Arizona Forest Health Highlights of 2021

Arizona Department of Forestry and Fire Management

Publication Assembled by Aly McAlexander, with Technical Support from Wolfgang Grunberg

Arizona has an incredibly diverse landscape - from the lower Sonoran desert scrub and pinyon-juniper woodland, to the high elevation spruce-fir forests. Forests cover approximately 27% of the state, which is over 19 million acres.

The Department of Forestry and Fire Management (DFFM) partners with the USDA Forest Service Forest Health Protection (FHP) team annually to survey millions of acres with forest and woodland resources from the air. This report highlights key information from our more in-depth 2021 Forest Health Conditions report which can be found here: Arizona Forest Health Conditions Report of 2021.

Figure 1: An Aerial Photo of Ponderosa pine mortality caused by bark beetles, and juniper die back due to drought; Coconino National Forest, 2021

2021 Climatic Overview

It is important to understand the climatic conditions occurring throughout our state, as precipitation and temperature are two of the biggest environmental factors influencing forest health. When trees are stressed from a lack of precipitation and increased average temperatures, they become increasingly susceptible to infection and infestation from diseases and insects. Furthermore, prolonged drought stress, meaning a drought lasting longer than 6 months, can lead to decreased overall tree health and an increased likelihood of tree death. According to the U.S. Drought Monitor, Arizona has been experiencing continual drought conditions since 2002 - nearly 20 years of continual drought stress.

The time period between the fall season of 2020 and January 2021 was extremely dry in Arizona. Nearly 73% of the state experienced Exceptional Drought levels (D4, Figure 2), which is the highest and most severe level of drought according to the Drought Monitor. By February, La Niña conditions were intensifying in the Pacific Ocean - leading to a drier than normal spring. Northern Arizona received much needed precipitation in March; however, it was not enough to improve drought conditions. April was still very dry, with most of the state receiving less than 25% of its average precipitation. A fairly active monsoon system in July brought significant amounts of precipitation across much of the state; many locations along the Mogollon Rim received up to 200% of their normal amounts of rain. However, by the end of July, a La Niña watch was issued for the fall and winter of 2021 - leading to another cool season of below average precipitation. La Niña conditions were already starting to develop over the Pacific Ocean in late August; and at this point, there was a 75% chance of a mature La Niña phase during the winter of 2021-2022.

This La Niña phase meant drier than average winter conditions across the state. By the end of September, most of Arizona experienced Moderate (D1 at 42%) to Severe (D2 at 25%) drought conditions (Figure 2). Drought levels slightly improved through October; but by November, Arizona started to dry out and warm back up. With only one measurable rainfall event occurring that month, both Tucson and Phoenix had their second warmest November on record. December didn't bring much change to Arizona's drought status; La Niña drought conditions persisted through the winter, resulting in drier than normal weather in Arizona.

It is necessary to understand Arizona's drought status throughout the year, as it influences our annual observations during the aerial survey season.

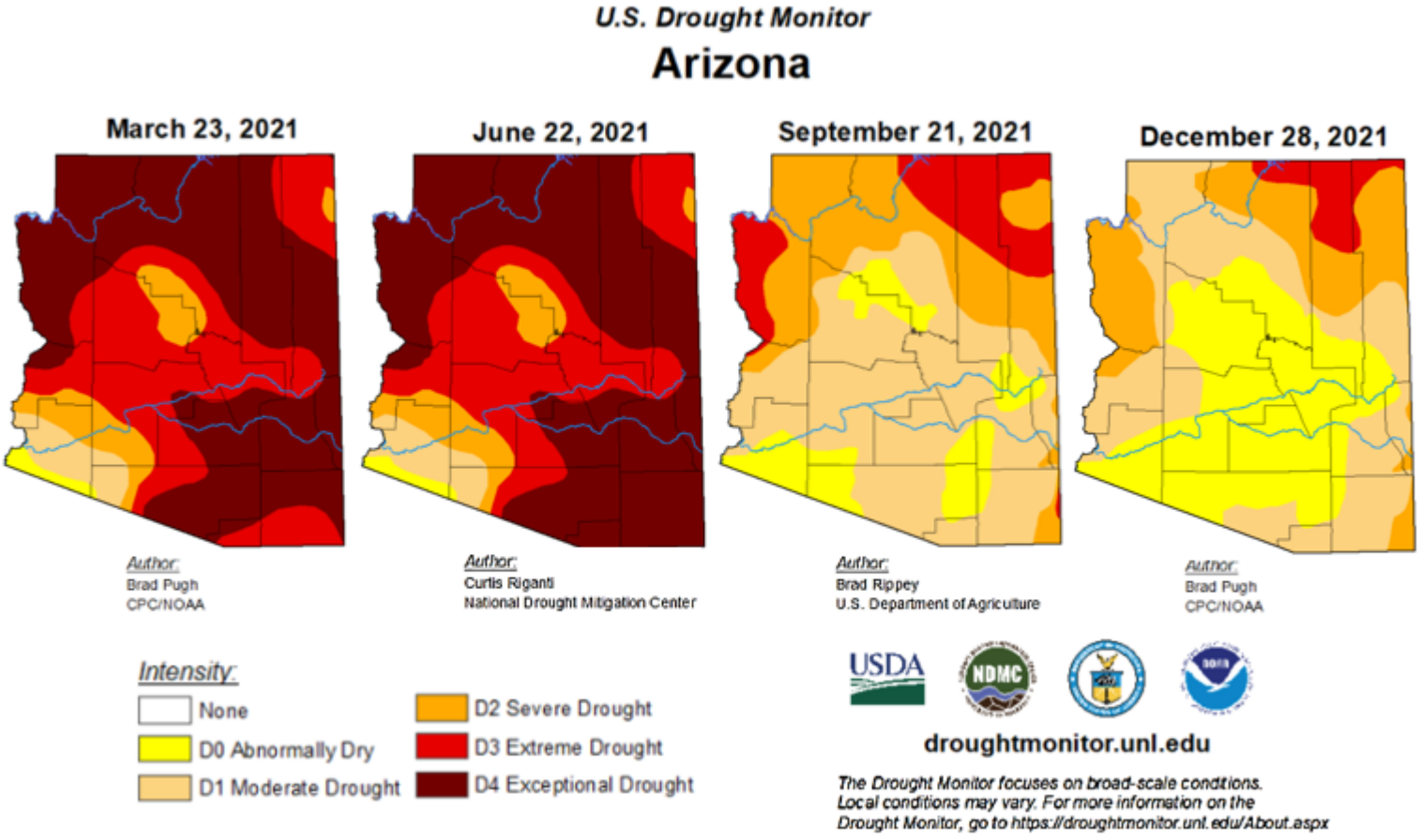

Figure 2: U.S. Drought monitor maps of Arizona in March, June, September, and December, 2021; obtained from droughtmonitor.unl.edu

2021 Insect and Disease Activity

During the Aerial Detection Survey (ADS) season in the summer of 2021, over 17 million acres were flown to identify dead, dying, or declining trees (Figure 2). However, prior to the ADS season forest health professionals around Arizona began noticing an increase in tree mortality caused by bark beetles during the fall and winter of 2020. This led to a supplemental aerial survey flight in early February of 2021. The supplemental survey confirmed that ponderosa pine mortality increased from what was mapped during the 2020 ADS season. During the summer of 2020, over 81,000 acres with bark beetle caused mortality were observed; in the summer of 2021, that number jumped to 528,108 acres (see ADS Highlights on page 3). This is a 551% increase in bark beetle caused tree mortality statewide.

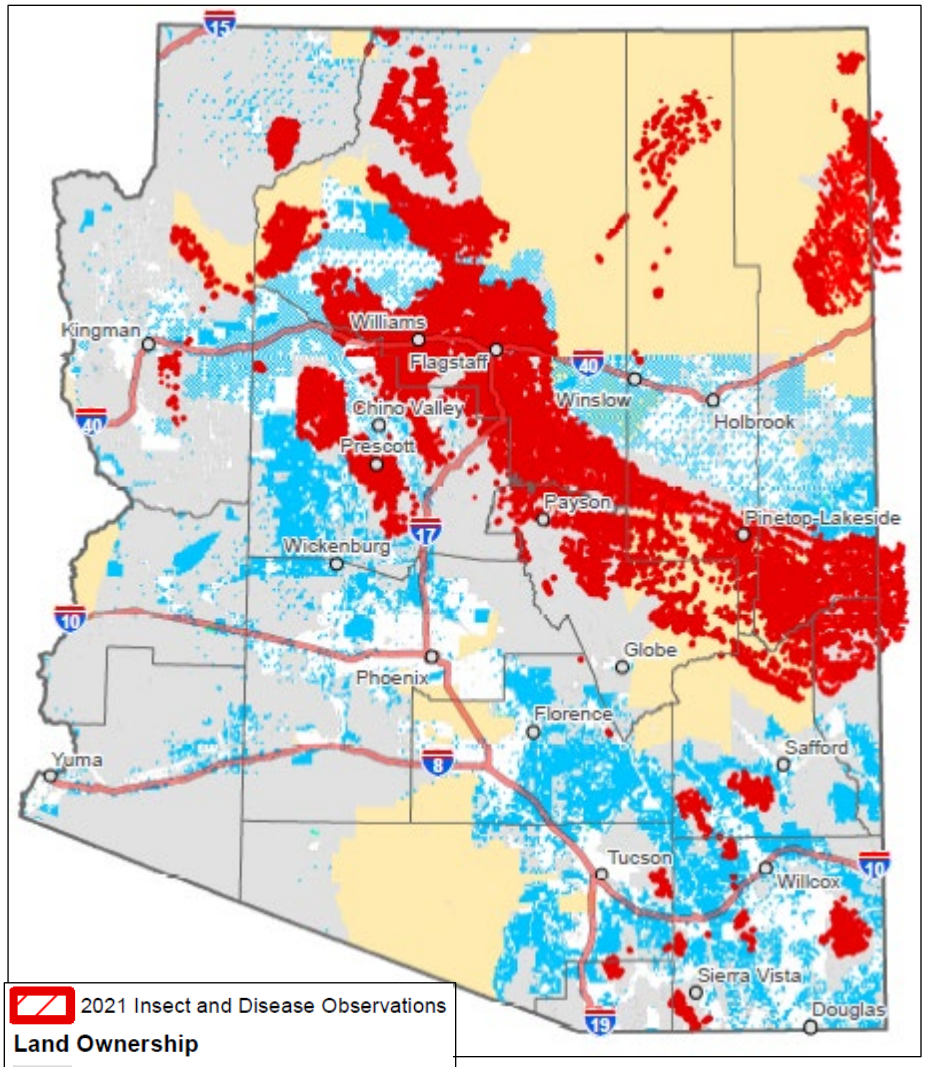

Figure 3: A Map of All Insect and Disease Observations in the State of Arizona, 2021. Forest areas with damage caused by insects and diseases are shown in red.

Figure 4 (Left): Legend for Figure 3 - Land Ownership type.

Several Arizona Districts also observed salt cedar defoliation from Tamarisk leaf beetle - this data is discussed per district in the full report. It is worth mentioning that the acres observed with tamarisk leaf beetle damage are areas we don't typically fly. Thus, these acres were captured only because our flight path took us over or near these riparian areas. Damage from these insects is possibly on additional acres that were not flown during the ADS season, therefore the acres reported are not representative of the entire state.

This year there was a significant increase in tree dieback due to drought, mostly occurring in the pinyon-juniper woodlands of the lower elevations forests throughout the entire state of Arizona. Additional acres of pinyon-juniper woodlands were surveyed to get a better idea of how many acres were affected by the severe drought conditions Arizona had been experiencing.

Many of the signs and symptoms associated with tree diseases can be difficult to identify from the air, as the aerial signatures can look very similar to insect activity. For this reason, USDA Forest Service and Arizona DFFM forestry professionals "ground truth", which means visiting the areas on foot, to verify that the damage

observed from the air is the same agent that is causing the damage on the ground. Due to the complexities with identifying diseases from the air, there were not many acres with observed disease damage. The majority of observed disease damage is found on the ground by forestry professionals working in the field.

Urban Forests Update

In 2018, DFFM began monitoring for the presence of the Mediterranean pine engraver (*Orthotomicus erosus*), or MPE, to determine if it had become established in the Phoenix Metro area. MPE traps were established throughout the Phoenix metropolitan area.

In 2021, 30 traps were placed in the Phoenix Metro, and an additional 10 traps were placed in Tucson, AZ. These 40 traps in the Phoenix metro and city of Tucson were left out for 24 weeks, from April to September.

Since monitoring began in 2018, over 168,000 MPE beetles have been collected from the Phoenix Metropolitan area. Significantly, MPE was confirmed in the Tucson region for the first time in 2021.

At this point, MPE has only been found in urban forests. However, due to its large host range, this invasive insect poses the risk of infesting wildland forests, underscoring the importance of continued monitoring and research regarding management options.

Figure 5: Photo of a Mediterranean Pine Engraver. Photo Credit: Chris Baptista, Entomology Program Manager, Environmental and Plant Services Division, AZDA

The Arizona Department of Forestry and Fire Management's public facing dashboard on the Mediterranean Pine Engraver in the Phoenix metro can be found at the following link: Mediterranean Pine Engraver Monitoring Program.

Aerial Detection Survey Highlights by DFFM District – 2021

Northern District (A1S)

- 314,016.63 acres with bark beetle caused tree mortality
- 5,552.69 acres with defoliator damage
- 10,836.83 acres with sap feeder damage
- 269,461.97 acres with drought damage

Northeast District (A2S)

- 101,419.76 acres with bark beetle caused tree mortality
- 7,947.40 acres with defoliator damage
- 5,361.82 acres with sap feeder damage
- 44,615.91 acres with drought damage

Southeast District (A3S)

- 11,072.99 acres with bark beetle caused tree mortality
- 2,967.45 acres with wood borer damage
  17,002.84 acres with drought damage

Central District (A4S)

- 60,734.48 acres with bark beetle caused tree mortality
- 939.37 acres with defoliator damage
- 10,373.90 acres with sap feeder damage
  15,326.19 acres with drought damage

Northwest District (A5S)

- 40,864.43 acres with bark beetle caused tree mortality
- 6.63 acres with defoliator damage
- 15,152.81 acres with sap feeder damage
- 1,693.43 acres with wood borer damage
- 59,587.92 acres with drought damage

General Contact Information

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

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Photo Credits

All aerial photos of observed insect, disease, and noninfectious disorders were taken by Aly McAlexander; any additional photos without credit were either taken by Aly McAlexander or other Department of Forestry and Fire Management employees.

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Figure 2: Photo of Lobster Mushroom (Hyphomycetes lactiflourum), Coconino National Forest, 2021

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