

Integrated Analysis for Management of Fire and Fuels, Terrestrial and Aquatic Ecological Processes, and Conservation of Sensitive Aquatic Species



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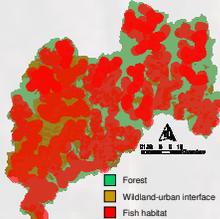
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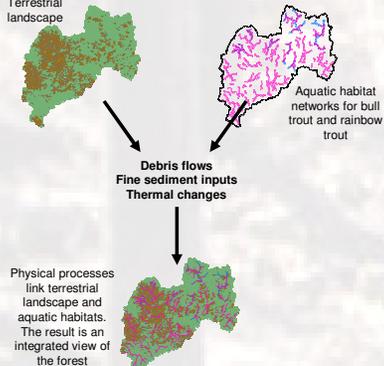
INTRODUCTION

The philosophy of multiple use means that forest managers have to contend with myriad threats to resident flora and fauna and the habitats in which they reside. Threats have the potential to affect both the terrestrial component of a forest ecosystem and the aquatic habitats that wind through it. Forest stand management has traditionally been viewed as conflicting with the conservation of sensitive aquatic species and areas containing these species (red, below) have resulted in direct conflict between forest and fuels management and aquatic conservation. At the heart of this conflict is the question:



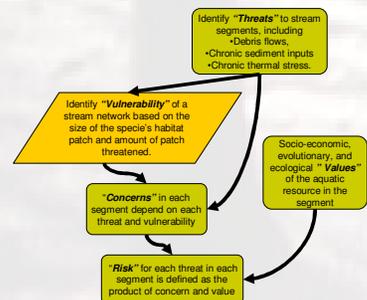
We believe an integration of forest and aquatic management is possible through the invocation of the physical linkage between the two habitats. In this poster we outline our analysis of three threats to sensitive aquatic habitats that arise from physical processes in the forest (see below). Our study area is the South Fork of the Boise River, located in southern Idaho. The watershed contains bull trout (*Salvelinus confluentus*) and inland rainbow trout (*Oncorhynchus mykiss*). The former species is listed as threatened under the U. S. Endangered Species Act.

Terrestrial landscape



Forest habitat and the aquatic habitats that wind through them are linked by physical processes such as debris flows and sediment deposition and transport. Additionally, the thermal patterns of a stream are greatly influenced by riparian vegetation which is susceptible to alteration by fire. Therefore, we are using the distribution of sensitive aquatic habitat (networks) as a filter for identifying areas where terrestrial and aquatic habitat management could return forest ecosystems to a condition in which wildland fire use and its after-effects could pose the least risk. Our hypothesis is that by examining the distribution of these physical threats to stream habitat we can identify areas where

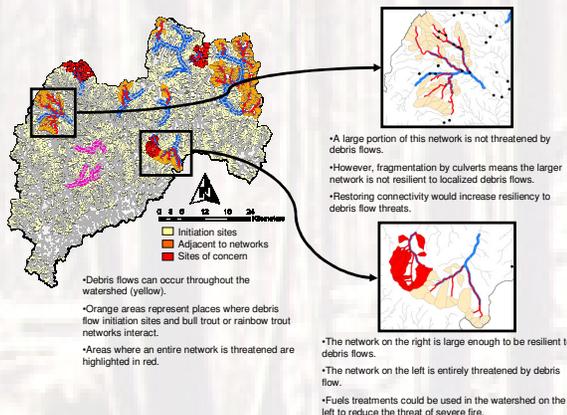
1. Wildland fire could be used to maintain healthy stand structure and disturbance regime.
2. Areas where restoration is needed to facilitate wildland fire use
3. Areas where conflict or human influence necessitate engineered solutions to aquatic or terrestrial management issues.



Bulking debris flows



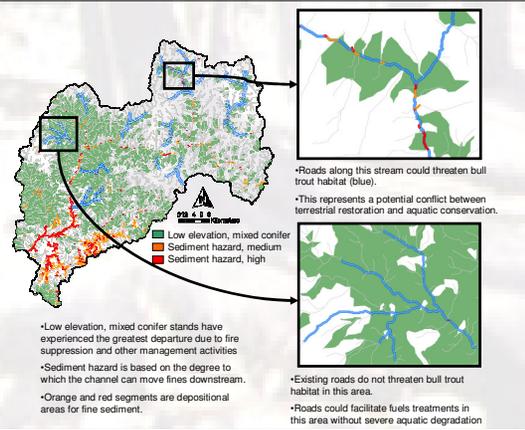
Debris flows can lead to the catastrophic reorganization of a stream channel and have a high probability of occurring following a fire.



Chronic sediment inputs



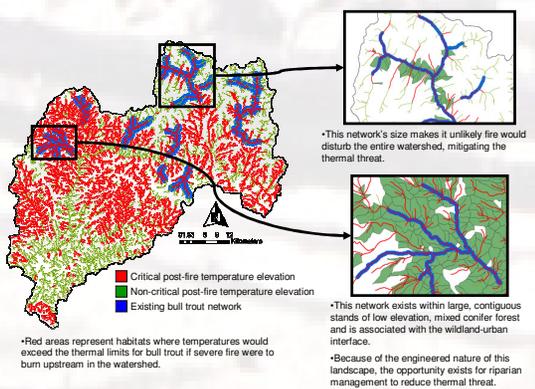
Sediment inputs from road networks can threaten spawning and rearing habitat for stream fishes.



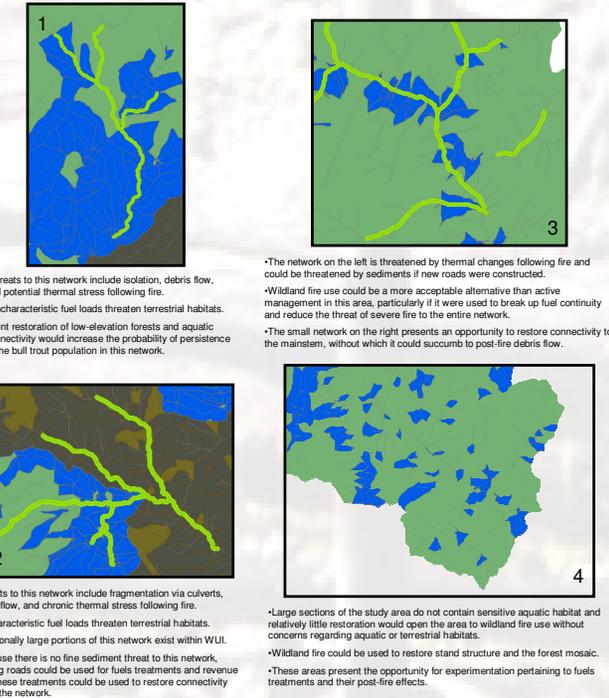
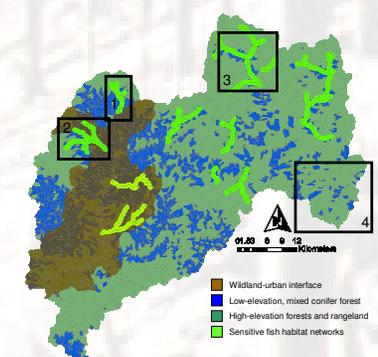
Chronic thermal stress



Severe fire in the riparian zone can elevate stream temperatures so that a stream is no longer suitable habitat for sensitive species like bull trout.



An Integrated View of the Forest



We believe that the linkage between terrestrial and aquatic habitats is a natural framework for identifying areas of convergent management opportunity and conflict. The example above illustrates how the forest can be classified into three types of habitat:

- Maintenance or conservation habitats are relatively unperturbed areas where a natural fire regime could be tolerated.
- Engineered or managed habitats are areas where human influence means that wildland fire would probably never be tolerated.
- Restoration habitats present the opportunity for terrestrial, aquatic, or joint restoration of habitat conditions to a state where wildland fire use could be an integral component of forest management.

Ultimately our approach will involve the integration of detailed information on stand structure and probable fire severity in order to develop a more accurate depiction of the distribution of conservation, engineered, and restoration habitats.

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