

Revitalizing Ecosystem Processes and Services Following Fire



Norman L. Christensen, Jr.

Professor of Ecology

Duke University Nicholas School of the Environment

President

Ecological Society of America

Fires of different severities, frequencies and sizes are a natural process in most grassland, shrubland and forest ecosystems.

- Different ecosystems are characterized by different fire regimes.
 - Fire regime determined by:
 - Nature and growth of fuels
 - Climate
 - Sources of ignition
 - Landscape features
- Plants and animals within such ecosystems display a wide array of adaptations to fire.
 - Often, they not only withstand fire, they depend on it.
 - Plants and animals native to an ecosystem are adapted to the historic range of variation (HRV) in the fire regime of that ecosystem
- Plant and animal populations respond to fires within the HRV in ways that quickly restore ecosystem functions and services.



Human activities have altered each of the 4 factors that influence fire behavior, producing in some places historically atypical fire regimes.

- Fires more frequent, larger or more severe than the HRV may:
 - Impair an ecosystem's capacity for self-restoration
 - Damage key ecosystem processes and services such as:
 - nutrient cycles
 - hydrologic flows
 - sediment retention
 - regeneration of plant and animal populations
- Although the frequency of non-HRV fires has certainly increased, most fires occur within the HRV for the ecosystems within which they occur.
- In a world of changing climates and altered landscapes, natural events within the HRV may produce "un-natural" or undesirable outcomes.
 - Retarded regeneration
 - Altered hydrology
 - Invasive species



Where fires burn within the HRV {i.e., most fires}, post-fire interventions are generally unnecessary and can be counter-productive.

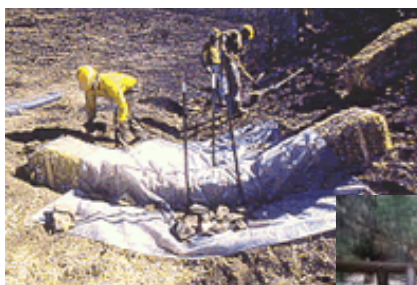
- Natural plant regeneration is usually quite rapid often from seeds in soil or released from closed cones.
- Fire consumes only about 10-15% of most woody debris – what remains provides:
 - Reservoir of organic matter and nutrients
 - Barriers to water flow and sediment movement
 - Plant and animal habitat that accelerates regrowth
- Specific areas of concern may arise at wildland urban interface where post-fire interventions may be indicated to mitigate:
 - Sediment movement
 - Manage water flows
- However, the consequences of such actions are often uncertain and the results may be opposite of what was intended.



Where fires burn outside the HRV, interventions such as sediment and hydrologic barriers, seeding, or other measures may be indicated.

General rules for such interventions:

- Don't just do something to be doing something!
- Understand short-term versus long-term tradeoffs.
- Whenever possible, imitate nature.
- Adaptive management is critical.



Post-fire salvage operations such as logging have significant costs in terms of ecosystem processes and services

- Standing and fallen dead trees play important roles in post-fire regeneration, including:
 - Hydrologic and sediment retention
 - Nutrient reservoirs
 - Habitat for wildlife
- Such material does not substantially increase future fire risk – indeed, the opposite is true.
- Management goals are critical!!!
- Where central management goals are conservation of diversity, critical ecosystem services, or multiple uses, costs of salvage logging far outweigh any short-term benefit.
 - This is true of most public lands
- Where central management goals are fiber production or financial gain – benefit/cost ratio depends on the specifics of the environment.

