Aerial Detection-Replacement Survey 2020

Significant Pest/Disease Activity

- **Hemlock Sawfly**: 143,233 Acres
- **Spruce Beetle**: 114,333 Acres
- **Aspen Defoliation**: 38,779 Acres
- **Yellow-Cedar Decline**: 10,386 Acres
- **Birch Defoliation**: 3,923 Acres
- **Spruce Damage**: 719 Acres
- **Willow Defoliation**: 428 Acres

Land Cover

- Conifer Forest
- Mixed/Broadleaf Forest
- Shrub
- Non-Forest
- Water
- Outline image surveyed
- 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.

Map 3. 2020 Aerial Detection-Replacement Survey. For more information on changes to the survey methods in 2020, please see Appendix 1, page 66.
Aerial Detection-Replacement Survey Areas

<table>
<thead>
<tr>
<th>Management Agency</th>
<th>Surveyed Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Alaska</td>
<td>1,778,000</td>
</tr>
<tr>
<td>US Forest Service</td>
<td>1,428,000</td>
</tr>
<tr>
<td>Native</td>
<td>1,023,000</td>
</tr>
<tr>
<td>Local Government and Private</td>
<td>2,088,000</td>
</tr>
<tr>
<td>National Park Service</td>
<td>210,000</td>
</tr>
<tr>
<td>US Fish and Wildlife Service</td>
<td>270,000</td>
</tr>
<tr>
<td>Bureau of Land Management</td>
<td>244,000</td>
</tr>
<tr>
<td>Department of Defense</td>
<td>154,000</td>
</tr>
<tr>
<td>Wild and Scenic River</td>
<td>20,500</td>
</tr>
<tr>
<td>Total Acres Surveyed</td>
<td>7,322,000</td>
</tr>
</tbody>
</table>

Total Acres Surveyed: 7,322,000

Map 4. 2020 Aerial Detection-Replacement Survey areas. For more information on changes to the survey methods in 2020, please see Appendix 1, page 66.
The 126 million acres of forestland in Alaska represent 17 percent of the Nation’s forests. In 2020, aerial surveys to detect active forest damage from insects, diseases, declines, and abiotic agents were grounded for the first time in decades due to the COVID-19 pandemic. In a typical year, our team aerially surveys around 20 million acres, or 15%, of the forested area of Alaska. An extensive ground survey approach in forests along roads and trails, in addition to remote-sensing techniques utilizing high-resolution satellite imagery (Map 3, page 7), (Map 4, page 8) enabled our team to gather the best forest health information possible given the current constraints (Table 1, page 9) (Table 2, page 10).

We also created an Alaska Forest Health project in iNaturalist to solicit observations from citizen scientists (Table 3). The remote-sensing methods and crowd-sourcing techniques developed to meet current challenges will undoubtedly enhance our forest health surveys in the coming years.

**Novel Survey Approaches**

**Combining Ground Surveys & Remote Sensing**

We conducted ground surveys along roads and trails, mapping major damage at regular intervals. These surveys covered approximately 2.4 million acres. Our goal was to capture major damage observations, approximating what would be mapped during our annual aerial survey, thereby providing damage locations to hone our remote-sensing tools and techniques. As in recent years, we also recorded damage that is indecipherable from the air using the Survey123 app. This information is displayed in the ground survey dashboard and can be viewed at: [https://arcgis/1SH58a](https://arcgis/1SH58a).

Based on locations with known forest damage, we evaluated damage signatures in high-resolution satellite imagery. This approach enabled us to map similar damage across broader and less accessible swaths of the landscape. High-resolution (< 1m) Worldview 2 and Worldview 3 satellite imagery captured June to September 2020 was requested for specific areas of interest through both Digital Globe and the

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**Map 1.** Ground surveys along roads were performed (black routes) and high-resolution imagery (green polygons) was systematically scanned, resulting in nearly 345,000 acres of damage mapped across 7.3 million acres surveyed in 2020.
USGS using their Commercial Remote Sensing Space Policy (CRSSP) Imagery Derived Requirements (CIDR) imagery request tool. Available imagery was mosaicked (overlaid and positioned) in ArcPro software to create basemaps, which were then imported into our standard aerial survey mapping software on mobile tablets.

Using a newly developed method called scan and sketch survey, surveyors systematically scanned 4.8 million forested acres of imagery for forest damage. Using similar methods as aerial survey, surveyors circled damage areas, attributing them with a damage agent, plant host, and damage severity. Imagery quality varied and damage was often more difficult to see in imagery compared to what can be seen from the plane at 1000-1500ft above the ground. Some agents that cause relatively homogenous and distinct color change to the tree canopy (e.g., spruce beetle, aspen leafminer, and hemlock sawfly) were easier to pick up in the high-resolution imagery compared to more subtle or scattered damage that can be mapped from a survey plane. Fortunately, those agents that were difficult to identify could still be recorded during ground surveys. Using both road and remote-sensing surveys (Map 1), we mapped nearly 345,000 acres of damage across 7.3 million acres surveyed (4.8 million acres surveyed with remote-sensing and 2.5 million acres ground surveyed). A detailed description of the remote-sensing approach to damage detection based on high-resolution satellite imagery can be found in Appendix 1 on page 66.

**iNaturalist**

This year, we established a citizen science project in iNaturalist, a social media platform that allows users to upload biotic observations, called “Alaska Forest Health Observations.” This allows us to tap into data that citizen scientists are already uploading from their backyards, roadsides, trails, remote islands, and even National Parks and Forests. We will continue to use this dataset to rapidly assess where forest damage agents have been observed and outbreaks may be building and to keep a finger on the pulse of forest health concerns of the public. Remarkably, between April and December, 312 observers uploaded 2,471 forest health observations of 217 different species in Alaska to our Alaska Forest Health Project in iNaturalist (Map 2; Table 3, page 11)! This year, iNaturalist observations of the previously undetected western tent caterpillar were crucial to assessing its current distribution.