.3	17.0
Willow dieback	0.0	0.6	0.0	0.0	0.0
Yellow-cedar decline	17.7	20.0	10.4	8.2	11.7
Total damage acres * **	**1113.8**	**1127.6**	**309.0**	**1019.68**	**874.8**
Total acres surveyed	27,954	24,421	7,322	15,724	16,314
Percent of acres surveyed showing damage	4.0%	4.6%	4.2%	6.5%	5.4%

* Agents specific to each category are listed in Table 3 on page 9.

** In 2020, aerial detection surveys were not conducted. Data was collected via high-resolution satellite imagery for a limited area.

*** Total damage acres do not double count overlapping damage areas, do not include older spruce damage collected in the current year, and may include minor damage not reported above.

Invasive Plant Highlights

Partnerships prove valuable when holding the line at Portage to prevent the movement of recently documented orange hawkweed, white sweetclover, and bird vetch from moving onto the Kenai Peninsula. Chugach National Forest, Kenai Watershed Forum, Kenai Peninsula –Cooperative Invasive Species Management Area, and Alien Species Control LLC staff worked together in 2022 to secure funding and treat these species. EDRR continues as an effective method to protect the Kenai Peninsula.

The Anchorage Cooperative Invasive Species Management Area (CISMA) has a new member: The Anchorage Soil and Water Conservation District (SWCD) initiated an invasive program in 2022 that will bolster and complement the good work being done. The Anchorage SWCD initiated a citizen Early Detection program, resulting in reports of orange hawkweed and chokecherry at the wildland-urban interface. These crucial locations were promptly treated by Anchorage CISMA members. Other Anchorage CISMA priorities include creeping thistle, a priority species for control with 49 acres treated in 2022 and eradication at 12 sites; Bohemian knotweed treated in 2021 and not found in 2022; and white sweetclover, bird vetch, orange hawkweed and reed canarygrass in Girdwood. In addition to species-specific treatments, the Anchorage CISMA members have organized multiple volunteer control activities to educate and engage the public, including coordinated efforts to smack down invasive plants in the Anchorage Municipality!

In the continuing battle to control aquatic Elodea, it is noteworthy that Elodea eradication has been achieved in two water bodies and no new infestations were found in 2022. The Alaska Department of Natural Resources (ADNR), the U.S. Fish and Wildlife Service, and the Fairbanks Soil and Water Conservation District (SWCD) surveyed 200 water bodies for Elodea with zero detections. Meanwhile, the Fairbanks SWCD continued to treat 26 water bodies (Figure 13) and ADNR treated 3 water bodies in the Anchorage area in ongoing Elodea control efforts.

Figure 13. FSWCD staff work to eradicate the invasive aquatic plant Elodea in Birch Lake, near Fairbanks. Photo courtesy of Aditi Shenoy, Fairbanks Soil and Water Conservation District.

Figure 14. Western blackheaded budworm defoliation in old and young growth forests near Excursion Inlet. USDA Forest Service photo by Dr. Elizabeth Graham.

Insect Highlights

The western blackheaded budworm outbreak that exploded in 2021 continued in 2022 with caterpillars feeding on Sitka spruce as well as western hemlock throughout Southeast Alaska (Figure 14). Damage was recorded from Haines to Ketchikan with over 685,000 acres of defoliation recorded during aerial detection surveys. Mortality associated with the hemlock sawfly and western blackheaded budworm defoliation event was observed in western hemlock across 73,500 acres, with the worst damage on Admiralty Island and the Central Tongass area.

A ground survey was conducted across the road systems of Southeast Alaska to determine the status of the insect populations and damage from the ground. This also served as a team-building opportunity for the Forest Health group with some members meeting for the first time in person (Figure 15). Additional surveys off the road system were conducted by Alaska Youth Stewards on

Figure 15. Forest Health Protection team members met in Petersburg, AK to conduct ground detection surveys for defoliating insects. The group spent time together calibrating how to measure damage and enjoying time in the field (with ice cream sandwiches for fuel)! USDA Forest Service Photo by Dr. Elizabeth Graham.

Figure 16. Alaska Youth Stewards Justice Duncan and Luke Jack developed note taking and field data collection skills during one of the many affectionately dubbed "bug hunts." USDA Forest Service photo by Eric Benedict.

Figure 17. Spruce beetle damage along Snug Harbor Road in the Cooper Landing area, viewed across Kenai Lake. USDA Forest Service photo by Steve Swenson.

Admiralty Island. The students from Angoon learned about insects and data collection while providing much needed ground data from their remote locations (Figure 16).

Spruce beetle activity has decreased dramatically, with only 48,800 acres of damage recorded during aerial detection surveys, the least reported since 2015, almost entirely in Southcentral, where the outbreak has impacted more than 1.86 million cumulative acres. The outbreak remains most active in the northern Matanuska-Susitna Borough, the lower Denali Borough, in and around the Chugach National Forest, and near Soldotna and Kasilof on the Kenai Peninsula. (Figure 17).

Aspen and birch leafminer continue to be the most damaging agents in the Interior, despite lower acreage recorded during aerial detection surveys. Ground detection surveys confirmed heavy defoliation predominately caused by two birch leafminer species in the Fairbanks North Star Borough: late birch leaf edgeminer and amber-marked birch leafminer. Aspen leafminer damage (Figure 18) was detected along every major roadway in and out of Fairbanks, with damage tapering in severity towards the Brooks Range, the Alaska Range, and the Canadian border.

Figure 18. Heavily defoliated aspen saplings were commonly observed in urban settings and along major roadways in the Interior. USDA Forest Service photo by Dr. Sydney Brannoch.

TABLE 3. Damage Type by Category*

ABIOTIC
Drought
Flooding
Landslide/avalanche
Windthrow
Winter damage

ALDER DEFOLIATION
Alder defoliation
Alder leafroller
Alder sawfly

ALDER DIEBACK
Alder dieback

ASPEN DEFOLIATION
Aspen defoliation
Aspen leaf blight
Aspen leafminer
Large aspen tortrix

ASPEN MORTALITY
Aspen running canker

BIRCH DEFOLIATION
Birch aphid
Birch crown thinning
Birch defoliation
Birch leafminer
Birch leafroller
Dwarf birch defoliation
Spear-marked black moth

COTTONWOOD DEFOLIATION
Cottonwood defoliation
Cottonwood leaf beetle
Cottonwood leafminer
Cottonwood leafroller

FIR MORTALITY
Western balsam bark beetle

HARDWOOD DEFOLIATION
Hardwood defoliation
Rusty Tussock Moth
Speckled green fruitworm

HEMLOCK DEFOLIATION
Hemlock flagging
Hemlock looper
Hemlock sawfly
Western blackheaded budworm

HEMLOCK MORTALITY
Hemlock canker
Hemlock mortality
Hemlock sawfly mortality

LARCH DEFOLIATION
Larch budmoth
Larch discoloration
Larch sawfly

LARCH MORTALITY
Larch beetle

SHORE PINE DAMAGE
Dothistroma needle blight
Shore pine dieback
Western gall rust

SPRUCE DAMAGE
Spruce aphid
Spruce broom rust
Spruce bud moth
Spruce budworm
Spruce defoliation
Spruce needle cast
Spruce needle rust

SPRUCE MORTALITY
Northern spruce engraver
Spruce beetle

SPRUCE/HEMLOCK DEFOLIATION
Western black-headed budworm
Conifer defoliation

WILLOW DEFOLIATION
Willow defoliation
Willow leafblotch miner
Willow rust

WILLOW DIEBACK
Willow dieback

YELLOW-CEDAR DECLINE
Yellow-cedar decline

* Animal-caused damage are not listed as stand-alone categories; when notable, they are listed under the host species they have affected.

TABLE 4. Ground observations of forest insects and pathogens in Alaska in 2022 (1/1/22-12/27/22). Cumulative ground detection survey observations by forest health professionals are displayed in our interactive Ground Survey Dashboard at https://arcg.is/1SH58a. Ground survey protocols are described in Appendix 2 on page 82. Ground observations by citizen scientists can be found in The Alaska Forest Health Observations project on iNaturalist, accessed at https://www.inaturalist.org/projects/alaska-forest-health-observations. Observations of unidentified or noninfectious agents from our ground surveys and species not closely tied to forest health are excluded.

Damage Agent Category	Damage Causing Agent	Scientific Names	Ground Observations*	iNaturalist Research Grade Observations**	Total
Insects	Adelgidae	*Adelgidae spp.*	16	1	17
Insects	Alder woolly sawfly	*Eriocampa ovata*	8	12	20
Insects	Amber-marked birch leafminer	*Profenusa thomsoni*	54	3	57
Insects	Aspen leafminer	*Phyllocnistis populiella*	105	35	140
Insects	Birch aphid	*Euceraphis betulae*	4	0	4
Insects	Birch leafminer	*Fenusa pusilla*	2	0	2
Insects	Birch leafminer/roller	*Caloptilia spp.*	46	0	46
Insects	Birch leafroller	*Epinotia solandriana*	16	0	16
Insects	Cottonwood leaf beetle	*Chrysomela scripta*	6	0	6
Insects	Cottonwood leafblotch miner	*Phyllonorycter nipigan*	3	0	3
Insects	Eriophyid mite	*Eriophyidae spp.*	74	7	81
Insects	Gall/Adelgidae spp.	*Gall/Adelgidae spp.*	39	0	0
Insects	Gall midge	*Cecidomyiidae spp.*	15	7	22
Insects	Green alder sawfly	*Monsoma pulveratum*	24	12	36
Insects	Hemlock sawfly	*Neodiprion tsugae*	11	0	11
Insects	Late birch leaf edgeminer	*Heterarthrus nemoratus*	52	1	53
Insects	Leaf beetles spp.	*Leaf beetles spp.*	74	3	77
Insects	Leafminers spp.	*leafminer spp.*	60	3	63
Insects	Rusty tussock moth	*Orgyia antiqua*	0	13	13
Insects	Spotted tussock moth	*Lophocampa maculata*	1	48	49
Insects	Spruce beetle	*Dendroctonus rufipennis*	2	7	9
Insects	Spruce bud moth	*Zeiraphera canadensis*	19	0	19
Insects	Spruce budworm	*Choristoneura spp.*	6	0	6
Insects	Striped alder sawfly	*Hemichroa crocea*	3	0	3
Insects	Western black-headed budworm	*Acleris gloverana*	82	30	112
Insects	Western tent caterpillar	*Malacosoma californicum*	0	2	2
Insects	Willow leafblotch miner	*Micrurapteryx salicifoliella*	78	4	82
Insects	Yellowheaded spruce sawfly	*Pikonema alaskensis*	4	0	4
Pathogens	Alder canker dieback	*Valsa melanodiscus*	9	0	9
Pathogens	Artist's conk	*Ganoderma applanatum*	10	24	34
Pathogens	Aspen running canker	*Neodothiora populina*	16	0	16
Pathogens	Aspen shoot blight	*Venturia mucularis*	5	0	5
Pathogens	Aspen target canker	*Cytospora notastroma*	2	0	2

TABLE 4. Ground observations of forest insects and pathogens in Alaska in 2022 (1/1/22-12/27/22). Cumulative ground detection survey observations by forest health professionals are displayed in our interactive Ground Survey Dashboard at https://arcg.is/1SH58a. Ground survey protocols are described in Appendix 2 on page 82. Ground observations by citizen scientists can be found in The Alaska Forest Health Observations project on iNaturalist, accessed at https://www.inaturalist.org/projects/alaska-forest-health-observations. Observations of unidentified or noninfectious agents from our ground surveys and species not closely tied to forest health are excluded.

Damage Agent Category	Damage Causing Agent	Scientific Names	Ground Observations*	iNaturalist Research Grade Observations**	Total
Pathogens	Bear's tooth fungus	*Hericium abietis*	0	5	5
Pathogens	Birch polypore	*Fomitopsis betulina*	6	60	66
Pathogens	Brown crumbly rot	*Fomitopsis mounceae**	3	44	47
Pathogens	Brown crumbly rot	*Fomitopsis ochraceae**	7	123	130
Pathogens	Brown crumbly rot	*Fomitopsis pinicola sensu lato**	3	4	7
Pathogens	Brown cubical butt rot	*Phaeolus schweinitzii*	7	13	20
Pathogens	Canker-rot of birch	*Inonotus obliquus*	0	17	17
Pathogens	Cedar leaf blight	*Didymascella thujina*	22	1	23
Pathogens	Coral tooth fungus	*Hericium coralloides*	1	79	80
Pathogens	Diplodia gall	*Diplodia tumefaciens*	2	4	6
Pathogens	Dothistroma needle blight	*Dothistroma septosporum*	5	0	5
Pathogens	Hardwood leaf rusts	*Melamspora spp.*	12	3	15
Pathogens	Hartig's conk	*Phellinus hartigii*	2	0	2
Pathogens	Hemlock dwarf mistletoe	*Arceuthobium tsugense*	15	3	18
Pathogens	Hemlock-blueberry rust	*Naohidemyces vaccinii*	15	0	15
Pathogens	Lacquer/varnish conk	*Ganoderma oregonense*	1	16	17
Pathogens	Lirula needle cast	*Lirula macrospora*	14	3	17
Pathogens	Paint fungus	*Echinodontium tinctorium*	0	1	1
Pathogens	Powdery mildew	*Erisiphe adunca*	24	1	25
Pathogens	Quinine conk	*Laricifomes officinalis*	3	4	7
Pathogens	Red ring rot	*Porodaedalea pini*	16	13	29
Pathogens	Rhizosphaera needle cast	*Rhizosphaera pini*	6	0	6
Pathogens	Sirococcus shoot blight	*Sirococcus tsugae*	1	0	1
Pathogens	Spruce broom rust	*Chrysomyxa arctostaphyli*	40	19	59
Pathogens	Spruce bud blights	*Spruce bud blights spp.*	14	0	14
Pathogens	Spruce bud rust	*Chrysomyxa woroninii*	22	2	24
Pathogens	Spruce needle rust	*Chrysomyxa ledicola*	53	6	59
Pathogens	Sulfur fungus	*Laetiporus conifericola*	11	57	68
Pathogens	Tinder conk/hoof fungus	*Fomes fomentarius*	7	70	77
Pathogens	Tomentosus root rot	*Onnia tomentosa*	2	8	10

* FHP staff identifies *Fomitopsis pinicola sensu lato* (a species complex) to species level whenever diagnostic features are present. There are two species that occur within Alaska: *F. mounceae* and *F. ochraceae*.

TABLE 4. Ground observations of forest insects and pathogens in Alaska in 2022 (1/1/22-12/27/22). Cumulative ground detection survey observations by forest health professionals are displayed in our interactive Ground Survey Dashboard at https://arcg.is/1SH58a. Ground survey protocols are described in Appendix 2 on page 82. Ground observations by citizen scientists can be found in The Alaska Forest Health Observations project on iNaturalist, accessed at https://www.inaturalist.org/projects/alaska-forest-health-observations. Observations of unidentified or noninfectious agents from our ground surveys and species not closely tied to forest health are excluded.

Damage Agent Category	Damage Causing Agent	Scientific Names	Ground Observations*	iNaturalist Research Grade Observations**	Total
Pathogens	Trunk rot of aspen	*Phellinus tremulae*	7	1	8
Pathogens	Trunk rot of birch	*Phellinus igniarius sensu lato***	29	13	42
Pathogens	Viburnum leaf and stem rust	*Puccinia linkii*	2	5	7
Pathogens	Western gall rust	*Cronartium harknessii*	16	4	20
Pathogens	Yellow-cedar shoot blight	*Kabatina thujae*	3	0	3

** *Phellinus igniarius sensu lato* (a species complex) in Alaska in not well understood but is widespread and common in Alaska on both live and dead birch trees and occurs less frequently on alder and willow species. We will refer to this species complex until we have more complete information.

Map 1. 2022 Aerial Insect and Disease Survey. For more information on survey methods in 2022, please see Appendix 1, page 77.

Aerial Insect and Disease Survey 2022

Significant Pest/Disease Activity

- Western Blackheaded Budworm — 684,860 Acres
- Hemlock Mortality — 73,542 Acres
- Spruce Beetle — 48,778 Acres
- Aspen Defoliation — 39,042 Acres
- Birch Defoliation — 22,596 Acres
- Alder Defoliation — 12,669 Acres
- Yellow-Cedar Decline — 11,677 Acres

Land Cover

- Conifer Forest
- Mixed/Broadleaf Forest
- Inland Lake
- Survey route

Note: Activity polygons are enhanced with a large border to aid visualization.

Many of the most destructive diseases are not represented on the map due to these agents not being detectable from aerial surveys.

0 100 200 Miles

0 150 300 Kilometers

US Forest Service, Alaska Region,
Forest Health Protection
161 East 1st Avenue, Door 8
Anchorage, Alaska 99501

Forest Health Assessment and Applied Sciences Team
2150 Centre Avenue
Building A Suite 331
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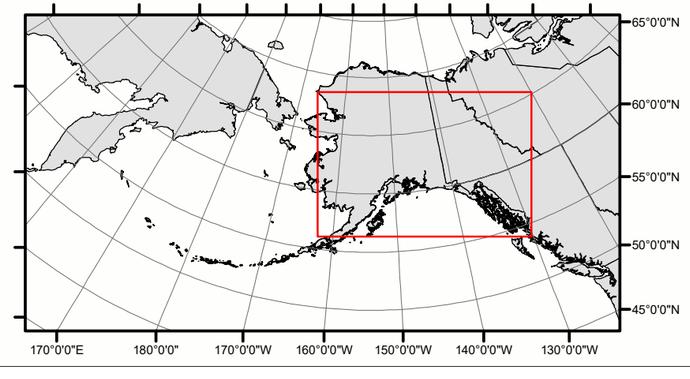
Alaska Department of Natural Resources,
Division of Forestry & Fire Protection
Forest Health Program
550 W 7th Ave #1450
Anchorage, Alaska 99501

Land Cover: U.S.G.S. EROS
Alaska Field Ofice



Map 2. Aerial Detection Survey flight paths. For more information on survey methods in 2022, please see Appendix 1, page 77.