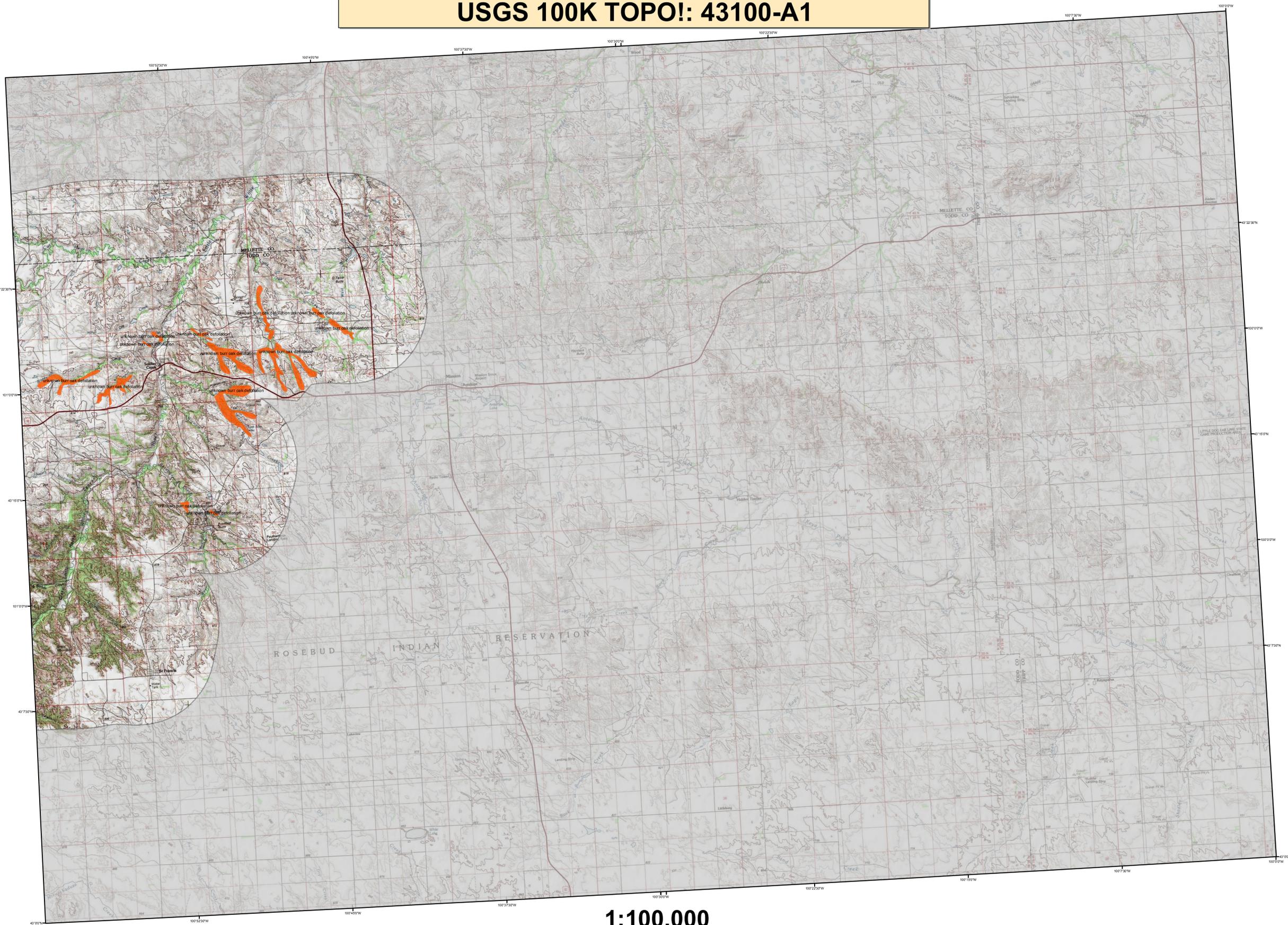


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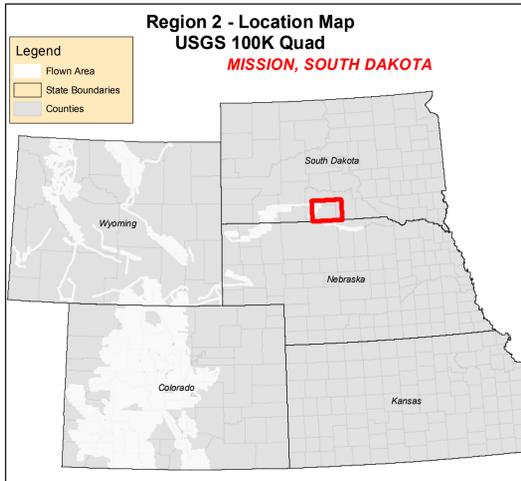


1:100,000

Legend ■ Causal Agent(s) ■ Not Flown

Use of the Number System
Example: S-L = The first number before the dash is the causal agent code. The letter after the dash is the estimate of dead "fader" trees in the polygon or point as a percentage of the total trees within the delineated area. An intensity code of Tr-Trace, L-Light, M-Moderate, S-Severe, and VS-Very Severe may be used after the causal agent code.
Trace: 1-3%; Light: 4-10%; Moderate: 11-29%; Severe: 30-50%; Very Severe: >50% Value ranges represent the percent of current "faders" in relation to the total forested area within the polygon. Periodically, whole numbers of trees can be used as an intensity code for small groups of trees. For example: 5-10 = The first number before the dash is the causal agent code, the number after the dash is an estimate of the number of dead "fader" trees in the polygon.

| Code | Causal Agent | Primary Host | Code | Causal Agent | Primary Host |
|------|---|------------------|------|--------------------------------------|-------------------|
| 1 | Douglas fir beetle | Douglas fir | 99 | Unknown | |
| 2 | Engelmann spruce beetle | Engelmann spruce | 100 | Scallopiform rust | Lodgepole pine |
| 3 | Blue spruce tip | Blue spruce | 107 | Red weevil | Cottonwood poplar |
| 5 | Mountain pine beetle | Ponderosa pine | 108 | road salt | Softwoods |
| 7 | Mountain pine beetle | Lodgepole pine | 109 | pinewood nematode | Scotch pine |
| 8 | Western pine beetle | Needle pine | 110 | oak wilt | Oak |
| 9 | Fir engraver | White fir | 111 | foliage disease | All Tree Species |
| 10 | Douglas fir engraver beetle | Douglas fir | 112 | spruce ips | White spruce |
| 11 | Western balsam bark beetle | Subalpine fir | 113 | resin duct chalcid borer | Oak |
| 12 | Unidentified bark beetle | Softwoods | 114 | anthracnose like foliar disease | Bur oak |
| 13 | Pine engraver | Lodgepole pine | 115 | Dieback | All Tree Species |
| 14 | Pine engraver | Ponderosa pine | 116 | Mortality | All Tree Species |
| 15 | Ponderosa pine needle miner | Lodgepole pine | 117 | Discoloration | All Tree Species |
| 16 | Lodgepole pine needle miner | Ponderosa pine | 118 | Herbicide | All Tree Species |
| 17 | Jack pine budworm | Jack pine | 119 | Flagging | Quaking aspen |
| 18 | Spruce budworm, light defol. | Douglas fir | 120 | aspen tortrix | Quaking aspen |
| 19 | Spruce budworm, medium defol. | Douglas fir | 121 | Mansuetio blight | Quaking aspen |
| 20 | Spruce budworm, heavy defol. | Douglas fir | 122 | Dieback (ash) | Ash |
| 22 | Douglas fir tussock moth | Douglas fir | 201 | Dieback (cottonwood) | Cottonwood poplar |
| 23 | Pine butterfly | Ponderosa pine | 202 | Dieback (hardwood) | Hardwoods |
| 25 | Pine looper | Ponderosa pine | 204 | Dieback (oak) | Oak |
| 27 | Pine tortrix | Ponderosa pine | 210 | Mortality (old cottonwood) | Cottonwood poplar |
| 28 | Text caterpillars | Hardwoods | 211 | Mortality (eastern cedar) | Eastern Red Cedar |
| 29 | Leaf beetles | Hardwoods | 212 | Mortality (hardwood) | Hardwoods |
| 30 | Aspen defoliation | Quaking aspen | 213 | Mortality (spruce) | Spruce |
| 33 | Oak leaf roller | Hardwoods | 214 | Discoloration (ash) | Ash |
| 34 | Pine needle-sheath miner | Ponderosa pine | 221 | Discoloration (conifer) | Softwoods |
| 35 | Pine sawflies | Ponderosa pine | 222 | Discoloration (cottonwood) | Cottonwood poplar |
| 36 | Pine tussock moth | Ponderosa pine | 223 | Discoloration (eastern cedar) | Eastern Red Cedar |
| 37 | Cankers/dieback | Hardwoods | 224 | Discoloration (hardwood) | Hardwoods |
| 38 | Variable oak leaf caterpillar | Hardwoods | 225 | Discoloration (oak) | Oak |
| 39 | Unidentified defoliator | All Tree Species | 228 | Discoloration (spruce) | Spruce |
| 40 | Cottonwood Decline/Mortality | Softwoods | 230 | Herbicide (cottonwood) | Cottonwood poplar |
| 41 | Heterobasidion annosum (Fomes annosus) | Softwoods | 231 | Herbicide (eastern cedar) | Eastern Red Cedar |
| 42 | Armillaria ostroyae (Armillaria mellea) | Softwoods | 240 | Flagging (hardwood) | Hardwoods |
| 44 | Phomopsis | Softwoods | 250 | Unidentified defoliator (cottonwood) | Cottonwood poplar |
| 45 | Cytospora | All Tree Species | 251 | Unidentified defoliator (elm) | Elm |
| 46 | Western gall rust | Unknown | 252 | Unidentified defoliator (hardwood) | Hardwoods |
| 47 | Comandra rust | Unknown | 300 | Mortality (grape) | Pine |



How Aerial Surveys Are Conducted

Data represented on this map are based on aerial observations manually recorded onto a map. This procedure is considered both an art form and a form of scientific data collection, and is highly subjective. An observer only has a few seconds to recognize the color difference between healthy and damaged trees of different species; diagnose causal agents correctly; estimate intensity; delineate the extent of damage; and precisely record this information on a georeferenced map. Air turbulence, cloud shadows, distance from aircraft, haze, smoke, and observer experience can all affect the quality of the survey. These data summaries provide an estimate of conditions on the ground and may differ from estimates derived by other methods.

Aerial surveys provide information on the current status for many causal agents, and are important when examining insect activity trends by comparing historical and current survey data over large areas.

Overview surveys are a 'snap shot' in time and therefore may not be timed to accurately capture the true extent or severity of a particular disturbance activity. Aerial surveys can be thought of as the first stage in a multi-stage sampling design. Other remote sensing approaches, including aerial photography, electro-optical sensors, and specially designed aerial surveys with modified flight patterns, can be used to more accurately delineate the extent and severity of a particular disturbance agent. The preceding methods are often more costly than overview surveys, and are generally reserved to address situations of sufficient environmental, economic, or political importance.

Map Created: 11/24/2015
Projection: UTM NAD83 Zone 13
Author: J. Ross, USDA Forest Service
A data dictionary and digital copies of this map and the insect and disease data are available at: <http://www.fs.fed.us/r2/resources/fhm/aerialsurvey/>

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****DISCLAIMER****
Forest Health Protection (FHP) and its partners strive to maintain an accurate Aerial Detection Survey (ADS) Dataset, but due to the conditions under which the data are collected, FHP and its partners shall not be held responsible for missing or inaccurate data. ADS are not intended to replace more specific information. An accuracy assessment has not been done for this dataset; however, ground checks are completed in accordance with local and national guidelines <http://www.fs.fed.us/foresthealth/nationalqualityassurance.shtml>. Maps and data may be updated without notice. Please cite "USDA Forest Service, Forest Health Protection and its partners" as the source of this data in maps and publications.

Due to the nature of aerial surveys, the data on this map only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on this map because these agents are not detectable from aerial surveys. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and causal agent. Shaded areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead or defoliated.

The insect and disease data represented on this map are available digitally from the USDA Forest Service, Region Two Forest Health Management group. The cooperators reserve the right to correct, update, modify or replace GIS products. Using this map for purposes other than those for which it was intended may yield inaccurate or misleading results.