



THE  
WILDERNESS  
SOCIETY

ECOLOGY AND  
ECONOMICS  
RESEARCH  
DEPARTMENT

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Our mission:

To protect wilderness  
and to inspire  
Americans to care for  
our wild places.

## **FIRE AND FUELS RESTORATION PRIORITY SYSTEM:**

### **USING MAPPING AND ANALYSIS TO HELP PRIORITIZE RESTORATION PROJECTS**



Photo by John McCarthy

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Photo by John McCarthy

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# INTRODUCTION TO THE FIRE AND FUELS RESTORATION PRIORITY SYSTEM

## BACKGROUND

In the fall of 2007, a diverse group of 30 Montanans released a set of “Guiding Principles” that will help shape future restoration work on National Forest lands. The 13 restoration principles, [www.montanarestoration.org](http://www.montanarestoration.org), were developed by consensus and are based on science and community needs while being designed to produce better, more efficient projects on the ground. Several pilot projects, two on the Lolo National Forest and one on the Bitterroot National Forest, are now underway. The demonstration projects include Forest-level Restoration Committees, made up of diverse and knowledgeable community stakeholders that are working alongside land managers to select, design, and monitor restoration projects. Public and stakeholder engagement at all stages of project development is a key to the restoration process.

## SUMMARY

Identifying the most appropriate areas for forest restoration requires the consideration of numerous factors while also considering the impact on the greater landscape. Unfortunately there is currently no systematic, landscape scale approach to prioritizing forest restoration in the Northern Rockies other than the very coarse-scale USFS Integrated Restoration Priority System. The absence of a high-resolution prioritization system creates problems when allocating funds, determining the most appropriate sites for restoration, or defending the location of a selected project.

In response, The Wilderness Society (a member of the Montana Forest Restoration Committee) has developed a tool that helps identify priority areas for forest and fire restoration efforts at the forest, district and watershed level. The tool uses a geographic information system (GIS) supplied with Forest Service data layers and provides a gradient of possible candidate stands across a given area or landscape that are ranked from low to high priority. The intent of this initial application is to prioritize

the restoration of natural conditions in forests notably altered by previous stand management and years of fire suppression.

The tool will potentially serve as an integral component of helping identify sites appropriate for restoration and should have a number of benefits:

- A systematic and transparent approach and record to prioritizing restoration establishes credibility and provides a basis from which the choice of restoration project can be defended;
- An appropriately devised priority system will improve the potential for the survival of key species and legacy individuals (e.g. large old growth trees);
- Consideration of how projects could coalesce across a landscape because isolated restored forests will have little large scale ecological significance;
- Restoration of forests should be conducted with goal of creating the maximal acreage of contiguous landscape expressing natural structure, function and process;
- Maximize use of limited federal funds;
- Promote community discussion of the priorities used to select restoration projects.

Importantly, the central intent of this prioritization tool is not to select any individual stand for restoration, but to serve as an informative, transparent and coherent means of identifying candidate stands for restoration. This prioritization tool is complementary to, and serves in direct agreement with, the Montana Restoration Principles. The tool is also complementary to the USFS Integrated Restoration Priority System (IRPS) but is intended to function on a much finer scale. This draft tool is still in developmental stages and is absolutely open to suggestions and improvements. The tool is available as a companion to this summary in an ARC-GIS based format.

## **LOCAL AND LANDSCAPE ANALYSIS**

So far, we have applied this concept at three scales: forest, district and watershed (see Figures 1 and 2). Specifically, we analyzed the Lolo National Forest, the Seeley Lake Ranger District, and the Monture Creek watershed within the Seeley Lake Ranger District. These locations were chosen to work in concert with the Lolo Restoration Working Group in its effort to identify appropriate sites for restoration efforts in the near future.

## HOW THE TOOL SETS PRIORITIES

This “tool” does not have a single button to push but rather functions as a sequence of logical GIS filters that eliminate those stands that are clearly low priority or are inappropriate for forest restoration. This does not mean that a stand eliminated by this process should not undergo some form of restoration; they are simply not regarded as priority sites for restoring resilience to wildland fire and restoring historical forest condition in mature stands. What the tool does accomplish is to identify *priority* areas for restoration across a landscape.

The following are filters used to remove stands not appropriate for restoration treatments:

### 1. **Infrequent fire regimes**

All low frequency, high severity fire types are removed (as these stands naturally burn catastrophically and natural fire regimes cannot be restored through silvicultural treatments) leaving only pure and mixed ponderosa pine, Douglas-fir, and western larch stand types.

### 2. **Fire History**

All stands exposed to fire within the last 20 years are removed as conditions should now exist in these stands that would allow natural fire regimes to be re-established without additional fuel or stand treatments

### 3. **Stand Age**

All stands that are NOT medium or large stand types are removed (e.g. sapling or herbaceous as at this stage stands with mature, large trees should be protected by removing ladder fuels and reintroducing fire) and secondarily all medium aged stand types are removed.

### 4. **Land Ownership and Designation**

All non-federal lands, roadless areas, wilderness areas, and recommended wilderness lands are removed leaving only federal managed stands.

### 5. **Accessibility**

All stands NOT within 300 meters of an established road are removed. This distance was chosen in keeping with grizzly bear habitat requirements and as a realistic distance for timber management without the need for building any new roads.

### 6. **Additional Overlays**

Data such as elk habitat, lynx habitat, soils, stand density, slope and aspect, haul distances, and other data layers can be added at the end to help inform the priority selections made by the tool

## LIMITATIONS

Available landscape data has several limitations that must be taken into consideration. Each data layer purporting to represent vegetative cover, canopy closure, size and density classes, or understory is subject to the methods, source, scale and date of its collection. Conditions on the ground, for example, inevitably change after each survey. Because of these limitations, the tool should be used only to help identify *candidate* sites for further field examination to determine which treatment types might be required to appropriately restore a more natural stand structure.

In most cases, we used the same sequence of data layers supplied from the Lolo National Forest to prioritize restoration candidates. Except in the Monture Watershed analysis, where we used locally available stand exam data, we relied on the USFS Region 1 VMAP land cover classification. We have been assured that this represents the best available vegetation information to provide wall-to-wall coverage across the greater Lolo landscape. Across most Forest Service lands, it is reasonable to assume that there are similar stand type, age, and fire history maps. As such, we presume these methods can be applied to most western National Forests and BLM districts; however, there will be cases where data accessibility limits the type and extent of analyses that might be performed.

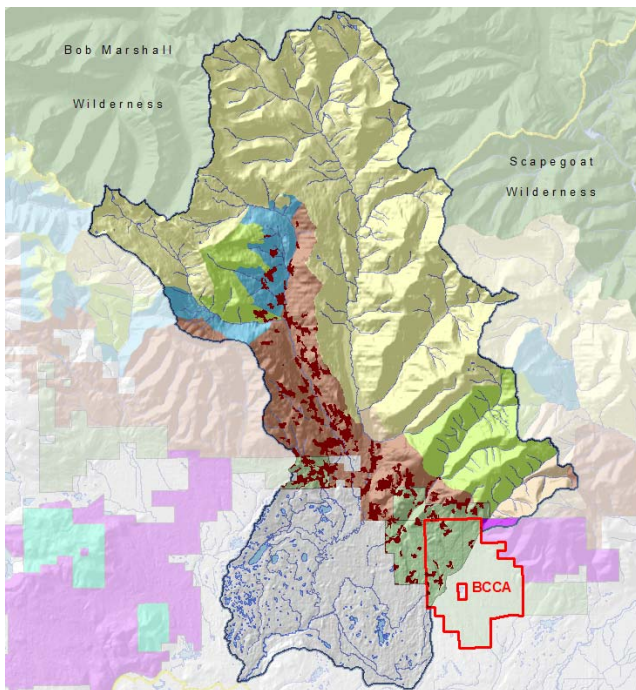


Figure 1. Priority candidate stands (maroon polygons) for forest restoration within the Monture Creek Watershed on the Seeley Lake Ranger District.

## **MONTURE CREEK WATERSHED EXAMPLE**

Using the Monture Creek Watershed as an example, the tool allowed us to reduce the total land area under consideration from 119,125 acres to less than 4,000 acres, a much more manageable starting point. From here we overlay habitat layers to determine if we need to filter off additional stands the management of which might serve as to reduce habitat quality. Conversely, if habitat is improved by the reintroduction of fire, then we can be more resolute in the decision to prioritize those stands. For example, winter elk habitat falls upon about 12 percent of the remaining priority stands, since restoration efforts would potentially improve the condition of this habitat, the 9 stands located in this portion of the watershed might gain additional priority ranking.

Road restoration or reconstruction efforts might also help guide priority designations. For example, the Seeley Ranger District currently has several road segments slated for obliteration. Several priority restoration stands exist within the 300 foot distance from these road segments. From a simple logistical perspective, it might make sense to rank this stands highest in priority to allow for their restoration prior to obliteration of the road segment.

Figure 2 demonstrates the output of the tool for the Seeley Lake District as a whole. From this perspective, it is clear that the Monture Creek watershed is a highly suitable location for restoration efforts.

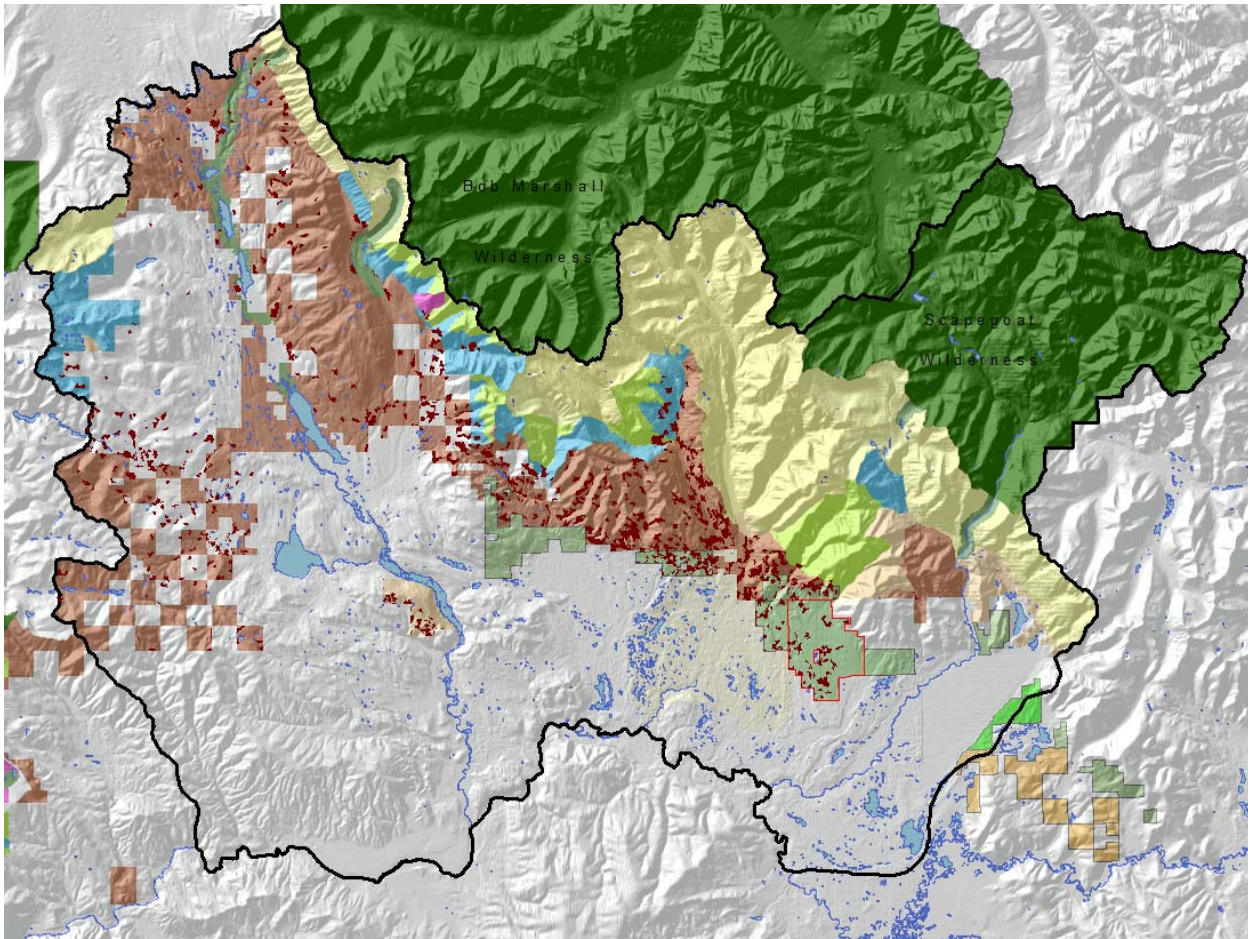


Figure 2. Priority candidate stands (maroon polygons) within the Seeley Lake Ranger District.

## CONCLUSION AND FUTURE APPLICATIONS

In all cases, the output yielded from this tool serves only to inform an evaluation level, following which, during the planning process, the stands must be field surveyed and verified for suitability for restorative activities. As indicated above, the restoration prioritization tool should be complementary to the IRPS developed by the USFS. The IRPS is intended for use at a much broader scale and focuses on municipal watersheds, fuel reduction, and fisheries. By comparison, our model focuses more on ecological attributes (vegetation type, condition and fire history) and it is no surprise that there is limited overlap with IRPS in the Seeley Lake District.

The restoration tool will also allow us to look at a landscape and envision what would be an ideal accomplishment of restoration activities across a 10, 50 or 100 year planning window. Such an ability

will greatly improve the likelihood of creating connected, naturally functioning landscapes that better afford the migration and existence (habitat, foraging, denning) of wildlife within the region.

It is our hope that this tool might be used in the evaluation and planning process of establishing restoration priorities and, in the long-run, lead to better informed decisions that improve efficiency while increasing the connectivity between naturally functioning upper elevation wilderness landscapes and lower elevation managed and private lands. It is our intention to extend the application of this tool to address the prioritization of restoration of degraded second growth stands that lack large, mature trees and to the prioritization of road restoration efforts with a focus on increasing landscape connectivity. These alternative prioritization modules will require a different set of data layers and filters for the identification of candidate stands or roads.

# A GIS USER GUIDE TO THE FIRE AND FUELS RESTORATION PRIORITY SYSTEM FOR LOLO NATIONAL FOREST

For the benefit of land managers across the Lolo National Forest, we have bundled the results of our assessment of priorities for fire and fuels management with several relevant GIS datasets in a user-friendly interface. The purpose of this GIS User Guide is to render these results as accessible as possible for restoration planners, both on the Lolo National Forest and beyond. As with any GIS tool, this guide assumes a basic knowledge of standard GIS software.

**The data and background information needed to do the analysis can be obtained through the following options:**

- Download the files from <ftp://ftpweb.tws.org>
- Request a CD of the files by e-mailing Bo Wilmer ([bo\\_wilmer@tws.org](mailto:bo_wilmer@tws.org)) or Dr. Tom DeLuca ([tom\\_deluca@tws.org](mailto:tom_deluca@tws.org)).

Materials include:

1. *Fire and Fuels Restoration Priority System: Using Mapping and Analysis to Help Prioritize Restoration Projects*
2. Restore.mxd – ARCGIS Map Document
3. Data Folder – Contains GIS background/reference datasets
  - TWS Filter Results for Restoration Priorities:
    - One, Two, Three, Four, Five and Six
  - TWS Community Fire Planning Zone (CFPZ)
  - Additional Reference Layers:
    - Lolo National Forest Boundary (Lolo NF)
    - Local Streets (Clipped from ARCDATA Streetmap)
    - Lolo Ranger Districts (Lolo NF)
    - Lakes (Lolo NF)
    - Local Rivers (ARCDATA Streetmap)
    - 30 Meter Hillshade (USGS –NED)

Inventoried Roadless Areas (Forest Service)  
Lolo National Forest Management Prescriptions (Lolo NF)  
Designated Wilderness (National Atlas)  
Federal Land (National Atlas)

#### 4. *Targeting the Community Fire Planning Zone: Mapping Matters*

Once the file “Restore.mxd” is uploaded in your computer, double click on it. When the ARCGIS software opens, you’ll see three landscapes available to you as data frames. They are, from coarsest to finest-scale, the *Lolo National Forest*, the *Seeley Lake Ranger District*, and the *Monture Creek Watershed*. Within each of these landscapes, you’ll find data layers that represent each step of the GIS filtering process which TWS developed to help identify the highest priority candidates for fuel reduction and fire restoration.

As explained previously, the GIS data available for the Lolo National Forest allowed our filtering process to be characterized according to six discrete steps. Thus, each landscape contains six data layers named for each of the six analytical filters which are called steps:

- **STEP 1 :** Represents frequent fire forest types (Ponderosa Pine/Larch/Douglas Fir)
- **STEP 2:** Retains large and medium size classes of the frequent fire forest types.
- **STEP 3:** Retains only the large size class of the frequent fire forest types.
- **STEP 4:** Step four eliminates recently burned stands (1980 – present)
- **STEP 5:** Withdraws less conducive, or incompatible, land management prescriptions, specifically Wilderness Areas (proposed or recommended), Inventoried Roadless Areas and Private Land.
- **STEP 6:** Stands that are greater than 300 meters from a road are eliminated.

The resulting map (see Figure 1) represents the final map of priority candidates for field examination to determine which types of fuels reduction and prescribed fire may be necessary to restore natural fire regimes.

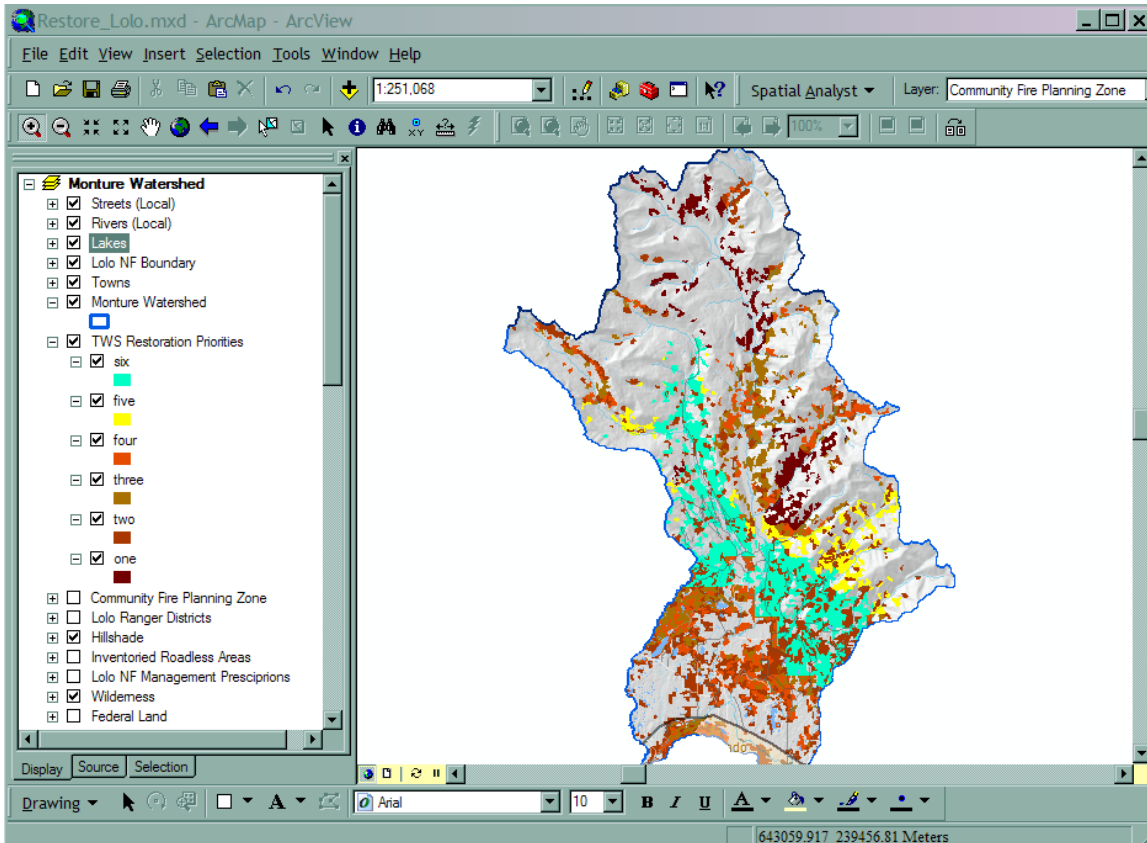


Figure 1. Example output of priority portions of the landscape within the Monture watershed on the Lolo National Forest.

In addition to the sequence of filters that are provided and exhibited through this GIS interface, we have provided an additional dataset which has proven useful across most landscapes, The Wilderness Society's *Community Fire Planning Zone (CFPZ)*. The CFPZ represents wildland fuels within ½ mile of communities, defined by Congress as housing densities exceeding 1 house per 40 acres, based on Census 2000 data. For more information about the CFPZ, including methods for its creation and implications of results, please refer to *Targeting the Community Fire Planning Zone: Mapping Matters*.