Ecoregions of Montana

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregions are directly applicable to the immediate needs of state agencies, including the development of biological criteria and water quality standards and the establishment of management goals for nonpoint source pollution. They are also relevant to integrated ecosystem management, an ultimate goal of most federal and state resource management agencies.

The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the spatial patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of such characteristics varies from one ecological region to another regardless of the hierarchical level. A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions (Commission for Environmental Cooperation Working Group 1997). At level III, the conterminous United States contains 104 regions (United States Environmental Protection Agency [USEPA], 1996). Level IV is a further subdivision of level III ecoregions. Explanations of the methods used to define the USEPA's ecoregions are given in Omernik (1995), Griffith and others (1994), and Gallant and others (1989). The level III and IV ecoregion map on this poster was compiled at a scale of 1:250,000 and depicts revisions and subdivisions of earlier level III ecoregions that were originally compiled at a smaller scale (USEPA 1996; Omernik 1987). This poster is part of a collaborative project primarily between USEPA Region VIII, USEPA National Health and Environmental Effects Research Laboratory (Corvallis, Oregon), Montana Department of Environmental Quality (MDEQ), United States Department of Agriculture Forest Service (USFS), United States Department of Agriculture-Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service), United States Department of the Interior-Bureau of Land Management (BLM), and United States Department of the Interior-U.S. Geological Survey (USGS) Earth Resources Observation Systems (EROS) Data Center.

The project is associated with an interagency effort to develop a common framework of ecological regions. Reaching that objective requires recognition of the differences in the conceptual approaches and mapping methodologies applied to develop the most common ecoregion-type frameworks, including those developed by the USFS (Bailey and others, 1994), the USEPA (Omernik 1987, 1995), and the NRCS (U.S. Department of Agriculture-Soil Conservation Service, 1981). As each of these frameworks is further refined, their differences are becoming less discernible. Regional collaborative projects such as this one in Montana, where agreement has been reached among multiple resource management agencies, is a step toward attaining consistency and consistency in ecoregion frameworks for the entire nation.

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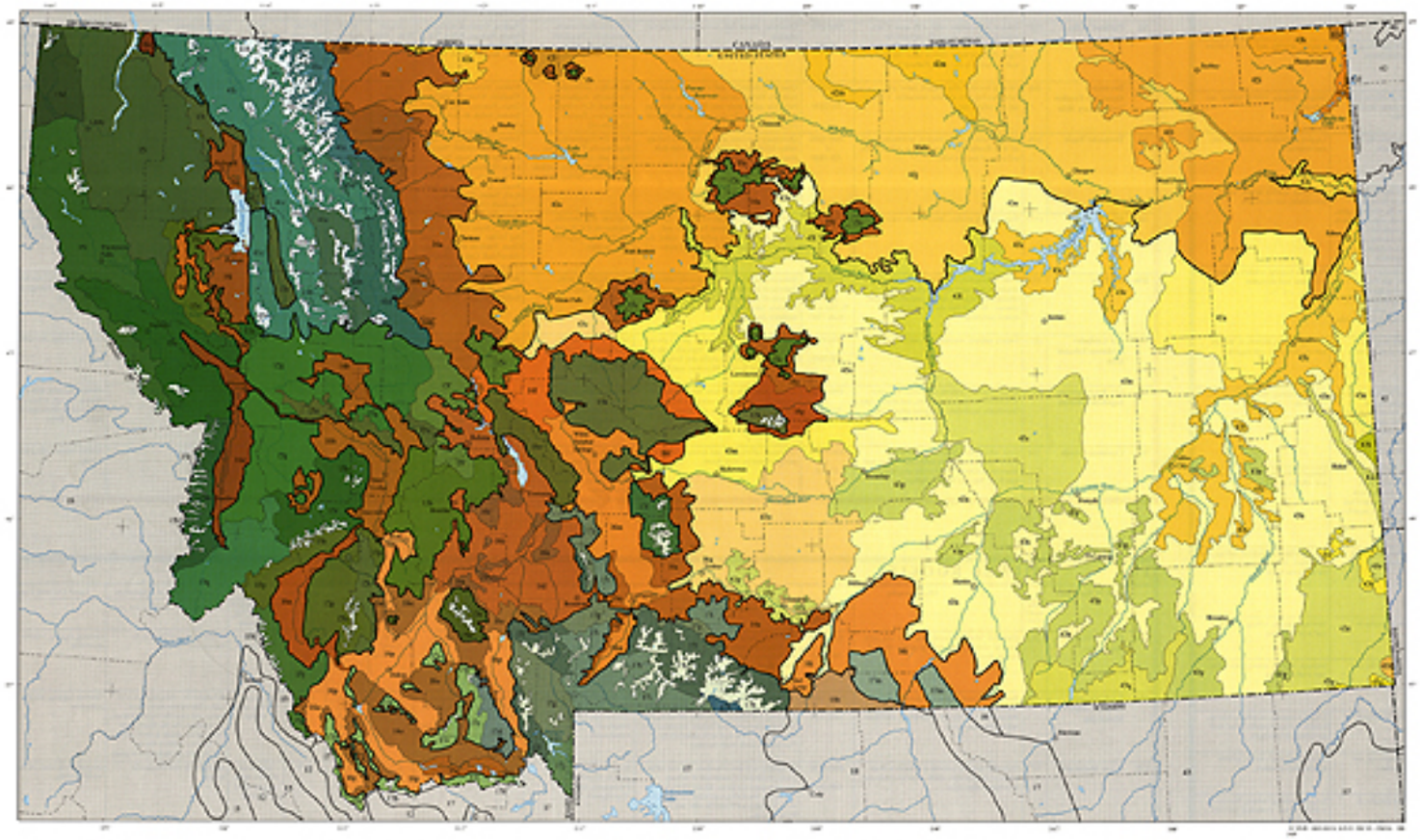

15 Northern Rockies

- 15a Cutoff Creek Range/Nine Mile Divide
- 15b Flathead Mountains, Boulder Batholith
- 15c Scattered Eastern Igneous Crest Mountains
- 15d Purcell Mountains
- 15e Flathead Hills and Mountains
- 15f Eastern Divide Mountains
- 15g Rattlesnake Bitterroot/South Swan Northern Garnet-Sapphire Mountains
- 15h High Alpine Zone
- 15i Salish Mountains
- 15j Forested Rim-rimed Mountains
- 15k Big Snowy-Little Belt Carbonate Mountains
- 15l Crest of Alpine Cabinet/North Bitterroot Mountains
- 15m Glaciated Bitterroot Mountains and Canyons
- 15n Tobacco Root Mountains
- 15o Big Belt Forested Highlands
- 15p Pioneer-Anaconda Ranges
- 15q Pintwell Rocks
- 15r Flint Creek-Anaconda Mountains
- 15s Eastern Pioneer Sedimentary Mountains
- 15t Stillwater-Swan Wooded Valley
- 15u Southern Garnet Sedimentary/Volcanic Mountains

16 Montana Valley and Foothill Prairies

- 16a Northwestern Foothill Grassland
- 16b Foothill Parkland
- 16c Tobacco Plains
- 16d Bitterroot-Frenchtown Valley
- 16e Camas Valley
- 16f Lower Foothill Grassland
- 16g Lower Foothill Savanna
- 16h Deer Lodge-Philipsburg-Avon Grassy Intermontane Hills and Valleys
- 16i Upper Big Hole Foothills
- 16j Flathead Valley
- 16k Forested-Shrubland Leaders Sapphire Hills
- 16l Townsend Basin
- 16m Shield South Paradise Valleys
- 16n Big Hole
- 16o Dry Gneiss-Schistose Sapphire Hills
- 16p Dry Intermontane Sapphire Basins
- 16q Centennial Basin

17 Middle Rockies

- 17a Eastern Gravelly Mountains
- 17b Southwestern Montana Raven Mountains
- 17c Crazy Mountains
- 17d Absaroka-Gallatin Madison-Bridger Sedimentary Mountains
- 17e High Elevation Rockland Alpine Zone
- 17f Absaroka-Gallatin Volcanic Mountains
- 17g West Yellowstone Valley
- 17h Lady of the Lake
- 17i Gneiss-Schistose Forested Mountains
- 17m Big Horn-Pryor Mountains

18 Wyoming Basin

- 18e Northern Semiarid Intermontane Basin

41 Canadian Rockies

- 41a Northern Front
- 41b Glacial Alpine Subalpine Zone
- 41c Western Canadian Rockies
- 41d Southern Carbonate Front
- 41e Flathead Thrust Faulted Carbonate Rich Mountains

42 Northwestern Glaciated Plains

- 42a Collapsed Glacial Outwash
- 42d Northern Missouri Coteau
- 42f Glaciated Dark Brown Prairie
- 42j Glaciated Northern Grasslands
- 42k Cutoff Lakes Upland
- 42l Sweetgrass Uplands
- 42m Cherry Patch Moraines
- 42n Milk River Pothole Upland
- 42o North Central Brown Glaciated Plains

43 Northwestern Great Plains

- 43a Missouri Plateau
- 43b Little Missouri Badlands
- 43c River Breaks
- 43d Forested Buttes
- 43e Sagebrush Steppe
- 43g Semiarid Petty Shale Plains
- 43h Dense Clay Prairie
- 43i Missouri Breaks Woodland/Scrubland
- 43m Judith Basin Grassland
- 43n Central Grassland
- 43o Unglaciated Montana High Plains
- 43p Ponderosa Pine Forest Savanna Hills
- 43q Movie Tongue River Dissected Plains

Level III ecoregion
Level IV ecoregion
County boundary
State boundary
International boundary

SCALE 1:1 500 000

PRINCIPAL AUTHORS: Alan J. Woods (Dynamac Corporation), James M. Omernik (USEPA), John A. Nesser (USFS), Bruce Shelden (USFS), and Sandra H. Azevedo (DAO Corporation)

COLLABORATORS AND CONTRIBUTORS: Robert Bukantis (MDEQ), Chuck Gordon (NRCS), Bill Vaile (BLM), Loren Kohl (Flathead Lake Biological Station, University of Montana), Don Stahnke (USFS), Vincent A. Bollman (Northwest Biological Associates, Missoula, Montana), Thomas R. Loveland (USGS), Anthony Selle (USEPA), Alisa Gallant (Raytheon STX Corporation, Science Applications Branch, EROS Data Center), Cliff Montagne (Land Resources and Environmental Sciences, Montana State University), John Donahue (Department of Geography, University of Montana), and Jeff Comstock (DAO Corporation)

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15. Northern Rockies

The mountains and valleys of the Northern Rockies (15) are covered by extensive Douglas-fir and subalpine fir climax forests. Portions of it are influenced by more maritime air masses and support Pacific Coast trees such as western hemlock and western redcedar which are absent from the Middle Rockies (17). Alpine areas occur here as a whole; the region has lower elevations, less perennial snow and ice, and fewer glacial lakes than the adjacent Canadian Rockies (41). Logging and mining are extensive and have affected water quality. Recreational uses are also important.

Subregions of the Northern Rockies (15). In Montana, Ecoregion 15 has enough variation in its biotic and abiotic characteristics to be subdivided into 21 level IV ecoregions (15a–15u). Ecoregions 15a–15e typically represent areas that have different types of climate, climax vegetation, rock, water quality, fish assemblages, stream and/or soil.

Igneous, metasedimentary, and carbonate rich rocks underlie Ecoregion 15, each lithologic type has distinct stream quality characteristics and unique fish assemblages.

The climate of the northwestern section of Ecoregion 15 has a strong Pacific influence. As a consequence, this area has more tree species, more diverse forests, and more rainfall than the rest of the ecoregion. Rainfall and snow melt waters are usually absorbed in the Northern Rockies (15), especially at higher elevations. Some water is stored in unconsolidated mountain valley fill, volcanic deposits, glacial deposits, and in permeable sedimentary rocks. Crystalline rock areas lack significant groundwater storage capacity; as a result, base flow to natural streamflow runoff is minimal, and streamflow at high elevations is typically restricted to rain and snow melt periods.

16. Montana Valley and Foothill Prairies

Ecoregion 16 is composed of northern foothills and broad, intermontane valleys. Mountain land, perennial streams characteristic and differentiate this ecoregion from the neighboring grasslands of the Northwestern Glaciated Plains (42) and the Northwestern Great Plains (43). Soils tend to be deeper and better developed than on nearby mountain slopes. Proximity to the high forested mountains also results in a dominant mosaic of terrestrial and aquatic biota. For both of Montana's human population and commercial economic activity occurs in Ecoregion 16 and its valleys serve as major transportation and utility corridors. Mine and another cities have locally impacted environmental quality. Much of the region is farmed and many parts of the valleys are irrigated. Grazing of beef cattle and sheep is common. Land use affects water quality. Pollutants tend to move quickly within coarse-grained deposits and can penetrate rock fractures.

Subregions of the Montana Valley and Foothill Prairies (16). In Montana, Ecoregion 16 has been divided into nine level IV ecoregions (16a–16i). Each ecoregion is characterized by superficial differences in rock type, terrain, climate, or potential natural vegetation. Intermontane valleys are usually wetter and can have a different potential natural vegetation than more nearby or more southerly valleys. Limestone and siliceous rich foothills have fish assemblages that are different from those underlain by non-carbonate rocks. Lake-studded foothills by foothills or the results of glaciated catchments have fish assemblages that are different from other nearby foothills.

17. Middle Rockies

The rugged Middle Rockies (17) is a level III ecoregion with climax forests rich in Douglas-fir and subalpine fir. Ecoregion 17 is less influenced by moist maritime air masses than the mountains of northwestern Montana and consistently lacks the grand fir, western hemlock, and western redcedar of Ecoregion 15. Recreation, logging, and mining are the major land uses; western livestock grazing also occurs and is more common than in Ecoregion 15.

Subregions of the Middle Rockies (17). In Montana, Ecoregion 17 has been divided into 10 level IV ecoregions (17a–17m). Each ecoregion is characterized by superficial differences in rock type, terrain, climate, or potential natural vegetation. Intermontane valleys are usually wetter and can have a different potential

Middle Rockies (17). High elevations are rainless, typically warm and convective and can be water stressed. The area's carbonate, metamorphic, and igneous rocks strongly influence hydrological characteristics, fish assemblages, and stream quality.

18. Wyoming Basin

The broad, semi-arid intermontane Wyoming Basin (18) is generally bounded by high hills and low mountains and dissected by grasslands and shrublands. The region is somewhat drier than the Northwestern Great Plains (43) and is nearly surrounded by mountains. Livestock grazing takes place throughout the ecoregion even though many areas lack sufficient vegetation to adequately support the activity.

Subregions of the Wyoming Basin (18). In Montana, Ecoregion 18 is undivided and lies in the southeastern of the Bearpaw Plateau. It includes some of the drier places in Montana and subsoiled, light colored soils are common. The potential natural vegetation is mainly sagebrush steppe which is distinct from that of the surrounding ecoregions.

41. Canadian Rockies

Ecoregion 41 extends into northern Montana from Alberta and British Columbia. The ecoregion is strongly influenced by more maritime air masses. Moving warm and moist air ascends at the higher elevations. Some surplus water is stored in glacial deposits, unconsolidated mountain valley fill, and permeable sedimentary rocks. However, areas underlain by crystalline rocks lack significant groundwater storage capacity; as percent streamflow runoff is in the form of groundwater supplies, in these places base flow is meager and high elevation streams generally flow only during rain and snow melt periods. The highest elevations are barren, glaciated alpine areas. The potential natural vegetation is mostly subalpine fir, Douglas-fir, and lodgepole pine. Soils are thin or absent on upper mountain slopes but become deeper and more developed below, especially west of the Continental Divide. Recreation, forestry, and mining are common land uses.

Subregions of the Canadian Rockies (41). Ecoregion 41 has been broken into four level IV ecoregions (41a–41d) that are characterized by different types of climate, potential natural vegetation, rock, and/or water quality. Highest elevations are barren and often more so on continental Ecoregions west of the Continental Divide have much more Pacific influence in terms of climate and tree species than do those on the eastern slopes of the Front Range. Portions are underlain by argillite and sparkling, they have substantially different water quality and fish assemblages than other areas underlain by limestone and dolomite. Ecoregion 41 contains Glacier National Park and the Great Bear, Bob Marshall, and Scapegoat Wilderness. Recreation is the major land use.

42. Northwestern Glaciated Plains

Ecoregion 42 is transitional between the generally more level, more arid, more agricultural Northern Glaciated Plains (46) to the east, the typically more irregular and drier Northwestern Great Plains (43) to the south, and the more hilly Montana Valley and Foothill Prairies (16) to the west. The northern boundary of the Northwestern Glaciated Plains (42) is near the limit of continental glaciation and its soils are derived from glacial drift. Holocene-age locally, water and are characterized by seasonal and some permanent ponds and wetlands. Land use is devoted to cattle ranching and farming.

Subregions of the Northwestern Glaciated Plains (42). In Montana, Ecoregion 42 has been divided into four level IV ecoregions (42b, 42d and 42j through 42o) that separate areas of different climate, land use, surficial deposits, soils, potential natural vegetation, and/or climate.

Ecoregion 42 extends eastward for hundreds of miles from the foothills of the Rocky Mountains. In certain till plain is marked by dark brown soils used for crops and large and

on western till plain is an important grain farming area, in contrast, in central till plain has brown, stony soils only primarily used for grazing. Outwash terraces and end moraines are found locally in Ecoregion 42 and contain many wildlife rich ponds and wetlands. Groundwater can be taken from the ecoregion's glacial deposits and bedrock, cold water by lithologic size and depth is usually the least productive rock type.

43. Northwestern Great Plains

Ecoregion 43 is largely an eight land, semiarid and rolling plain that is underlain by shale, siltstone, and sandstone. It contains occasional buttes, badlands, ephemeral intermittent streams, and a few perennial streams. Low precipitation and high summer evaporation rates mean groundwater recharge rates. Rangeland is extensive, but spring wheat and other farming also occur; agriculture is affected by climate, precipitation and the opportunities for irrigation. Native grasslands persist, especially in areas of steep or broken topography.

Subregions of the Northwestern Great Plains (43). In Montana, 13 level IV ecoregions (43a–43c, 43g, and 43h–43q) have been recognized. Any separate areas of distinct climate, land use, soil, surficial material, climate, and/or potential natural vegetation. Rolling grassland is characteristic of large parts of Ecoregion 43, but wildlife-rich forests and rough stony buttes occur locally and can be extensive in some jurisdictions plain forests or sandstone. Rangeland is distinctive, especially in areas of sandy soils, poor drainage, or dissected terrain. Grassland is found locally in Ecoregion 43 such as on the distinctive Quaternary surficial deposits of the Judith River Basin. Most soils have a frigid temperature regime and the southernmost soils are mesic.