MINIMUM ROADS ANALYSIS & AQUATIC RESOURCES

Wenatchee-Okanagon National Forest

Earth Systems Institute

NetMap

Community Digital Watersheds & Shared Analysis Tools (www.netmaptools.org)

1.0 What is a Minimum Roads Analysis?

All national forests are required to identify the minimum road system required for protection, management and use of NFS lands. Roads that are no longer needed to meet forest resource management objectives need to be identified for decommissioning or considered for other uses (36 CFR 212.5(b)). This directive is driven, in part, by fiscal concerns about road maintenance.

Fig. 1. Many watersheds contain extensive road networks built from the 1960s through the 1990s in support of timber harvest programs among other uses.

2.0 NetMap's Road Tools

NetMap addresses roads in several unique ways. Channel-segment scale drainage wings (~100 m) allow information on hillslopes (such as roads but also erosion potential, fire risk etc.) to be evaluated in much greater detail (Fig. 2 A).

Roads in NetMap are broken at pixel scale boundaries so that small road segments can be evaluated for numerous attributes including road drainage diversion potential, road instability and surface erosion as well as drainage density (Fig. 2 B)

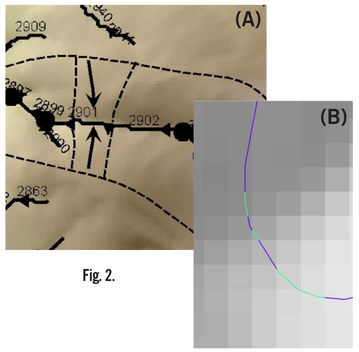


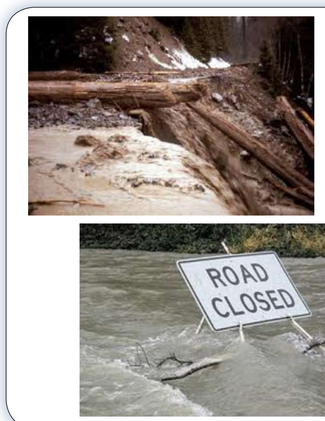
Fig. 2.

The Wenatchee-Okanagon National Forest conducted a minimum roads analysis in the Peshastin watershed. The minimum roads analysis required the following information:

1. Fish habitat use and habitat potential,
2. Road density, stream segment scale,
3. Habitat length above each road crossing,
4. Roads in floodplains and
5. Density of road-stream crossings per subbasin.

3.0 Climate Change & Minimum Roads

The Wenatchee-Okanagon NF's minimum roads analysis occurred prior to the availability of downscaled Global Climate Model predictions from University of Washington's Climate Impact Group. The forest has suffered several unusual rain-on-snow events since the late 1990s that created widespread road-related damage. Hence, the minimum roads analysis qualitatively considered climate change (e.g., an additional driver of road related problems).



4.0 Peshastin Watershed's Fisheries

The national forest used its fish distribution layer to identify habitat use (Fig. 3 A). They also applied NetMap to create a quantitative ranking of habitat potential for steelhead (Fig. 3 B).

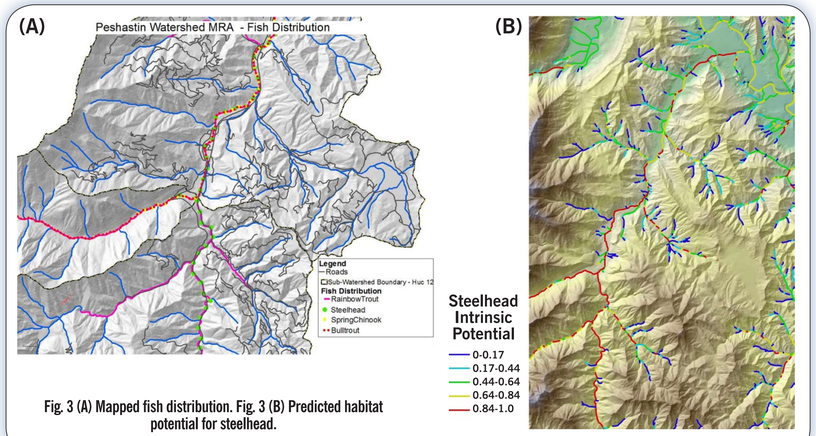


Fig. 3 (A) Mapped fish distribution. Fig. 3 (B) Predicted habitat potential for steelhead.

5.0 Road Density

Road density is often used to measure overall watershed condition and studies have found that road densities between 1.7 and 4.7 miles/ square mile negatively effect fish habitat (Quigley and Arbelbide 1997).

The upper Peshastin watershed has a road density of 3 mi/mi2 with 554 road-stream crossings; many hillsides have densities significantly in excess of 3.

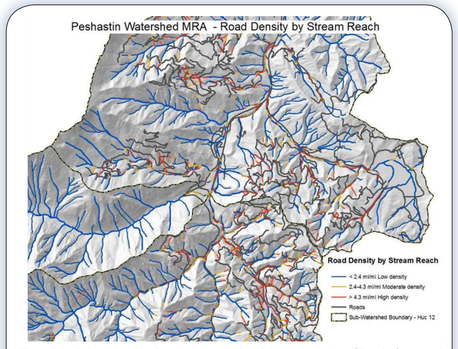


Fig. 4 Road density calculated at the scale of drainage wings (Fig. 2 A) ranged from less than 2.4 mi/mi2 to greater than 4.3 mi/mi2. Many sub basins have very high road densities that overlap areas of high habitat quality (Fig. 3 B).

6.0 Fish Habitat Above Road Crossings

As part of its minimum roads analysis, the Wenatchee-Okanagon NF mapped the total distance of fish habitat length and quality above each road-stream crossing using NetMap.

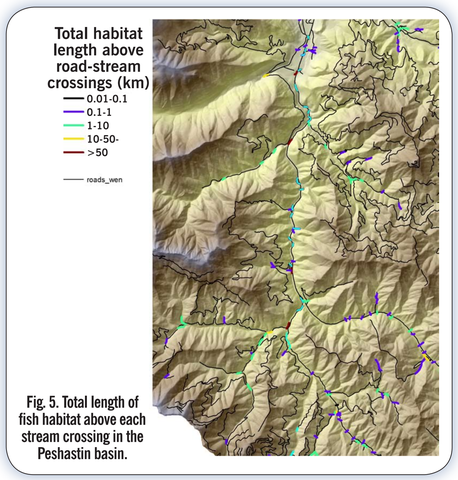


Fig. 5. Total length of fish habitat above each stream crossing in the Peshastin basin.

7.0 Road-Stream Crossing Density

The density of road-stream crossings can be used as a index of cumulative effects in a watershed. NetMap was used to evaluate the sub basin scale variation in the density of road stream crossings (Fig. 6). Some of the highest road-stream crossing densities in the Wenatchee basin occur in the Peshastin sub basin.

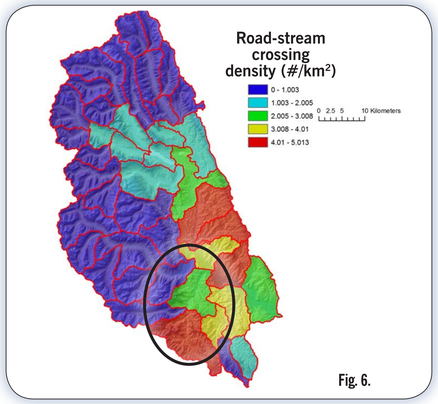


Fig. 6.

8.0 Roads in Floodplains

Mapping roads in floodplains using NetMap was an important component of the analysis (not shown).

9.0 Minimum Roads Analysis: Results

Wenatchee-Okanagon NF's minimum roads analysis is ongoing. Data from the Peshastin watershed has been compiled within a spreadsheet that ranks the NetMap data outputs along with field survey notes from 2009 and operational maintenance categories.

Eliminating roads in national forests is a difficult and emotionally charged endeavor. Development of a formula to integrate analysis results with road maintenance budgets and societal expectations is ongoing.

In summary, it is important to apply a consistent methodology across a forest, such as the one illustrated here, so that internal and external reviewers can evaluate the types of information that was used in the roads analysis.

Peshastin Minimum Roads

ID	BMP	EMP	SEG_LENGTH	JURISDICTION	OBJ_MAINT	OPER_MAINT	SURFACE_TYPE	Proximity (% Road in Floodplain)	Road Surface Erosion Potential	Road/Stream Connectivity roads w/ drainage area ≥1 mi/sq mi	2009 Road Survey Comments
7200000	3.1	8.1	5	FOREST	3 - CARS	2 - HIGH	CRUSHED	0.44	M	x	
7200010	0	0.05	0.05	PRIVATE	2 - HIGH	2 - HIGH	CRUSHED			x	
7200010	0.05	0.2	0.15	FOREST	2 - HIGH	2 - HIGH	CRUSHED			x	
7200012	0	0.15	0.15	FOREST	2 - HIGH	2 - HIGH	NATIVE				
7200075	0.03	0.18	0.15	FOREST	1 - CLOSED	1 - CLOSED	NATIVE				
7200075	0	0.03	0.03	PRIVATE	1 - CLOSED	1 - CLOSED	NATIVE				
7200078	0	0.03	0.03	FOREST	1 - CLOSED	1 - CLOSED	NATIVE				
7200100	0	0.6	0.6	FS - FOREST	1 - CLOSED	1 - CLOSED	NAT - NATIVE	0.41	M	x	Rills and ruts on road surface. At-risk road surface drainage. Connected to stream network. Decom FY10
7200101	0	0.2	0.2	FOREST	1 - CLOSED	1 - CLOSED	NATIVE	0.31		x	Decom FY10
7200105	0	0.02	0.02	FOREST	1 - CLOSED	1 - CLOSED	NATIVE	0.33			Decom FY10

Refer to NetMap Technical Help for relevant citations.

Contact Earth Systems Institute at: www.earthsystems.net or www.netmaptools.org