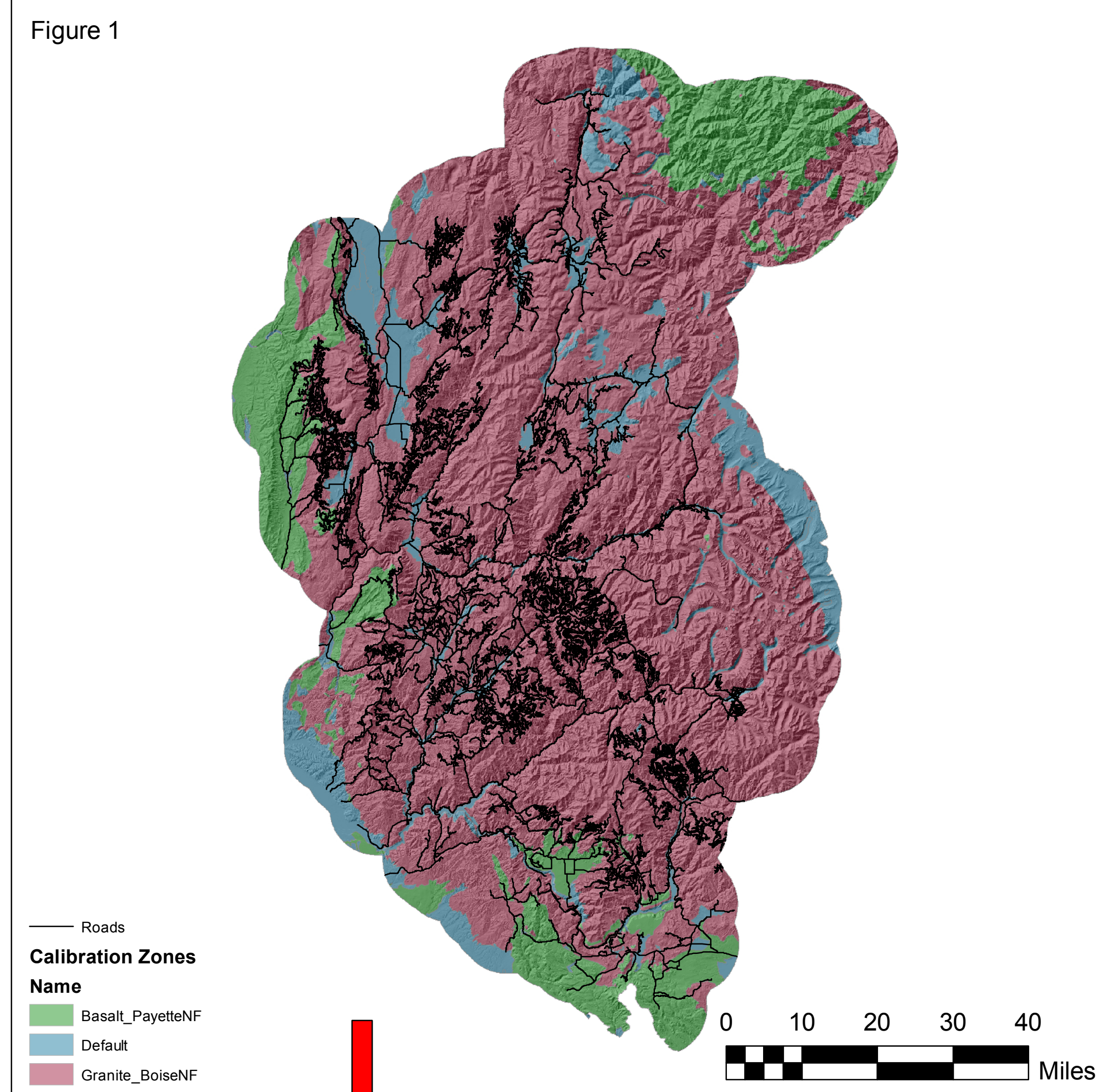


GRAIP_Lite: A System for Road Impact Assessment

Nathan Nelson¹, Charlie Luce¹, Tom Black¹, and Christine Dartiguenave²

¹U.S. Forest Service, Rocky Mountain Research Station, Boise, ID

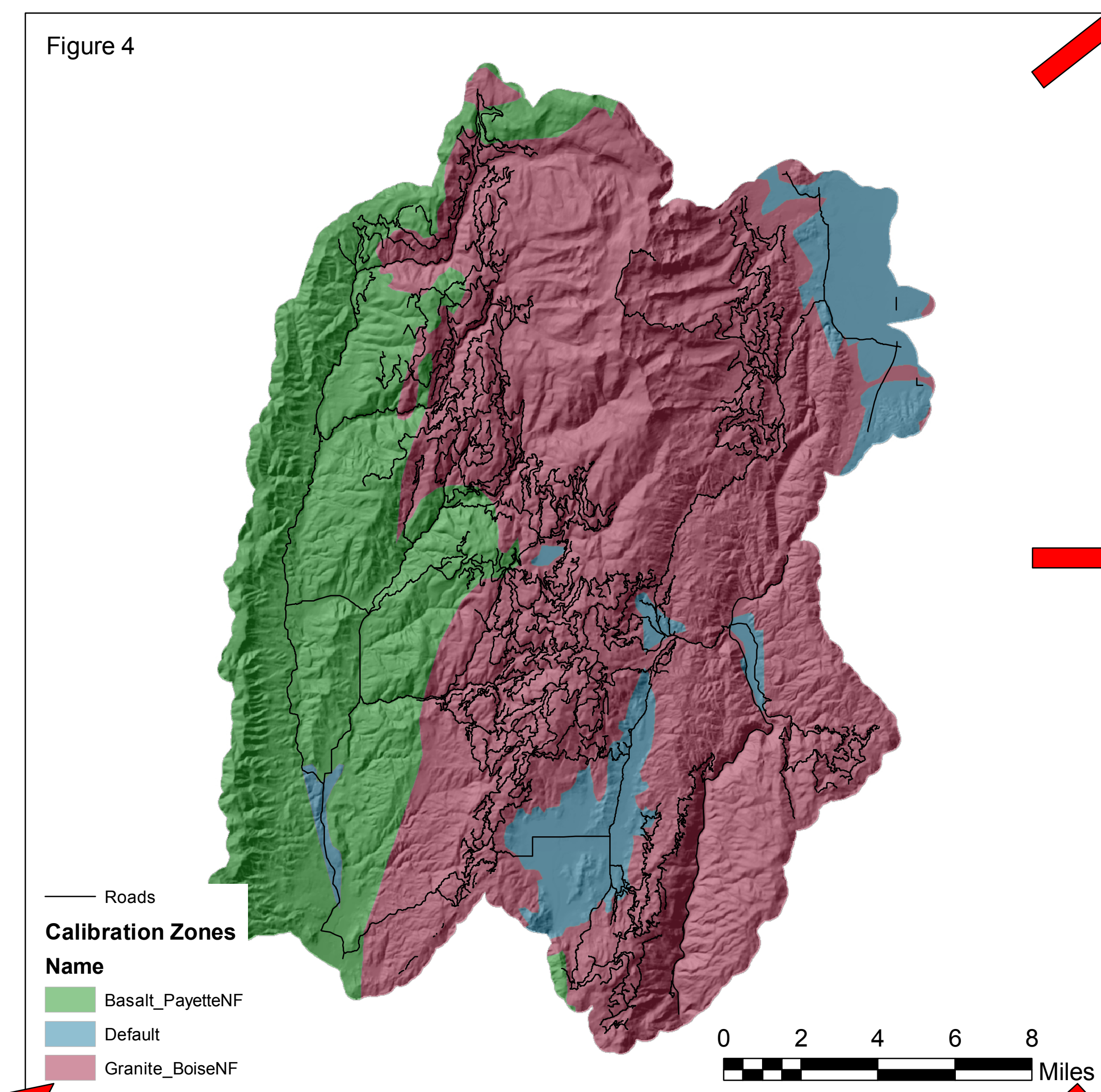
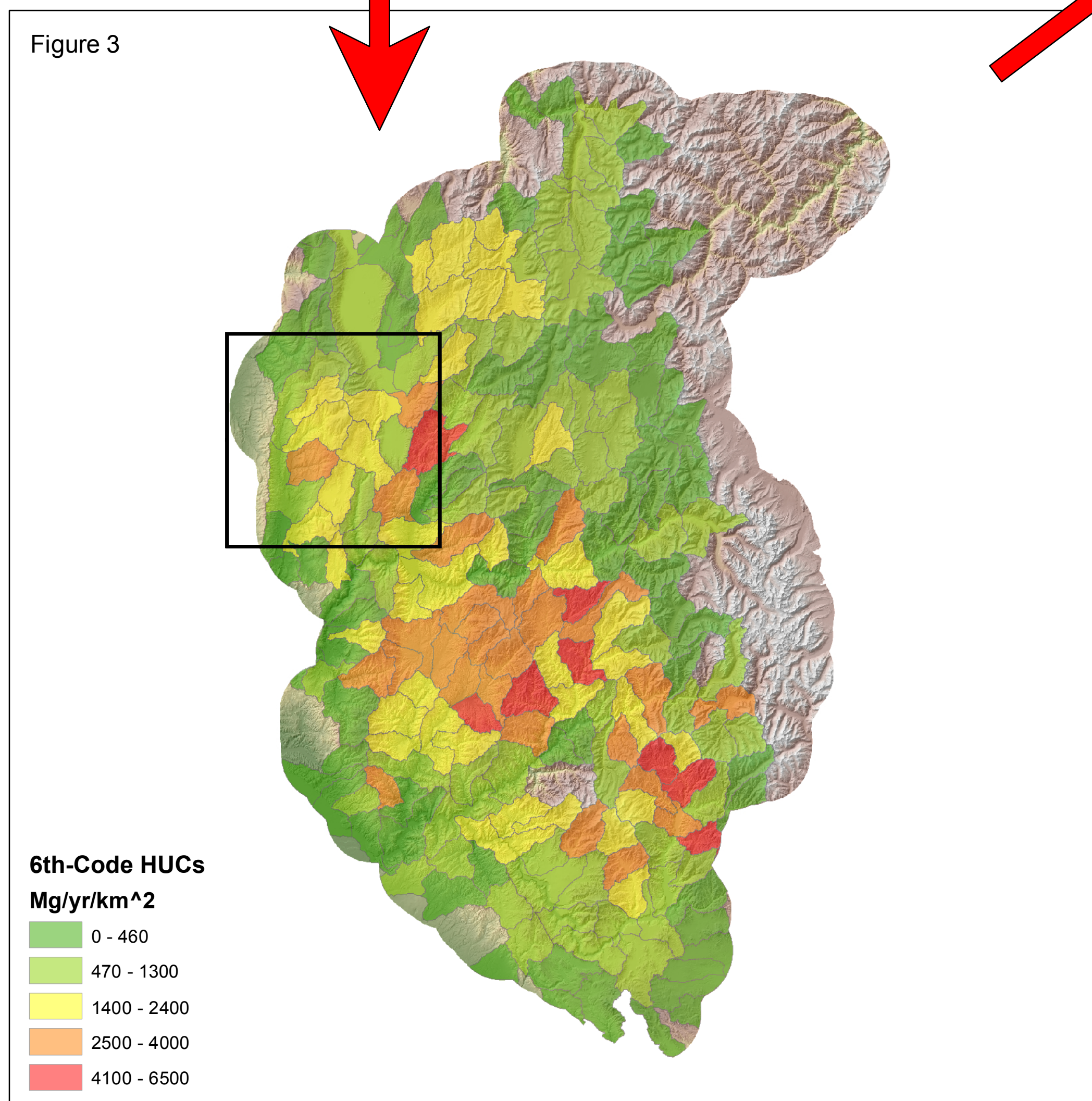
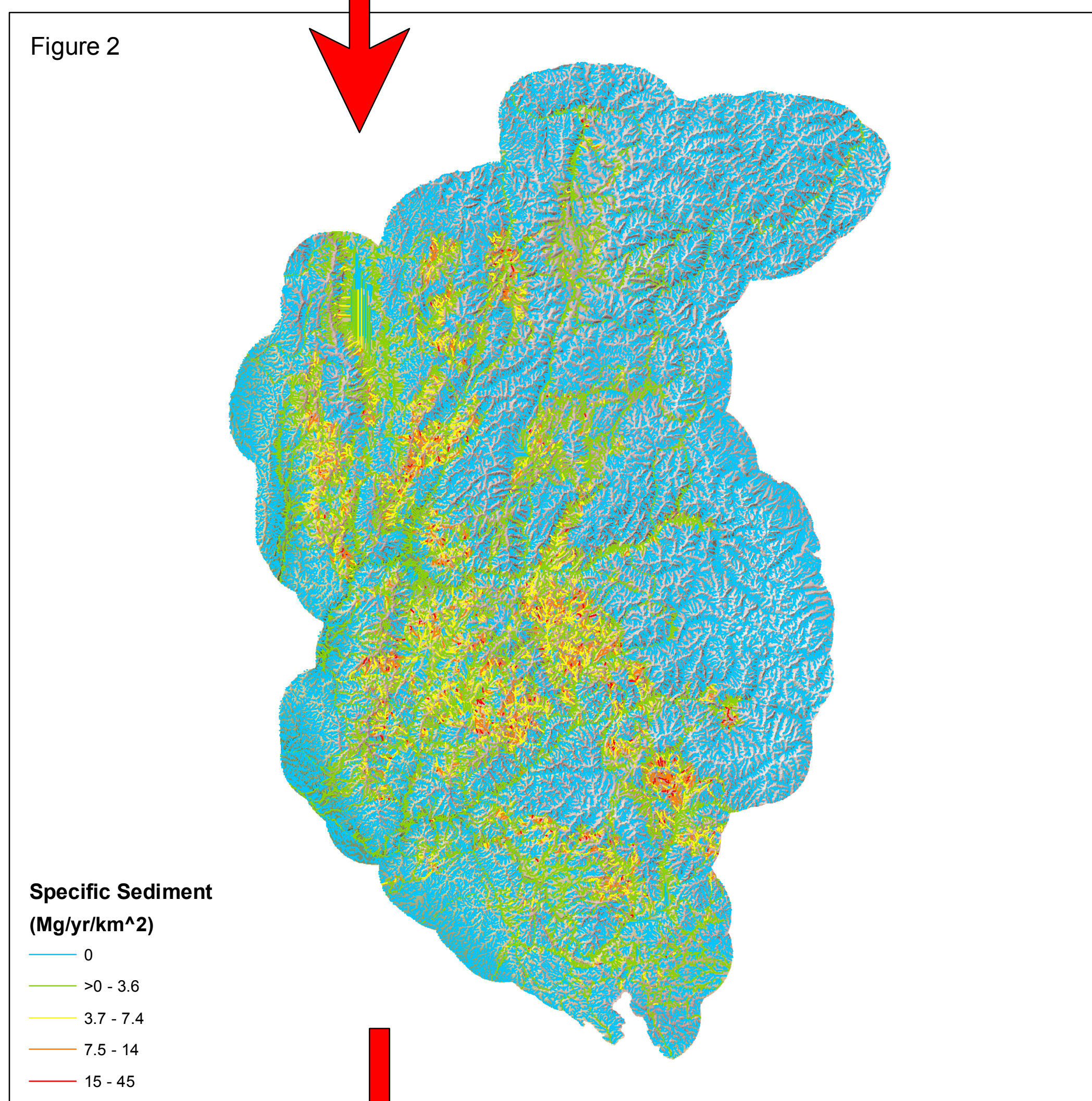
²ESRI Water Resources Team, ESRI, Redlands, CA



GRAIP_Lite is a system running in ArcGIS that uses simple inputs to model road-related sediment delivery to streams. Using a road layer and a Digital Elevation Model (DEM), as well as optional calibration region polygons and known drainage points, GRAIP_Lite evaluates road surface sediment production and delivery and then models that sediment accumulation in the stream network. Initially, GRAIP_Lite should be used to evaluate road-related sediment impacts across the entire landscape or forest. This allows areas to be prioritized for treatment projects, which increases the efficiency of restoration efforts by focusing on higher impact areas.

This example shows the inputs for such an analysis. These inputs are the DEM, road layer, and calibration polygon layer shown in Figure 1. Figure 2 then shows the model results in the modeled stream network; road-related sediment impact is displayed as specific sediment accumulation (Mg/yr/km^2). Figure 3 then shows the results aggregated to the NHD 6th-Code HUCs showing impact as specific sediment delivery (also Mg/yr/km^2). A project area has also been chosen, and that area is shown using an extent rectangle.

At this point, a second model run is set up to encompass the project area (Figure 4). It again has the same inputs as the previous analysis, but the inputs have been clipped down to the appropriate area. The model is run, which provides the foundation for analyzing the alternatives.



Next, the alternatives are set up in the model. In this example, three separate alternatives are being analyzed. Alternative1 is focused on restoration, and included intensive decommissioning of roads and resurfacing of native surfaced roads to reduce the road-related sediment impact on streams in the project area (Figure 5-A). Alternative 2, like Alternative1, includes a lot of intensive decommissioning work, but also includes some areas of temporary intensive use, including the temporary re-opening of closed roads; all such roads are decommissioned after a period of use (Figure 5-B). Alternative3 is weighted much more towards an intensive use/harvest type scenario where a few roads are decommissioned at the beginning of the project, but most are re-opened, used intensively, and then decommissioned at the end of the project (Figure 5-C).

GRAIP_Lite is then used to model each alternative, which GRAIP_Lite does at three separate time steps through the life of the project. GRAIP_Lite models the road and stream networks during the initial condition prior to work starting, during the disturbed condition immediately following treatment or during peak use, and then during the recovered condition after the project is over and the roads have stabilized. GRAIP_Lite also calculates the differences from the initial condition at the disturbed condition and at the recovered condition; the changes for each alternative are shown in Figure 6 at the disturbed condition and in Figure 7 at the recovered condition.

