



PINYON PINE AND JUNIPER MORTALITY IN UTAH AND NEVADA: EXTENT, SEVERITY, and CAUSAL AGENTS

Brytten Steed¹, John Shaw², and Gail Durham³

¹FS Forest Health Protection-Ogden Field Office,
²FS Forest Inventory and Analysis, ³Nevada Division of Forestry



BACKGROUND :

In Utah (UT) and Nevada (NV), Forest Service, Forest Health Protection (FHP) staff has been working with other Forest Service staff groups and NV State Forestry to assess the extent and severity of pinyon pine and juniper tree mortality and to collect data on insect and disease agents. To meet survey objectives, FHP-Ogden Field Office signed a memorandum of understanding with Interior West Forest Inventory and Analysis (IWfia-Ogden) allowing FHP personnel to revisit a subset of IWfia locations.

Re-visitations of IWfia locations has the benefit of providing statistically valid data about mortality (extent and severity) over a several year period (2000-2005 for UT; 2004-2005 for NV) for a wide range of conditions in the pinyon-juniper (PJ) forest type. This subset of IWfia locations will serve as a permanent plot system for FHP to monitor PJ ecosystem changes, particularly those related to insect and disease agents, of interest to the land managers they serve.

OBJECTIVES:

FHP goals for this project are to monitor ecosystem changes in the pinyon-juniper forest type of Utah and Nevada, encompassing both the common pinyon (*Pinus edulis*) and the singleleaf pinyon (*P. monophylla*) (Fig. 1). Specific objectives include:

- monitor changes in tree mortality over time; describe pre- and post- mortality stand conditions
- evaluate relative importance of stand and site characteristics to mortality levels
- monitor activity of insect and disease agents, especially those causing mortality; gain better understanding of their prevalence, activity, and, in some cases, their identity
- monitor regeneration of the stand after the mortality event
- monitor the fate of mortality trees (e.g. snag or woody debris status)



Pinus edulis
(esp. Utah)



Pinus monophylla
(esp. Nevada)

Figure 1: Pinyon pine species included in study

In addition, this data should also allow IWfia to produce a more accurate assessment of mortality trends than is possible under the annual plot system by providing a statistically sound basis for projecting forward plots that were visited by IWfia under the annual inventory system and before the onset of the pinyon mortality event. Detailed documentation of insect and disease activity will also provide an independent assessment of causal factors that can be compared with assessments made by IWfia field crews. Collaboration between the NV Division of Forestry and FHP will further develop understanding of the various insect and disease agents.

METHODS:

Plots surveyed by FHP are a subset of IWfia locations described as 'pinyon-juniper woodland', with one condition class, and Forest Service or Bureau of Land Management ownership. These plots must also meet the minimum criteria of 35 ft²/acre total basal area, 35% of which is pinyon species. Although this may have excluded some of the poorer pinyon sites, it allowed us to focus on the pinyon component of this forest type.

In order to cover a wide range of PJ habitat types, 10 plots in each of eight ecoregions (Fig. 2) were selected at random from the list of plots that met the above criteria. Ecoregions that contain fewer than 10 potential plots and the two ecoregions along the California border were excluded. All annual panels from 2000 through 2005 are represented in this adjunct survey.

Identification of insect and diseases found on pinyons and junipers was based on literature and professional identification. Measures of pest activity were largely tallied in 10% categories for the affected portion of the tree. Attempts were made to use IWfia-P3 methodologies, but were modified as needed.

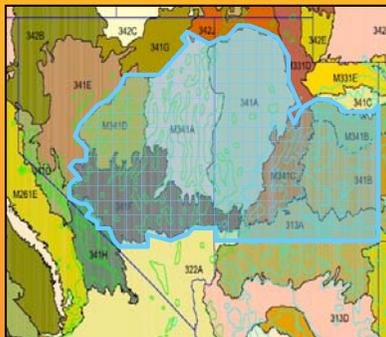
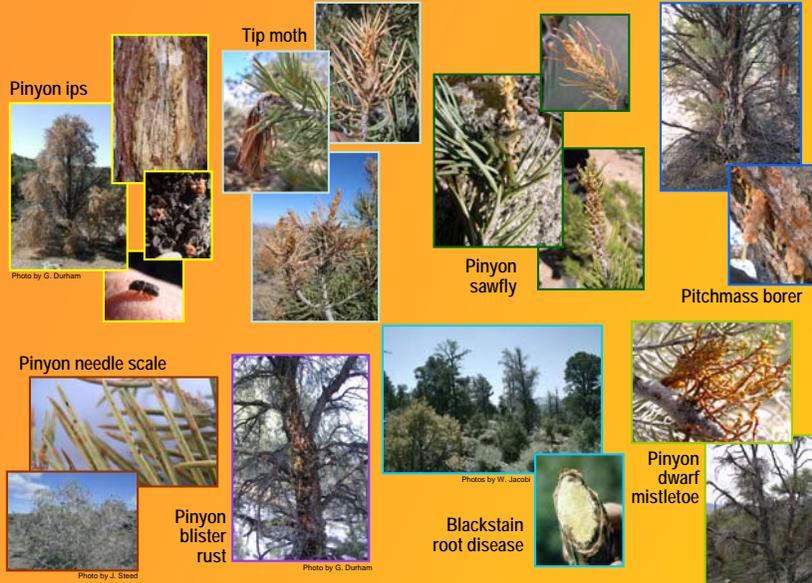


Figure 2: Ecoregions surveyed are highlighted in blue with pinyon ranges outlined in green and state boundaries in purple.

INSECT AND DISEASE AGENTS:

Over 80 IWfia plots were revisited in 2004-2005. However, full analyses are not yet available. Most of the mortality observed in pinyon pine was caused by pinyon ips, *Ips confusus*. However, several other insects and diseases were locally important. Significant activity by pinyon dwarf mistletoe (*Arceuthobium divaricatum*), black stain root disease (*Leptographium wageneri* var. *wageneri*), pinyon pitch mass borer (*Dioryctria ponderosae* and/or other *Dioryctria* and *Vespa* spp.), pinyon needle scale (*Matsucoccus acalyptus*), pinyon pine sawfly (*Neodiprion edulicolus*), tip moth (*Dioryctria albobivittella*) and pinyon blister rust (*Cronartium occidentale*) also contributed to tree mortality. Occasionally these other agents work singly, killing the tree directly, but more often they work in concert, with each agent causing cumulative damage or stress that eventually overcomes the tree's defenses. However, drought and higher than normal temperatures are still considered the principle stress factors of pinyon pines in this region.



Mortality of junipers, principally the dominant Utah juniper (*Juniperus osteosperma*) appears much lower than that of the pinyons, however, many insect and disease agents are active. Prevalent disease agents include a variety of *Gymnosporangium* rusts on the bole, branches, and leaves, as well as true mistletoe (*Phoradendron juniperinum*). Insect agents are less common but include wood borers (possibly *Styloxus bicolor* and *Trachykele blondeli*), cedar bark beetles (*Phloeosinus* spp.), and minor agents on the cones (the weevil *Anthonomus juniperinus*, *Trisetacus* spp. mites, and possibly *Megastigmus* spp.).



CONCLUSIONS:

Expected analyses of data for these 80 plots includes:

- 1) Determination of how annual panel locations measured prior to the mortality event might be projected forward to provide a more accurate assessment of mortality
- 2) Development of additional insect and disease identification guides for use by FIA and other field personnel. In some cases species will be added or status clarified
- 3) Determine the prevalence of various insects and diseases on pinyons and junipers in the region; compare site characteristics with presence and activity levels
- 4) Evaluate tree mortality in terms of site characteristics (hazard rating)
- 5) Many objectives require monitoring over time to detect change. We plan on repeating this adjunct survey in 2009-2010



All photos by B. Steed or the FHP field crew unless otherwise noted

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