AQUATIC ECOLOGICAL CLASSIFICATION, ECOSYSTEM DIVERSITY AND CRUCIAL WATERSHED AREAS IN MONTANA'S COLUMBIA RIVER BASIN

Background: Effective conservation of aquatic biodiversity requires a system for identifying high quality aquatic species and communities and understanding the landscape habitat conditions that support them. As part of Montana Fish, Wildlife and Parks' Crucial Areas Assessment, we developed a hierarchical framework of landscape habitat variables and analyzed associated native biological data to classify all lotic ecological systems within the Columbia River Basin of Western Montana.

Project Description: Streams from the NHDPlus were classified by seven landscape variables: stream order, elevation, lithology, downstream and upstream connectivity, precipitation and gradient (Figure 1). Stream order, elevation, downstream and upstream connectivity, and gradient were calculated using the attribute tables from the NHDPlus. Lithology and precipitation were derived from the USFS 1:500,000 Ecological Subsections and PRISM Average Annual Precipiation 1971-2000 respectively. The resulting classes were truncated into 35 distinct ecological system codes.

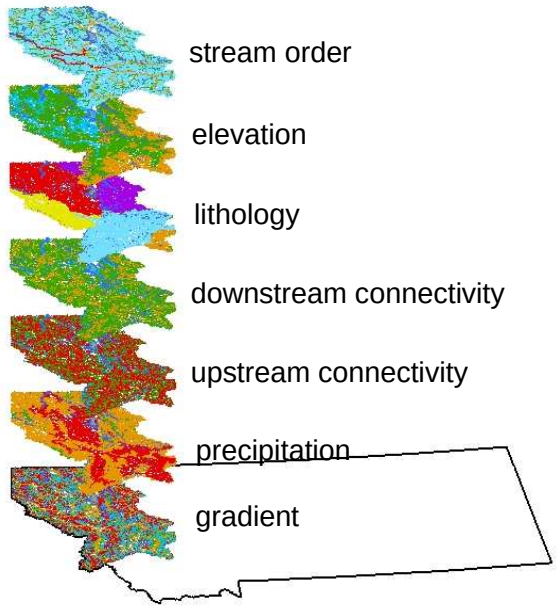

Figure 1. Landscape variables

Concurrently, we analyzed over 5,000 native aquatic biological samples for group associations and indicator species within the ecological system codes to define 6 broader ecological systems that encompass the lotic native aquatic community diversity of western MT (Table 1).

Table 1. Ecological systems with species associations, indicator species, species of concern, representative watersheds or rivers, and crucial conservation areas.

AES	AES codes	Associations	Native Indicator Vertebrate Species	SOC Potential	Watershed/Rivers	Crucial Areas
Large Valley Intermontane Rivers	A005, A005L, A006	Large River fish assemblage	Burbot	White Sturgeon	Lower Clark Fork, Kootenai	Kootenai River
Medium Intermontane/ Montane Rivers	B009, B009L, B009V, B010, B010L, B010V, B011, B011L, B011V	Cool water fish & Traditional Trout Steam Assemblage	Bull Trout, Northern Pikieminnow, Largescale Sucker, Redside Shiner	Westslope Cutthroat, Columbia Basin Redband Trout, Western Pearlshell	NF Blackfoot, Thompson River	Middle Fork & South Fork Flathead River, Yaak, Blackfoot
Intermontane Foothill Streams	C007, C007L. C009, C009L, C010, C010L, C011, C011L	Traditional Trout Steam Assemblage	Westslope Cutthroat, Bull Trout	Western Pearlshell	Upper Rock Creek, Upper Willow, Clearwater River	Flint-Rock, Blackfoot
Forested Montane Streams	D001, D001L, D007, D007L	Cold-water stenotherm macroinvertebrates Headwater fish assemblage	Westslope Cutthroat, Bull Trout, Rocky Mountain Tailed Frog	NRMR SOC inverts, Western Pearlshell Westslope Cutthroat, Torrent Sculpin	Kootenai, Yaak, Fisher, Middle Clark Fork, Swan, Bull	Bitterroot Mountains, Flathead Valley Ecological Section
Forested Headwater Source Streams	D009, D009L D009i, D010, D010L D011, D011L	Cold-water stenotherm macroinvertebrate & amphibian community, Headwater fish assemblage	Rocky Mountain Tailed Frog, Idaho Giant Salamander, Westslope Cutthroat	NRMR SOC inverts (6spp.) Idaho Giant Salamander, Westslope Cutthroat	St. Regis	Bitterroot Mountain Ecological Section
Alpine, Subalpine Streams	E001, E001L, E002, E002L	Cold-water stenotherm macroinvertebrate & amphibian community, usually fishless	Rocky Mountain Tailed Frog	NRMR SOC inverts (6spp.) Alpine SOC Caddisflies and Stoneflies (14spp.)	Middle Fork Flathead, McDonald and Reynolds Creek	Bitterroot Mountain, Northern Rockies Ecological Section

Using the aquatic ecological systems classification and expected taxa lists, we developed a crucial catchments map highlighting areas that, if preserved, would effectively conserve all aquatic biodiversity available in western MT (Figure 2).

Our mapping of stream classifications and their expected associated native species will enable aquatic scientists or land managers to develop an understanding of the aquatic resources at various spatial scales depending on the level of depth or breadth of information needed (i.e., at the landscape level: number of river miles of an aquatic ecological system in their watershed or management region, or at the local reach scale: finding similarly classified stream reaches for a targeted survey) (Figure 3).

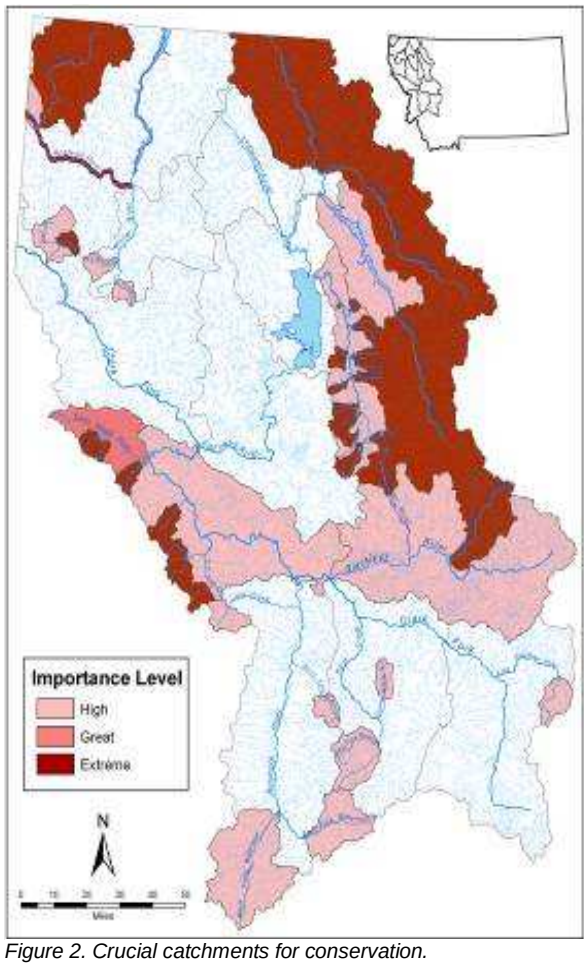

Figure 2. Crucial catchments for conservation.

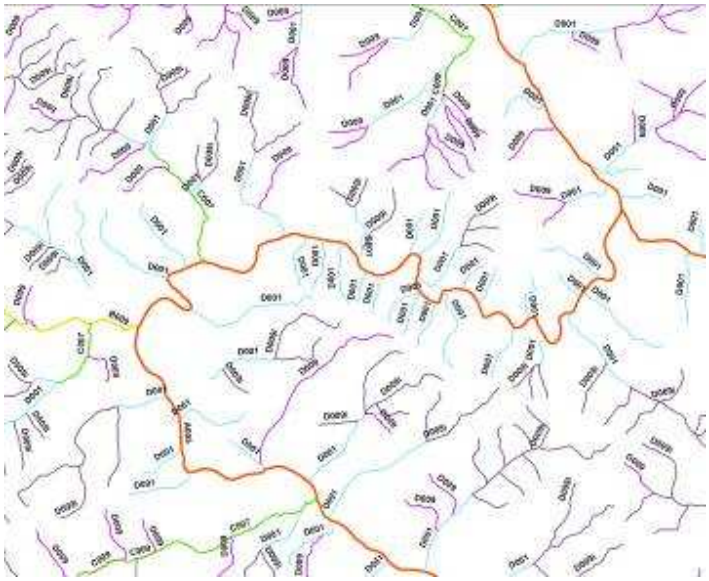

Figure 3. Map of stream classifications.

Partners:

Montana Fish Wildlife and Parks, USFS Region 1, and the University of Montana.

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