ARIZONA FOREST HEALTH CONDITIONS 2017

A publication by the Forest Health Program of the Arizona Department of Forestry and Fire Management

Arizona is a state with incredible landscape diversity that ranges from the lower Sonoran Desert scrub and pinyon-juniper woodland, to the high elevation spruce-fir forests.

Forests cover roughly 27% of the state and occupy 19.4 million acres. These forests are comprised of 37 species of coniferous and hardwood trees. The majority of forestland is located above the Mogollon Rim with distinct forested areas scattered throughout the rest of the state. Juniper (*Juniperus* spp.) and pinyon juniper (*Pinus edulis-Juniperus* spp.) woodlands are the most abundant forest type in Arizona, occupying approximately 14.8 million acres, or 20.3% of the state. The rarest and most significant in ecological terms is riparian forest, which occupies less than one-half of 1% of Arizona's land.

In urban areas, we experience urban forests that are typically composed

14 million acres surveyed by air

45,000 acres of tree mortality from bark beetles

34,000 acres of tree defoliation

57% decline in trees damaged or killed from 2016

of a mix of native and introduced tree species that require various management techniques. These urban forests are inhabited by almost 90% of Arizona's residents and provide numerous environmental, economic and social benefits. With such a broad diversity of forests comes a similarly diverse group of insects and diseases that impact forest and woodland health, such as Pine Engraver beetles, Pine sawflies, Spruce aphid, Pinyon needle scale, Sycamore anthracnose, and white pine blister rust.

Annually, DFFM partners with the USDA Forest Service to survey millions of acres of forest and woodland resources from the air. The Aerial Detection Survey (ADS) provides land managers and the public with information about landscape-level forest and woodland health conditions. In 2017, the ADS occurred over 14 million acres to detect dead and/or dying trees. During the year, DFFM forest health specialists and district staff verify ADS data, conduct ground surveys, and provide landowner technical assistance. This conditions report summarizes the ADS and discusses forest and woodland health issues in Arizona.

Overview

There was a total of 80,469 acres (the area of about 60 football fields including the end zones) of forests trees damaged or killed by insects and disease in 2017, which is a 57% decline from the previous year. Most tree mortality was caused by bark beetles (45,003 acres) with the majority occurring in ponderosa pine forests (43,185 acres), also a 57% decline. Ponderosa pine is the host for several species of bark beetles, of which western pine beetle, pine engraver, and Arizona fivespined ips account for most of the mortality in Arizona. Other notable bark beetle caused mortality was in pinyon pine by the pinyon ips (568 acres), white fir by the fir engraver (507 acres), Douglas-fir by the Douglas-fir beetle (504 acres), and sub alpine fir by the western balsam bark beetle (123 acres). Aspen decline accounted for the remainder of tree mortality (231 acres). Most tree damage was caused by defoliators and sap feeders (35,466 acres), which is a decline of 49%. The defoliation of 19,692 acres of ponderosa pine by the pandora moth is a significant increase compared to the 2 acres from the previous year. Pandora moth activity combined with 4,157 acres of tamarisk defoliation by the tamarisk leaf beetle accounted for most of the defoliation. The remainder was caused by the box-elder tussock moth, Douglas-fir tussock moth, needleminers, rose chafer, sawflies, and western spruce budworm. The sap feeding spruce aphid damaged 5,615 acres of spruce forests (83% reduction), and the pinyon needle scale affected 1,518 acres of pinyon pine (39% reduction). The remaining damage was caused by wind, road salt or deicers, foliage disease, and the goldspotted oak borer.

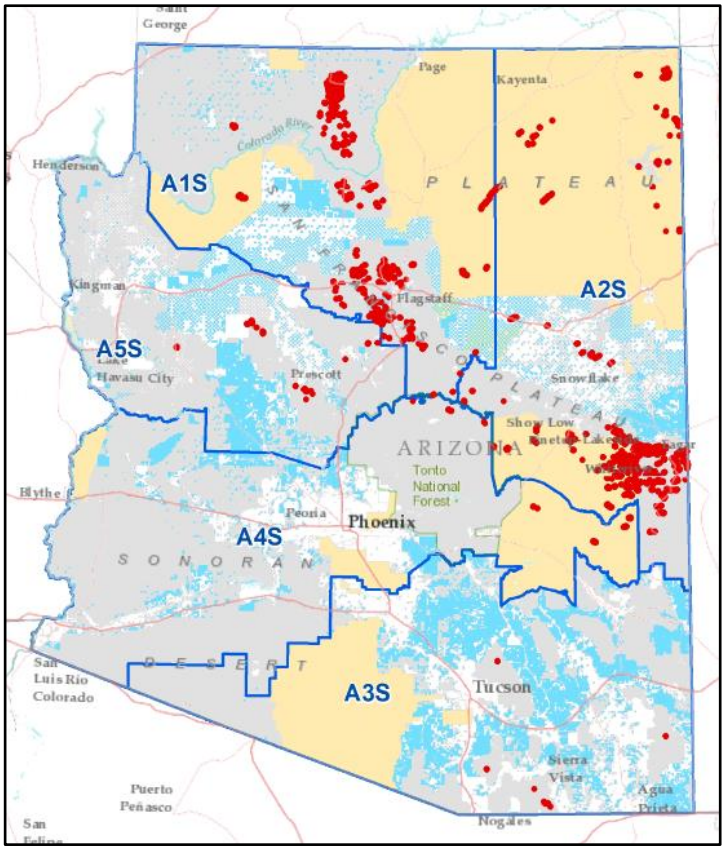


Figure 1. Arizona 2017 Aerial Detection Survey Insect and Disease Locations

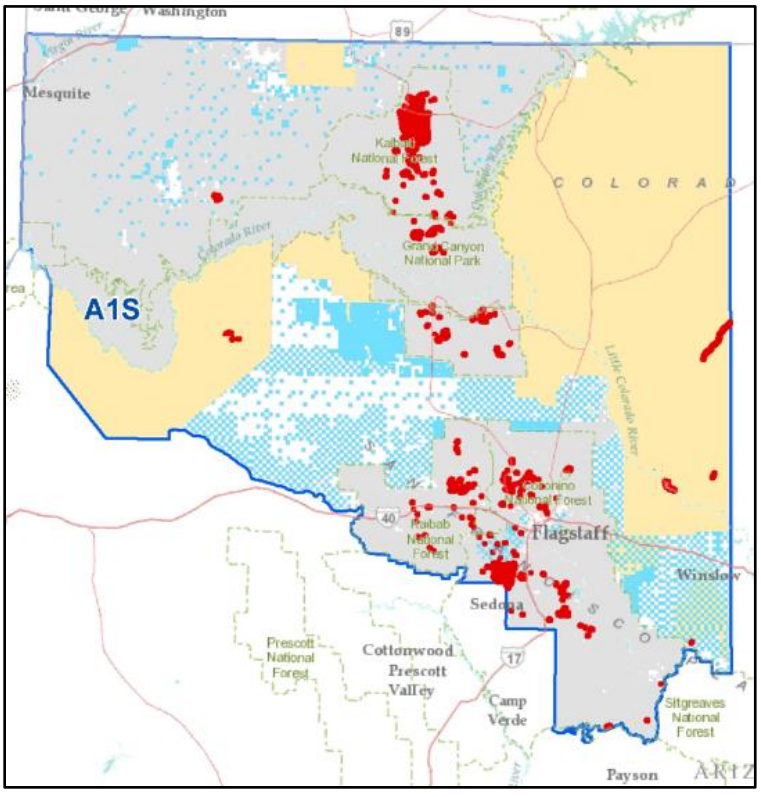
Arizona Department of Forestry and Fire Management has 5 distinct districts. Each district shares similar forest and woodland health issues but also has a varying degree of tree damage from insects and disease.

Northern District (A1S)

There was a total of 45,021 acres of forest trees impacted by insects and disease in 2017 in the Northern District, which is an increase of 23% over the previous year. Most of the increase was due to bark beetle and pandora moth activity. Bark beetle caused mortality increased 77% to 19,969 acres, primarily in ponderosa pine forests. Pandora moth defoliation increased from <2 to 19,692 acres reflecting the 2-year life cycle of this insect. Tamarisk defoliation by the tamarisk leaf beetle declined 78% to 1,895 acres. 112 acres of spruce aphid activity was detected this year when previously there was none, and pinyon needle scale increased 460%.

Table 1. Northern District 2017 Estimated Acres of Observed Tree Damage by Land Ownership

Damage Causing Agent	Federal	Indian Lands	Private and Local	State	Grand Total
Abiotic Agents	349.7		0.2		**350.0**
Bark Beetles	19,121.0	766.0	36.6	45.2	**19,968.9**
Declines	140.1		5.5		**145.6**
Defoliators	21,432.0	1,887.6	66.3	10.2	**23,396.1**
Foliage and Shoot Diseases	0.3				**0.3**
Human Activities (road salt or deicers)	27.4		1.3		**28.7**
Sap Feeders	1,052.5	52.0	27.0		**1,131.5**
Grand Total	**42,123.1**	**2,705.6**	**137.0**	**55.4**	**45,021.1**



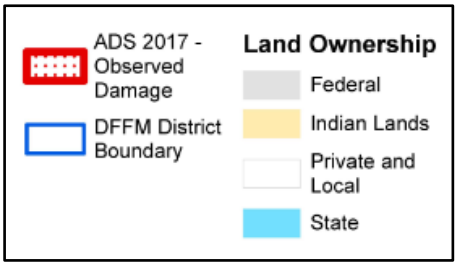


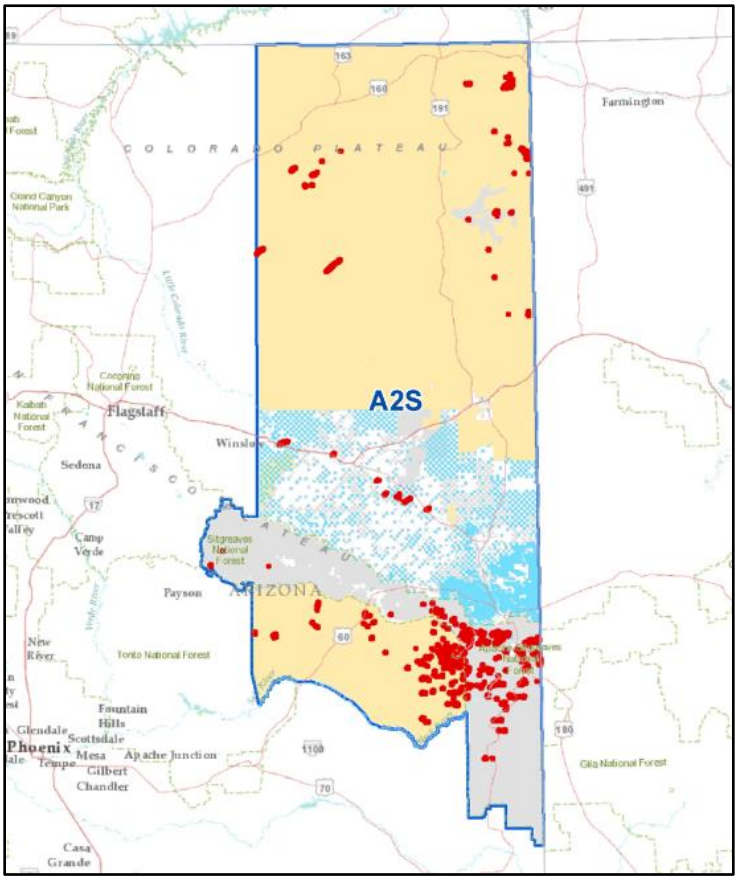
Figure 2. Location of Insect and Disease Activity in the Northern District.

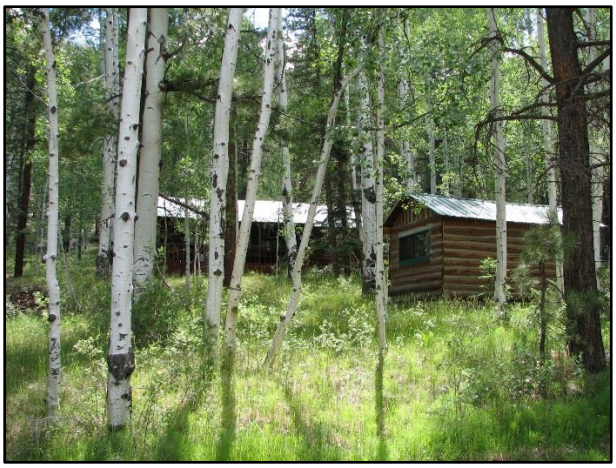
Northeast District (A2S)

There was a 73% decrease of insect and disease impacts to forests trees in the Northeast District in 2017 compared to the previous year, primarily due to significant reductions of bark beetle, tamarisk leaf beetle and spruce aphid activity. Bark beetle caused mortality declined 63%, mostly in ponderosa pine forests, with similar reductions of fir engraver and Douglas-fir beetle activity in mixed conifer forests. Defoliating insect activity declined 86%, primarily due to a reduction of tamarisk leaf beetle defoliation of tamarisk by 82%. Similarly, there was a reduction of spruce aphid activity on spruce trees by 88%.

Table 2. Northeast District 2017 Estimated Acres of Observed Tree Damage by Land Ownership

Damage Causing Agent	Federal	Indian Lands	Private and Local	State	Grand Total
Abiotic Agents	0.3	1.6			**1.8**
Bark Beetles	17,570.7	4,968.7	288.2	0.5	**22,828.1**
Declines		85.4			**85.4**
Defoliators	224.2	2,516.4	690.0	64.4	**3,495.0**
Foliage and Shoot Diseases	118.0	293.2			**411.1**
Human Activities (road salt or deicers)			0.3		**0.3**
Sap Feeders	581.9	5,325.9			**5,907.7**
unspecified	0.3				**0.3**
Grand Total	**18,495.3**	**13,191.1**	**978.4**	**65.0**	**32,729.7**





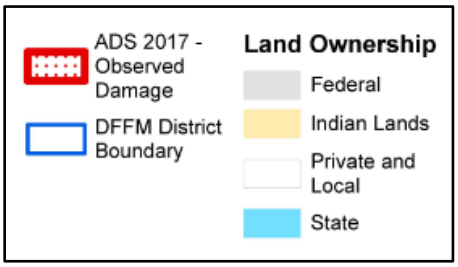


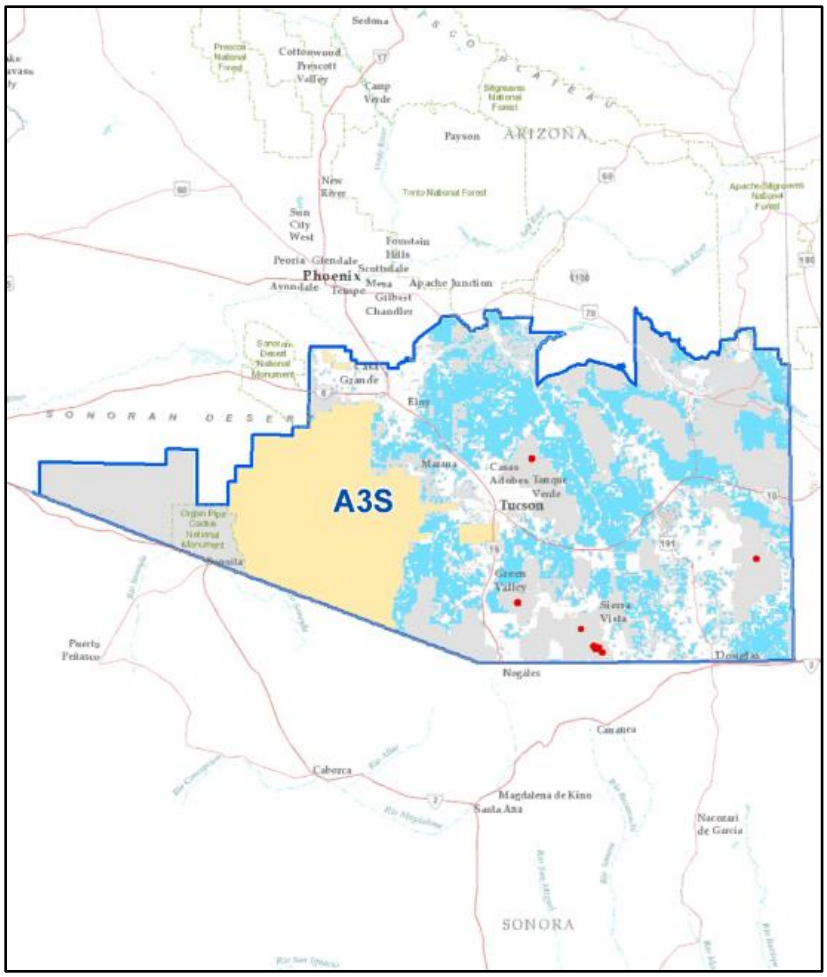
Figure 3. Location of Insect and Disease Activity in the Northeast District.

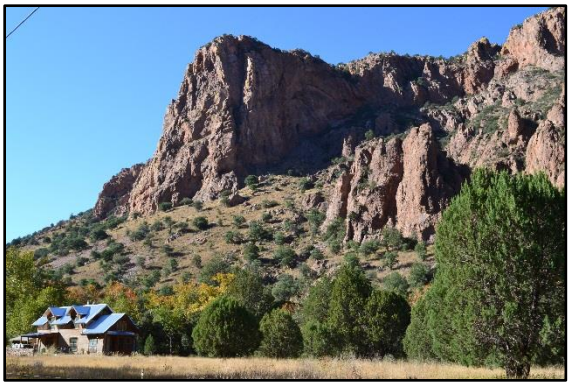
Southeast District (A3S)

There was a 91% decrease in insect and disease impacts to forest trees in the Southeast District in 2017 compared to the previous year, primarily due to significant reductions of bark beetle caused mortality of ponderosa pine. There was an increase of defoliator activity by 75% caused mostly by the Douglas-fir tussock moth resulting in 279 acres of defoliation. Of note, there was a 98% reduction of goldspotted oak borer activity, a serious pest of oaks in Southern California, resulting in only 2.4 acres being infested. In the greater Tucson area, bark beetle activity was similar in 2017 as compared to 2016. Trapping of beetles is occurring in numerous parks throughout Tucson and will continue to be monitored through 2018 by DFFM and the University of Arizona, Department of Entomology. Target beetles of concern are *Ips calligraphus*, *Ips lecontei*, and *Orthotomicus erosus*.

Table 3. Southeast District 2017 Estimated Acres of Observed Tree Damage by Land Ownership

Damage Causing Agent	Federal	Private and Local	State	Grand Total
Bark Beetles	71.8	0.3	0.3	**72.4**
Defoliators	268.6	10.4		**279.0**
Wood Borers	2.4			**2.4**
Grand Total	**342.8**	**10.6**	**0.3**	**353.7**





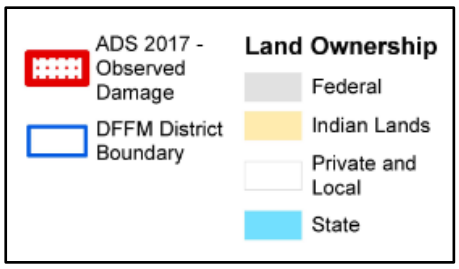


Figure 4. Location of Insect and Disease Activity in the Southeast District.

Central District (A4S)

There was a 95% decrease in insect and disease impacts to forest trees in the Central District in 2007. The only damaging agent found was bark beetles, primarily in ponderosa pine forests, and that mortality has declined by 92%. Ground surveys in June detected the occurrence of the tamarisk leaf beetle on the Hassayampa River in the Lower Gila River watershed. This population was found in Wickenburg and our partners at the Tamarisk Coalition are continuing monitoring activities. There was continued decline in *pinus* spp. in the Phoenix metropolitan area. While the decline is likely attributed to abiotic factors (climate, water, etc.) and age, the exact cause of mortality is still unknown.

Table 4. Central District Estimated Acres of Observed Tree Damage by Land Ownership

Damage Causing Agent	Federal	Indian Lands	Private and Local	Grand Total
Bark Beetles	148.5	1,181.1	1.4	**1,331.0**

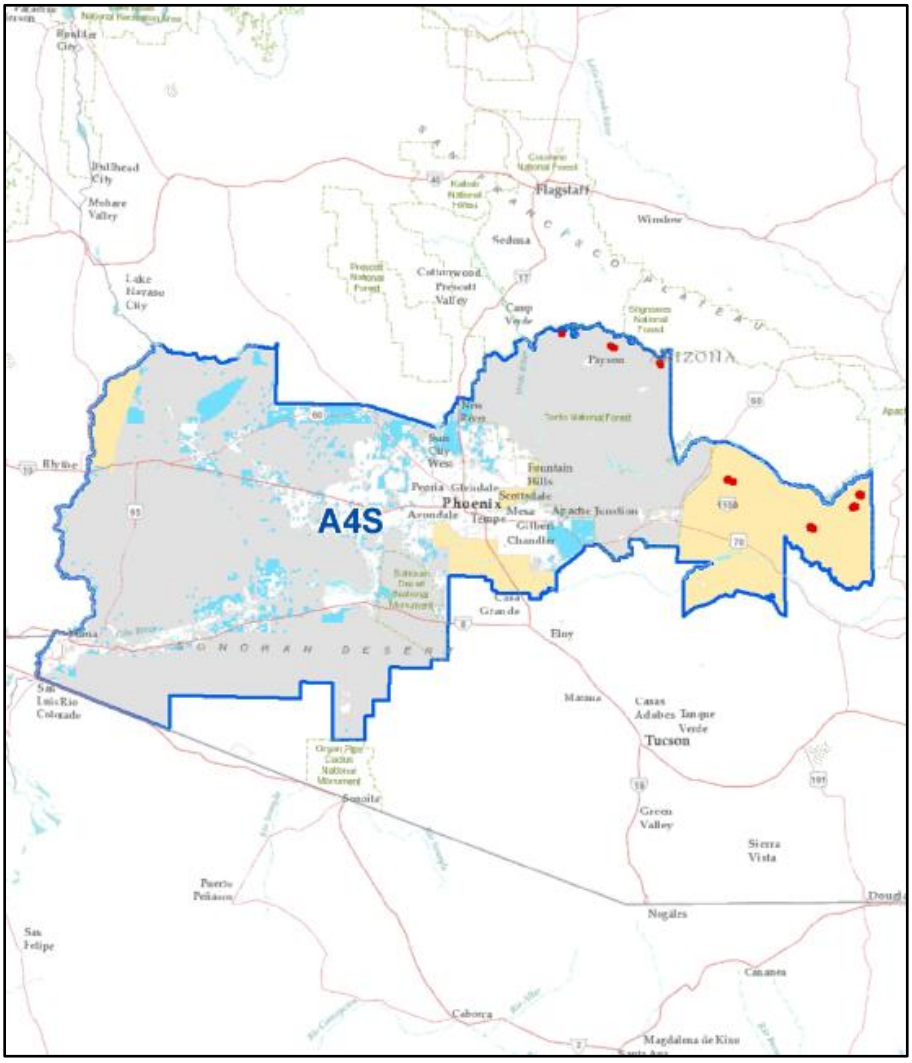


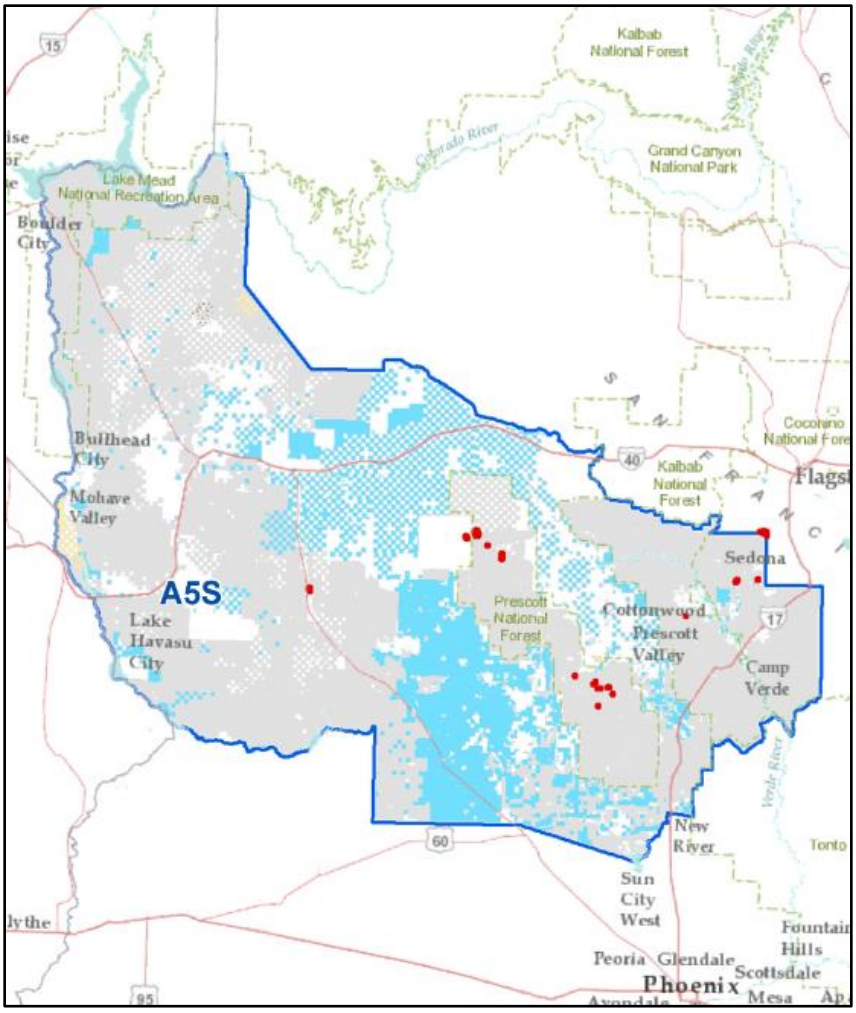
Figure 5. Location of Insect and Disease Activity in the Central District

Northwest District (A5S)

There was a 53% increase in insect and disease impacts to forest trees in the Northwest District in 2007 compared to the previous year. Most of the increase was due to higher levels of bark beetle activity in ponderosa pine forests. Mortality of pinyon pine by pinyon ips beetles has declined 85%, but there has been new evidence of pinyon pine defoliation by the pinyon needle scale. There also has been a new detection of defoliation of tamarisk by the tamarisk leaf beetle affecting about 64 acres.

Table 5. Northwest District Estimated Acres of Observed Tree Damage by Land Ownership

Damage Causing Agent	Federal	Private and Local	State	Grand Total
Bark Beetles	734.2	67.5	1.3	**803.0**
Defoliators	18.8	67.5		**86.2**
Human Activities (road salt or deicers)	50.9			**50.9**
Sap Feeders	64.8	28.5		**93.3**
Grand Total	**868.7**	**163.5**	**1.3**	**1,033.4**



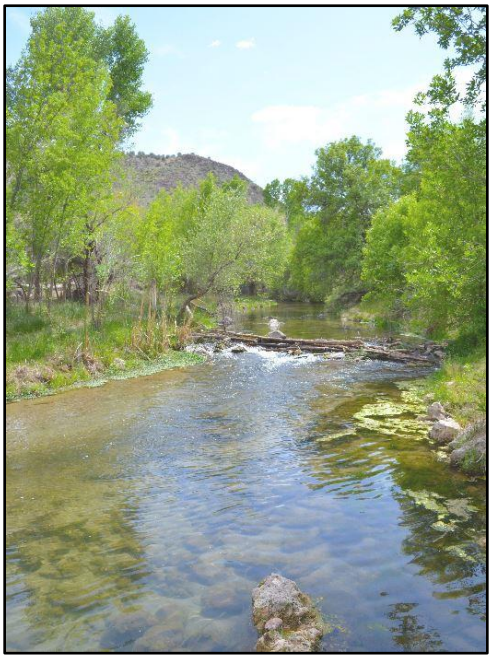
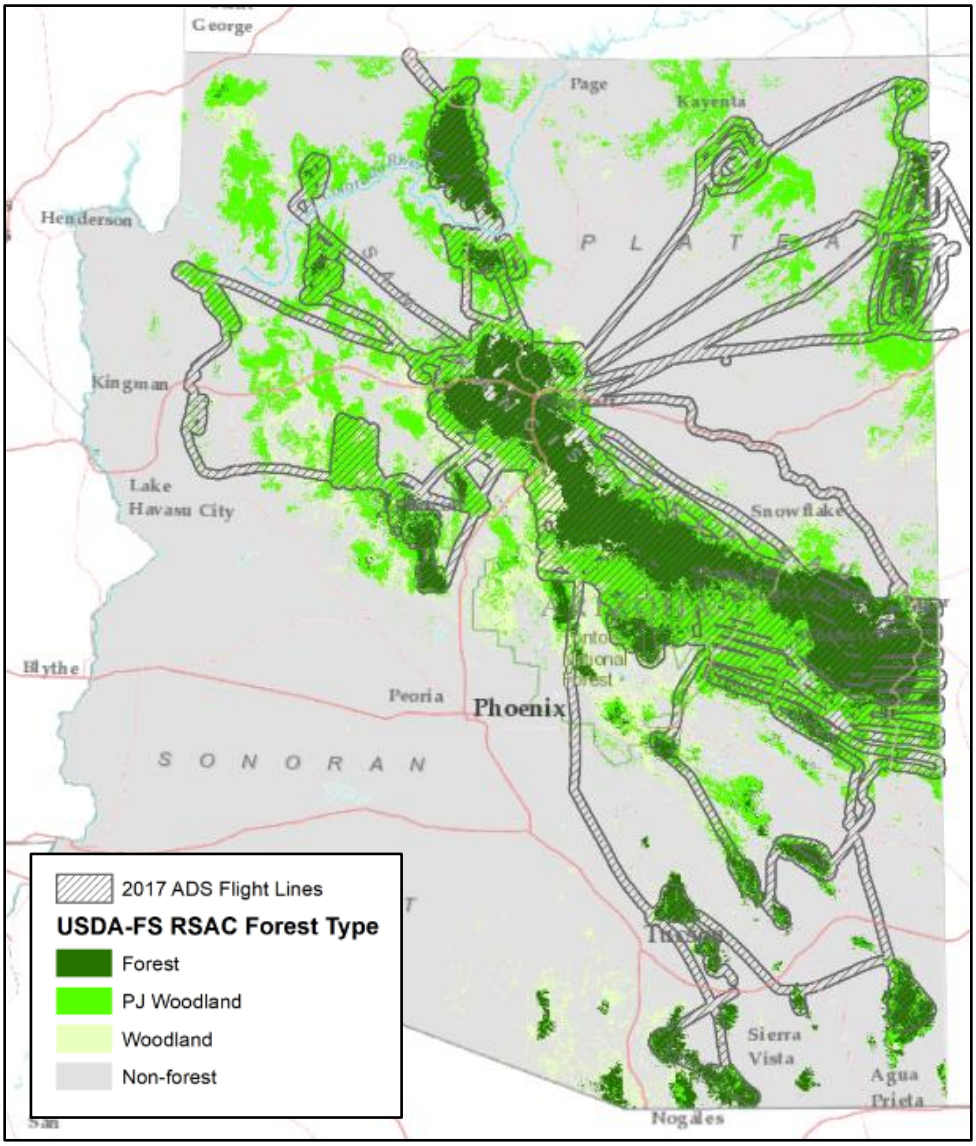


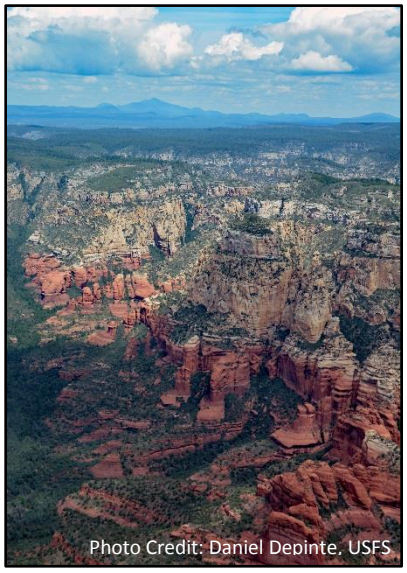
Figure 6. Location of Insect and Disease Activity in the Northwest District

Flight Information

Table 6. Estimated Flight Area by Forest Type

Forest Type	Arizona (ac)	Flight Area (ac)	Covered by Flight (%)
Forest	5,847,239	4,874,714	83%
PJ Woodland	10,205,097	4,985,280	49%
Woodland	3,223,490	654,115	20%
Non-Forest	53,656,586	4,231,806	8%
Total Area	**72,932,412**	**14,745,915**	**20%**
Estimates based on 2 mile buffer around survey flight lines.			





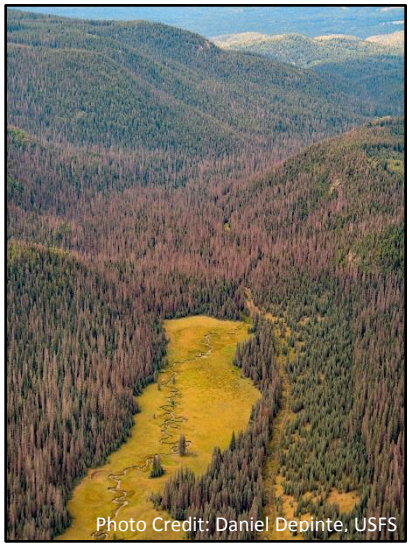


Figure 7. 2017 Aerial Detection Survey Flight Area

Contact Information

The DFFM Forest Health Program is a statewide program that is based in Phoenix, AZ.

Office of the State Forester
1110 West Washington St., Suite 100
Phoenix, Arizona 85007
602-771-1400

Website: dffm.az.gov

Forest Health Website: dffm.az.gov/forestry-community-forestry/forest-health

The Forest Health Team

Program Manager: John Richardson, JRichardson@dffm.az.gov, 602-771-1420
Forest Health Specialist: Steve McKelvey, SMcKelvey@dffm.az.gov, 602-771-1415
Project Coordinator: Wolfgang Grunberg, WGrunberg@dffm.az.gov, 602-399-1886
Conservation Education Coordinator: Cori Dolan, Cdolan@dffm.az.gov, 520-262-5519

The State of Arizona Forest Health Program is made possible with assistance from the USDA Forest Service.

Published: November 30, 2017