Implementing Forest Ecosystem Health Projects on the Ground

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Abstract.—Understanding the functions and processes of ecosystems is critical before implementing forest ecosystem health projects on the landscape. Silvicultural treatments such as thinning, prescribed fire, and reforestation can simulate disturbance regimes and landscape patterns that have regulated forest ecosystems for centuries. As land managers we need to understand these processes, including historical disturbance regimes and then determine where on the landscape the forests are at high risk to uncharacteristic disturbances. By using our knowledge of ecosystem processes we are developing site specific management actions such as the Deadwood Ecosystem project. Management activities from the Deadwood EM project will provide for sustainable ecosystems in the future because these activities simulate disturbance regimes and landscape patterns of the past. Monitoring, adaptive management, and the human dimension must become key components of ecosystem management if we are to fulfill our role as land stewards and leaders in conservation biology.

INTRODUCTION

Insects in epidemic outbreaks and large catastrophic fires sweeping over the landscapes; these are symptoms of a forest health crisis. What are the causes underlying the symptoms? What steps are needed to address these symptoms and the cause? Where on the landscape are forests at the greatest risk? To implement forest ecosystem health on the ground we need to answer these questions.

In 1988, insect activity began to show sharp increases. The Forest responded by treating the symptom (dead trees) with salvage harvesting and hoping for rain. The insect activity continued and large intense fires became the normal summer occurrence (fig. 1). There was something else occurring on the landscape that treating the symptoms was not going to cure. In 1991, after more than 400,000 trees had been killed by insects (a four fold increase) (USDA Forest Pest Management, 1992), the Boise Forest initiated a Forest Health Strategy.

THE STRATEGY

The three part strategy focused on 1) Salvaging dead or dying trees to recover the economic value and provide minor forest health benefits (fuel reduction, fund reforestation); 2) thinning green stands using silviculture and prescribed fire to reduce tree densities and to increase the use of prescribed fire on the landscape to treat fuel buildup; and 3) collecting and sharing information on forest health (Morelan, et al. 1994). It became evident right from the start that forest health is more than "trees." The Forest shifted to Forest Ecosystem Health as recommended by a group of interested citizens, organizations, agencies, and partners during a policy analysis of the Forest Health Strategy.

The Boise NF now had a strategy for implementing forest ecosystem health. But, salvage was a short term activity to treat the symptoms not the cause. To provide for future ecological functioning

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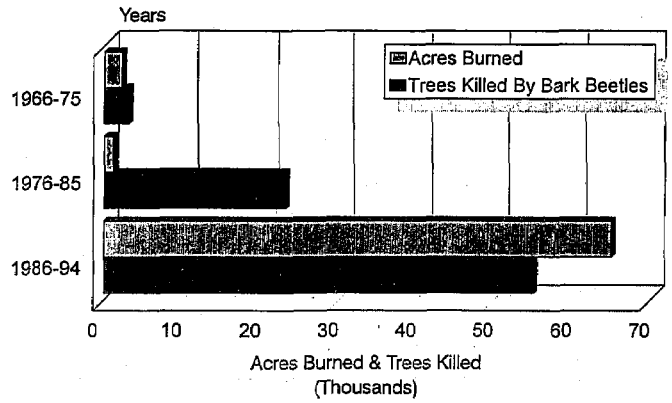

Figure 1.—Average Annual Acres Burned and Trees Killed. Boise National Forest 1966–1994.

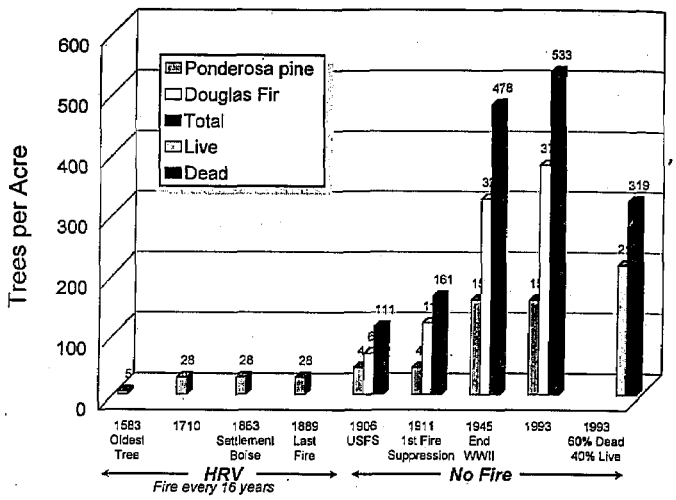

Figure 2.—Tree Densities and Species Composition in the Boise Basin.

of the landscape, the forest has begun concentrating on what remains on the site NOT what is removed. Long term measures such as thinning from below, prescribed fire, and adjustment of species composition are needed to restore resilience to the ponderosa pine dominated landscapes of the intermountain west and provide for wildlife habitat, aquatic systems, and recreational values. Also critical in our forest ecosystem health strategy is and has been collecting and sharing information. Information on fire frequency, intensity and severity demonstrated that changed fire regimes were an underlying caused to the forest ecosystem health symptoms. Studies into the historical range of variability (HRV) demonstrate that current species composition and stand density are significantly different than before settlement and current conditions present a risk to maintaining wildlife diversity (Erickson & Towell, 1994). Research information (Sloan, 1994) shows the tremendous increase in Douglas-fir trees and the subsequent mortality when the drought began in the dry Douglas-fir habitat types in the Boise Basin (fig. 2).

As silviculturists and land managers we need to understand the disturbance regimes that regulate ecosystems and cycle materials (nutrients). We must recognize that a one size approach to management does not fit all, management options in the ponderosa pine forest cover types may not be appropriate in the spruce-fir or cedar-hemlock types. Gathering and sharing information on disturbance regimes for all forest cover types will move us toward ecosystem management at the landscape level.

THE TREATMENTS

Where frequent low intensity (non-lethal) ground fires were the historical norm, the Boise Forest is experiencing uncharacteristic high intensity (lethal) fires across the landscape. Management options can reduce the risk and help sustain ecosystems.

During the Foothills fire of 1992, the Tiger Creek drainage displayed that thinning and prescribed fire when used together can significantly affect wildfire behavior. The Tiger Creek area was commercially thinned and shelterwood harvested in the late 80s and early 90s. A fuels treatment prescribed burn was completed in March of 1992. During the August foothills wildfire, flames came racing over the ridge into the upper end of Tiger Creek burning intensely (lethal). When the fire reached the thinned/prescribed burned area, it dropped to the ground and became a low-intensity (non-lethal) ground fire and suppression crews were able to stop the spread of the Foothills fire on that flank. Other areas such as the Sheep Creek drainage continued to burn as a high intensity (lethal) fire.

The Cottonwood prescribed fire was initiated in May of 1994, a maintenance burn in an area that was prescribed burned in the early 1980s. Originally planned for a few hundred acres, the size was increased to a landscape-based prescribed fire

(1,000 acres). The Star Gulch fire of August 1994 moved quickly and intensely south and east heading towards the Cottonwood Creek drainage. The Star Gulch fire came roaring over the ridge burning down slope as a high severity (lethal) fire until it came to the Cottonwood prescribed fire area (just on the other side of a 14' wide road). When the Star Gulch fire entered the prescribed fire area, it reburned the area as a low-intensity (non-lethal) ground fire and once it exited the prescribed burned area it regained intensity and became a lethal fire again as it continued east and south.

Cottonwood and Tiger Creek areas displayed that treatments can reduce the risk of uncharacteristic fires burning across the landscape. But, the Boise Forest still needed to know where to implement these effective tools and how much of the landscape was at risk to uncharacteristic high intensity wildfires. A mid-scale (forest level) hazard and risk assessment was initiated.

THE HAZARD/RISK ASSESSMENT

Information related to watersheds and subwatersheds was used to develop the Boise National Forest Hazard/Risk Assessment (Boise NF, 1995). This assessment is fire-based because wildfires burning outside HRV can directly affect more resources than most other disturbances (insects, disease, floods, windstorms, etc.). This assessment will estimate where high-intensity (lethal) wildfires burning outside HRV (uncharacteristic wildfires) will result in high levels of erosion, increased risk of extinction of important fish species, and will change late-successional habitat needed by old growth and other wildlife species.

Satellite imagery was used to determine forest cover types where ponderosa pine is or once was a major seral species and to assess current density compared to historical information. Moderated and high hazard subwatersheds are those where 25 percent or more of the area contains forest cover types where ponderosa pine is or was a major seral species and is moderate or dense (> 30 percent crown closure). Other submodels evaluate where lightning and human-caused fires have historically started since 1956. Subwatersheds which contained sections (640 acres) where more than 4 fires were noted are identified as moderate or high hazard. Erosion potential was used to evaluate sediment yield using landtypes and landtype associations. Subwatershed with potential sediment yields greater than 36 tons/square mile/year were rated moderate or high hazard. Wildlife persistence examines where large, extensive areas of late-successional forested habitat occurs that are uncharacteristic (outside HRV) and very susceptible to high intensity (lethal) wildfires. And fisheries persistence evaluates the risk of extinction over the next 100 years for indicator species such as Chinook salmon and bull trout, based on factors such as availability of "refuge" habitat, population size, growth and survival.

The hazard and risk assessment will be a tool for District personnel as they prioritize areas to further examine for potential ecosystem restoration projects, similar to the Deadwood Ecosystem project.

THE DEADWOOD ECOSYSTEM PROJECT AND LANDSCAPE ASSESSMENT

The Deadwood project is an integrated, systematic, interdisciplinary approach to ecosystem management on a broad, landscape scale. The Forest Supervisor and the District Ranger have challenged the Interdisciplinary Team to expand and validate ecosystem concepts and ideas using a holistic landscape approach, to assess ecosystem complexity, biological legacies, viability of the landscape to retain ecological values, comparison of historic-to-existing conditions, and resilience to environmental stresses. The concepts of analysis scales, ecological units, land system inventories, potential natural vegetation, fire regimes, historical range of variability, disturbance regimes, and hazard and risk from insects, disease, fire, and inherent erosion were incorporated into the project.

The Deadwood Landscape analysis area is the Deadwood River drainage, approximately 153,000 acres. The Deadwood River system is part of the Upper Columbia River Basis assessment and EIS. Linkages between these higher scale assessments and project scale assessments will be looked at as part of the Deadwood Landscape analysis process.

The Forest Vegetation Simulator (FVS [formerly Prognosis]) is used to determine current and future

structural stages (early successional, late successional, etc.) on the landscape. These stages are then mapped using GIS (Arc-info), producing a "picture" of how the landscape could change over time. This is used to display ecosystem sustainability. Hazard and risk assessments linked to these structural stages (current and future) are also mapable through the GIS system.

These structural stages and hazard and risk assessments are further linked to fire regime (fire group) which is determined by using Potential Natural Vegetation (Habitat types). With the linkages of fire regime, potential vegetation, structure, and hazard, the district can determine where prescribed fire should be used, where certain silvicultural treatments with prescribed fire should occur and where restorative treatments are needed to incorporate integrated Pest management opportunities over the entire landscape.

By viewing the changes that could occur over time on the landscape and knowing the current and historical conditions (figs. 3 and 4), it will be easier to assess the changing landscape effects on wildlife habitat, Threatened and Endangered species, sensitive plants, water quality, fish habitat, recreation, and societal values (including economics and jobs).

Proposed Actions will consider all 153,000 areas in the drainage over the next 10 years where treatments are necessary. The proposed actions range from no treatment to prescribed burning, thinning young stands (precommercial thinning), commercial thinning, selection harvests, and regeneration harvests (shelterwood and limited patch clear cutting). All areas of the Deadwood project will have a hazard and risk assessment completed as part of the analysis. Looking at the current vegetation, as well as at future vegetation

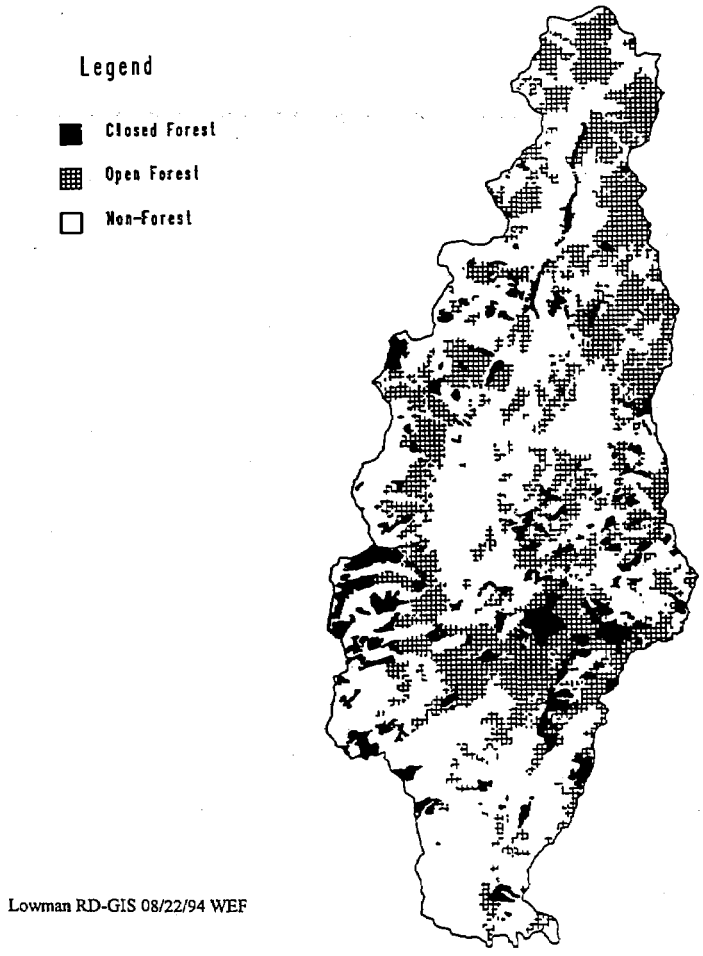

Figure 3.—Historical Landscape Patterns, Pre-1850.

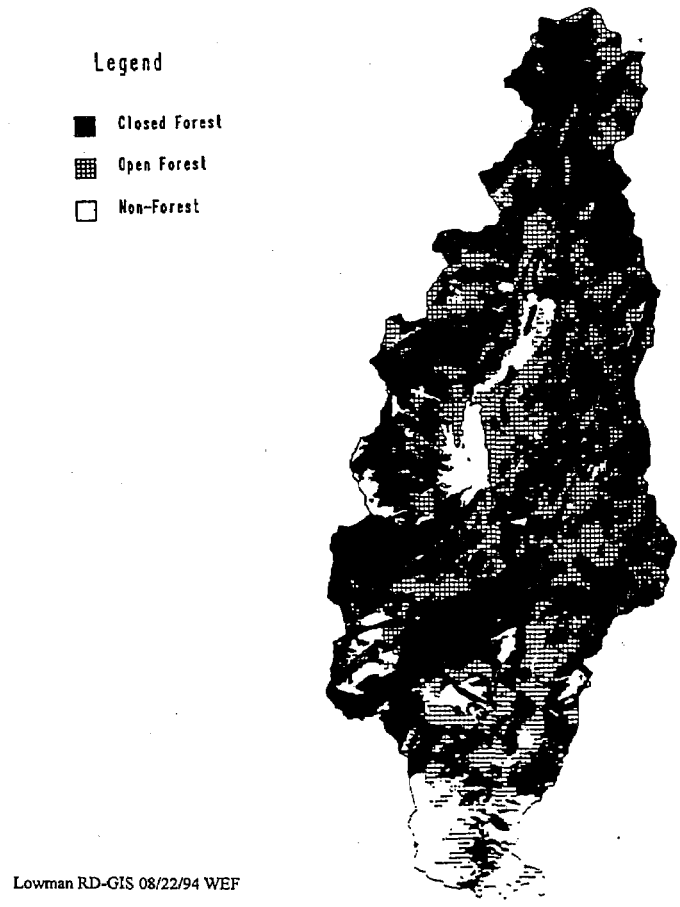

Figure 4.—Existing Landscape Patterns, 1994.

(simulated using growth models) and the hazard and risks associated with the landscape.

The Deadwood Ecosystem project and landscape assessment will also contain extensive monitoring so that adjustments to future treatments will be based on the knowledge we gain from current treatment a process known as adaptive management.

ADAPTIVE MANAGEMENT

Implementing Forest Ecosystem health doesn't end with assessments, proposed actions, or management activities. We need to assure that appropriate monitoring is completed, learn from the monitoring, and then adapt future management activities based on what we've learned. The success of forest ecosystem health will depend on how successful we are at implementing and the information we've gained with our customers. Ecosystem management as we know is more than ecological functionings, it also has a human dimension (economic and social).

THE HUMAN DIMENSION

As more people recreate on national forest land, build home on private lands adjacent to national forests, continue to use wood products, and enjoy the amenity values of fish and wildlife, we must continue to collect and most importantly, share information about forest ecosystems. Without public support the most ecologically sound, the highest resilient, or the lowest risk management option for sustaining ecosystem may not be implemented. We have the tools, we can implement them on the ground to provide for sustainable ecosystems, but private citizens, interest groups, and government employees must work together to provide sustainable healthy ecosystem for future generations.

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