Preliminary Results of a Biodiversity Analysis in the Greater North Cascades Ecosystem

by Peter Morrison, Susan Snetsinger, and Evan Frost

THE GREATER NORTH CASCADES ECOSYSTEM (GNCE), a region over ten million acres in size spanning the Washington–British Columbia border, has been the focus of major conservation efforts over the last five decades. While substantial progress has been made, the current system of protected areas does not include the full array of biological communities and is not sufficiently large and connected to maintain important ecological processes or viable populations of sensitive wildlife. The task of protecting the ecological integrity of the GNCE remains incomplete.

To strengthen the scientific foundation for future conservation efforts in the GNCE, the Northwest Ecosystem Alliance undertook a cooperative project with the Sierra Biodiversity Institute to 1) conduct a regional biodiversity analysis to identify areas with high conservation value, and 2) using the results of this analysis, draft a proposal for a network of new and existing reserves, restoration areas, and linkage zones.

Our assessment of regional biodiversity made use of the powerful analytical capabilities of geographic information systems (GIS). As the first step in this project, we assembled data themes based on landscape-level biological and environmental variables correlated with biodiversity. This involved acquiring digital data from various agencies in both the US and Canada, crosswalking their attributes, and merging them into uniform region-wide data sets. In some cases, digital information from the agencies was updated with more recent information from hardcopy maps. Many data themes (such as species distribution and abundance) could not be used in the final analysis because full ecosystem coverage did not exist. The following basic region-wide data themes were assembled and used in the final analysis:

- Existing and potential vegetation (series level)
- Forest cover, including canopy cover, successional stage, age or size class
- Elevation
- Rivers and streams
- Wetlands
- Road systems

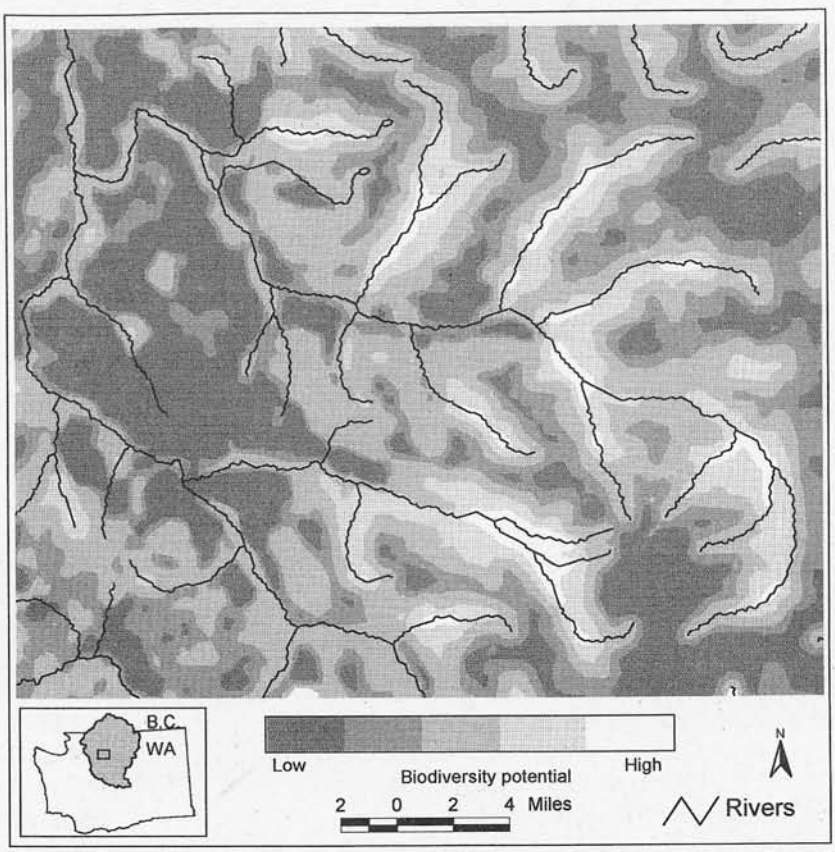

Figure 1. Example of biodiversity value model.

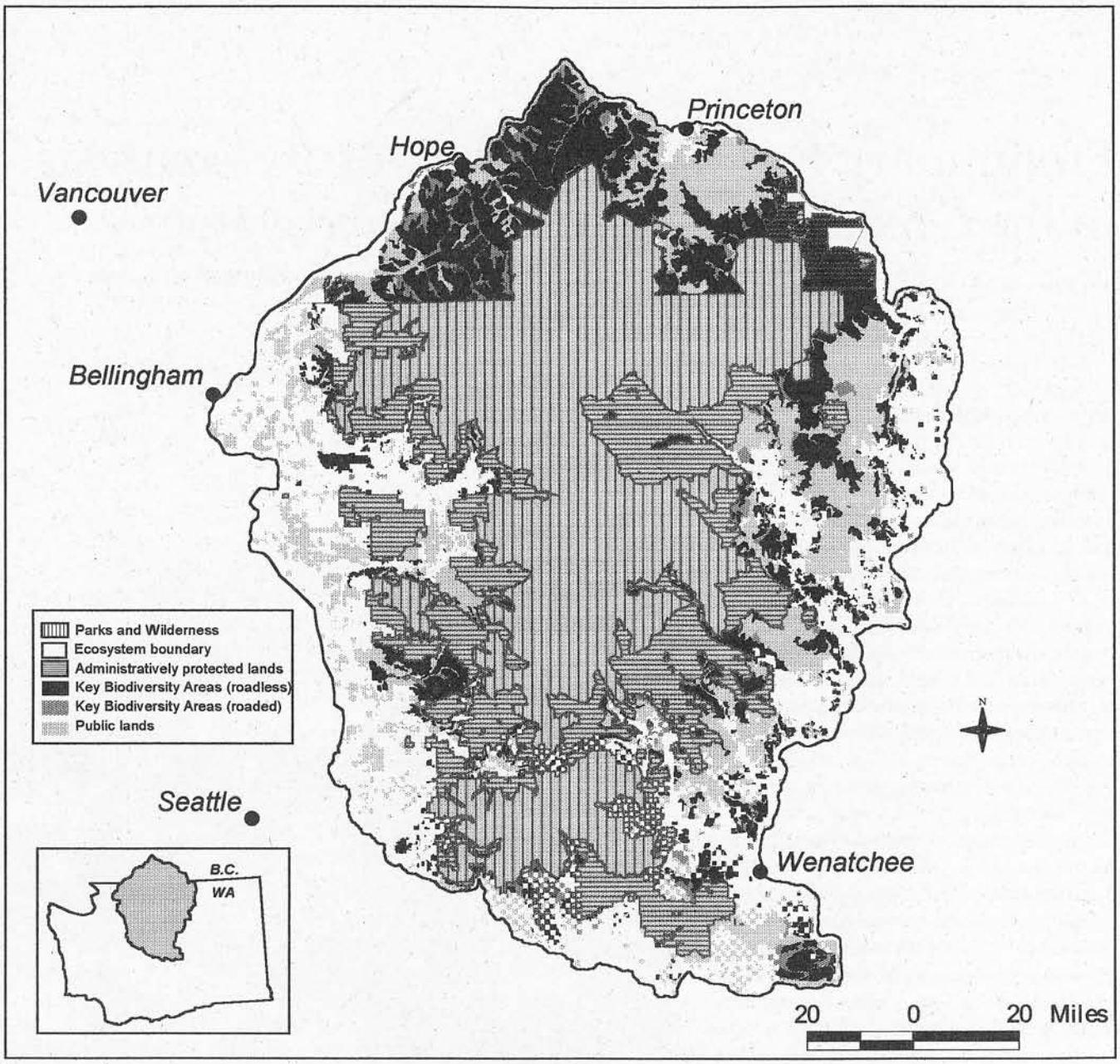

Figure 2. Key Biodiversity Areas on public lands in the Greater North Cascades Ecosystem.

From these data themes, the following additional layers were derived for use in subsequent analysis:

- Presence/absence of wetlands
- Degree of late-successional forest development
- Index of size, configuration, and connectivity of late-successional forest patches
- Rarity of vegetation types with respect to overall abundance in the GNCE and current protected status
- Density and proximity of roads
- Distance from major streams and rivers
- Index of size of roadless/unmanaged regions

For each data theme, a weighting algorithm was developed, with higher values indicating greater biodiversity potential. For example, large, connected patches of late-successional forest with small perimeter to area ratios received a higher value than small, isolated patches with convoluted shapes.

All of these derived data themes and their relative values were then integrated into an ARC/INFO grid-based model to evaluate the cumulative biodiversity potential. Values for all data themes were summed for each 1 hectare grid cell, across the entire region. High values in the resulting grid model represent areas with high biodiversity potential and conservation

value. Low values in this model represent areas with low biodiversity potential, such as those degraded by past management (Figure1).

Overall biodiversity values were then averaged for watershed units (1000-5000 ha in size) and all roadless regions greater than 400 hectares (roughly 1000 acres) in size. Watershed units and roadless regions with relatively high overall scores were identified as "Key Biodiversity Areas" for the GNCE (Figure 2). This map of Key Biodiversity Areas has been used by a consortium of US and Canadian conservation groups (the Cascades International Alliance) to delineate boundaries for a proposed Cascades International Park. Key Biodiversity Areas that are unprotected and roadless have been proposed as new reserves or "Conservation Areas." Watersheds with high biodiversity scores that are unprotected and roaded have been proposed as "Restoration Areas." Linkage zones were also delineated in order to connect proposed Conservation and Restoration Areas with the existing system of protected areas.

Maps depicting all proposed Conservation and Restoration Areas were circulated to conservation activists in the region and evaluated by a group of conservation biologists. Some changes suggested in this review process have since been incorporated into the final proposal. The results of the GNCE biodiversity analysis will have long-term utility, serving as building blocks for future regional conservation efforts.

For information and written materials about the International Park campaign in the GNCE, contact the Northwest Ecosystem Alliance. Contact the Sierra Biodiversity Institute for a more detailed report on this project. ❙

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References

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ὕβρις

Linnaeus wrote
"The first step
of science is to know
one thing from another"

but taking the world apart
demands
the even greater τεχνη
of putting it
all together again

which is
the creative μυθος
of poet • dancer • worldmaker

in his last years
Linnaeus suffered a stroke
& it is said
he who named
& classified all the known
species flora
& fauna of his day

forgot
even his own name

—Lone Cone Free Poem

Note: the borrowings are from Attic Greek.
ὕβρις • hubris • fateful pride
τεχνη • techne • skill, technique
μυθος • mythos • myth

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