

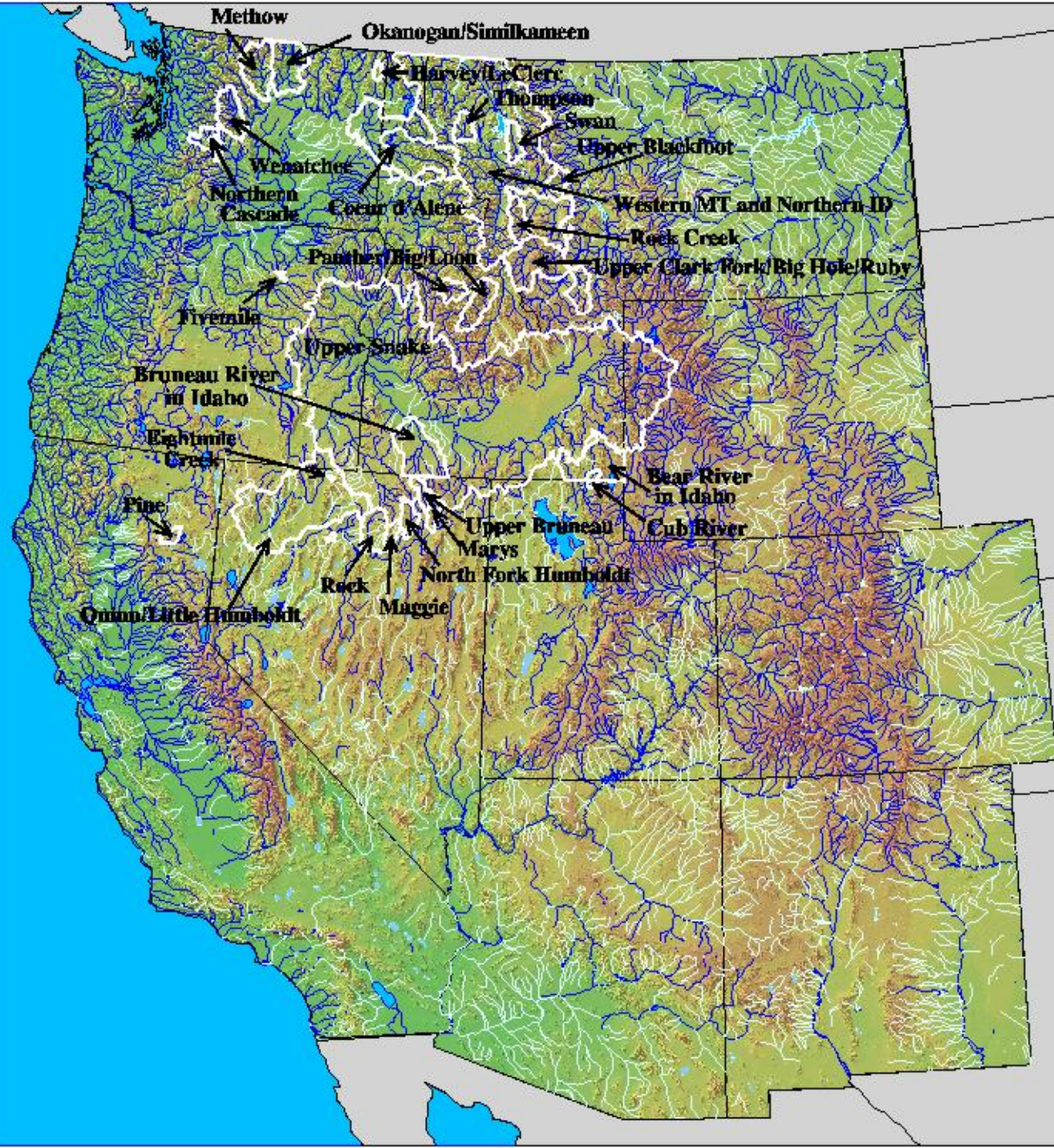


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ECOLOGICAL CLASSIFICATION INDEX

White Horse Associates has completed 25 ecological classifications covering over 100 million acres in the western United States. The approach was first developed to assess livestock and mining impacts in the North Fork Humboldt River basin in northern Nevada. The approach was refined through applications covering over 100 million acres in Washington, Montana, Oregon, Idaho, Wyoming, California, Nevada and Utah. Ecological classifications have been used for assessing livestock, mining and forestry impacts to stream and riparian resources. They have been used to identify appropriate control/treatments in Natural Resource Damage Assessments and for fisheries studies. More recently, they have served as the basis for water quality and TMDL assessments. We have compiled most of these reports on this CD. General descriptions and links to reports follow in reverse chronology. Links to specific reports are also provided on the map that follows. White Horse Associates has also conducted a couple dozen riparian studies and three dozen wetland studies, including several major mapping projects. Sherman Jensen has provided expert testimony in the fields of physical ecology, classification, mapping, soils, streams and riparian resources. For other experience see *WhiteHorseAssociates.com*.

- *Ecological classification, Bruneau River Basin, Idaho. 2001.* Mapped and described ecoregions, geologic districts and subsections for about 1.6 million acres. Also mapped valley-bottom types, state (i.e. condition class), valley-bottom landforms and riparian vegetation types for selected subbasins. Results will be used as the basis for assessing water quality parameters and TMDL relative to ecological potential. *Conducted for Idaho Department of Environmental Quality, Twin Falls, ID.*
- *Ecological classification, Coeur d'Alene, St. Joe and St. Regis River basins, Idaho and Montana. 2000.* Mapped and described ecoregions, geologic districts and subsections for about 2.5 million acres and including about 4,681 linear miles of stream. Also mapped valley-bottom landtype, valley-bottom type, state, valley-bottom landform and riparian vegetation type for impacted and selected control streams. Results were used for Natural Resource Damage Assessment litigation. *Conducted for ASARCO Inc., et al.*
- *Ecological classification, Bear River basin in Idaho. 1999.* Identified (mapped) areas with distinctive water quality potential and identified the state (condition) of major tributaries for about 1.8 million acres, inclusive of about 673 linear miles of stream, in southeast Idaho. Information will be used to develop water quality and TMDL assessments for water quality limited subbasins. *Conducted for Idaho Division of Environmental Quality, Boise, ID.*



- *Ecological Classification, Winnemucca District, Nevada.* 1999. Mapped and described ecoregions, geologic districts and subsections for about 6 million acres in northern Nevada from small-scale information sources. Also mapped valley-bottom landtype, valley-bottom type, state, valley-bottom landform and riparian vegetation type from large-scale aerial photos for 31 watersheds comprising about 626,691 acres within the project area. Results were used to evaluate livestock management. *Conducted for Winnemucca District BLM, Winnemucca, NV.*
- *Geologic districts and subsections in western Montana and northern Idaho.* 1999. Conducted a broad-scale inventory for about 19.5 million acres to identify areas of distinctive ecological potential, based on similarities in climate, geology and geomorphology. Results were applied to forestry management and research. *Conducted for Plum Creek Timber Company, Columbia Falls, MT.*
- *Ecological classification, upper Snake River basin, Idaho, Oregon, Nevada, Utah and Wyoming.* 1999. The upper Snake River basin is about 4.7 million acres and contains 85,157 linear miles of stream, of which 30,400 miles is perennial. We classified and mapped geologic districts and subsections for the upper Snake River basin. We further classified and mapped valley-bottom type, state, landform and riparian vegetation types for several 6th code watersheds where water quality studies were conducted. Correlated results of water quality studies to the ecological classification. Upon review, the EPA accepted ecological classification as an approach for assessing TMDLs. *Conducted for Idaho Division of Environmental Quality, Twin Falls, ID.*
- *Ecological Classification, Rock Creek Basin, Montana.* 1998. Detailed mapping of ecoregion, geologic districts, geomorphic classes, valley-bottom types and states (i.e. condition classes) was conducted for 569,386 acres of mountainous terrain including about 1,885 linear miles of stream. Results were used to identify stream segments favorable for bull trout spawning. *Conducted for US Forest Service Research Branch, Forest and Range Experiment Station, Missoula, Montana.*
- *Ecological classification, Eight Mile Creek basin, Humboldt County, Nevada.* 1998. Mapped and described ecoregions, geologic districts, subsections, valley-bottom landtype, valley-bottom type, state, valley-bottom landform and riparian vegetation type for about 13,044 acres in northern Nevada. Results were used to evaluate multiple use management of the basin. *Conducted for US Forest Service, Santa Rosa Ranger District.*
- *Ecological classification, Marys River, Nevada.* 1997. Applied a hierarchical classification to identify RRH with distinctive ecological potential and existing condition. The project area was 324,689 acres and included 1,341 linear miles of stream, all of which was classified to the level of valley-bottom type. Existing condition (i.e. state), riparian landform and riparian vegetation types were identified for perennial streams. Results were used to assess range management in the basin. *Conducted for Elko District BLM, Elko, NV.*

- *Ecological classification, Thompson River basin, Montana.* 1997. A hierarchical classification was applied to 410,276 acres that included about 1,326 miles of stream. Levels of classification were ecoregion, geologic district, landtype association, general landtype class, landtype, valley-bottom type and riparian habitat. A statistical similarity analysis for watersheds within the Thompson River basin was also conducted using cluster and discriminate analysis. Results served to evaluate forestry practices and as a basis for subsequent forest studies. *Conducted for Plum Creek Timber Company, Columbia Falls, MT.*
- *Ecological stream classification, upper Blackfoot River basin, McDonald Gold project, Montana.* 1996. Nested a stream classification into a hierarchical structure (Ecoregion, geologic district, landtype association, landtype, valley-bottom type, reach and state). The project area was 308,804 acres and included about 995 miles of stream. Results served as a baseline for predicting effects of proposed mining. *Conducted for Phelps Dodge Mining Company, Seven-Up/Pete Joint Venture, Helena, MT.*
- *Ecological classification, LeClerc/Harvey project area, Washington.* 1996. Conducted a hierarchical classification for about 98,242 acres and 237 linear miles of stream in northeast Washington. Map levels included ecoregion, geologic district, landtype association, landtype, valley-bottom type and valley-bottom landform. Results served to evaluate forestry practices. *Conducted for Plum Creek Timber, Columbia Falls, MT.*
- *Ecological classification, Swan River basin, Montana.* 1995. Conducted a hierarchical classification and inventory for about 408,630 acres and 1,257 linear miles of stream in western Montana. Information served as both an assessment of existing conditions relative to potential conditions and to evaluate effects of forestry practices. *Conducted for Plum Creek Timber, Columbia Falls, MT.*
- *Ecological classification, Rock Creek basin, Nevada.* 1995. Conducted a hierarchical classification for 808,476 acres and 3,366 linear miles of stream of which 262 miles is perennial. The focus was stream and riparian resources. Order 1 mapping of stream riparian habitat was conducted for all perennial stream. Information served as both an assessment of existing conditions and a baseline for monitoring effects of groundwater pumping. *Conducted for Barrick Gold Mining Company under direction of Elko District BLM, Elko, NV.*
- *Ecological classification, Maggie Creek basin, Nevada.* 1995. Conducted a hierarchical classification for 253,736 acres and 847 linear miles of stream, of which 233 miles is perennial. The focus was stream and riparian resources. Order 1 mapping of stream riparian habitat was conducted for all perennial streams. Information served as both an assessment of existing conditions and a baseline for monitoring effects of groundwater withdrawal. *Conducted for Barrick Gold Mining Company under direction of Elko District BLM, Elko, NV.*

- *Ecological classification, Habitat Conservation Plan project area, Washington.* 1994. Conducted a hierarchical classification for 418,859 acres and 738 linear miles of streams in the Cascades. Results served as a basis for a Habitat Conservation Plan reviewed by President Clinton and Vice-President Gore. *Conducted for Plum Creek Timber, Seattle, WA.*
- *Ecological classification, Wenatchee, Methow and Okanogan Rivers, Washington.* 1994. Applied a hierarchical classification to identify distinctive reaches of streams draining the eastern Cascades. The project area was about 9.5 million acres. About 218 linear miles of stream were classified to the level of valley-bottom type and state. Results served as a basis for fisheries studies. *Conducted for Don Chapman Consultants, Boise, ID.*
- *Inventory of stream/riparian habitat, Panther Creek basin.* 1993. Utilized a hierarchical classification to identify reaches of the Panther Creek valley-bottom with distinctive geologic and geomorphic character. The inventory was also applied to other basins in the vicinity to identify potential controls for comparison with Panther Creek. The project area was about a million acres and included 1,660 linear miles of stream. Results served as the basis for a Natural Resource Damage Assessment of the Blackbird Mine. *Conducted for Don Chapman Consultants under direction of Idaho Attorney General, Boise, ID.*
- *Ecological classification, Bruneau basin, Nevada.* 1992. Applied a hierarchical classification to identify landtypes of distinctive ecological potential and vegetation types for 268,144 acres in the upper Bruneau River basin. Also conducted very detailed mapping of stream and riparian habitats for 1,218 linear miles of stream. Upland and stream/riparian inventories were fully integrated. Results were used to assess the feasibility of elk introduction, wildlife and fishery values, and range management. *Conducted for Humboldt National Forest Mountain City Ranger District, Mountain City, NV.*
- *Inventory and Assessment of Riverine/Riparian Habitat, Five-Mile Creek basin, Oregon.* 1991. Conducted very detailed mapping of stream and riparian habitats in a tributary of the North Fork Powder River, Oregon. The project area was 32,256 acres with 89 linear miles of stream. Results were used to assess multiple use management, including livestock grazing, and habitat for endemic fish. *Conducted for National Forest John Day Ranger District, Ukiah, OR.*
- *Classification, inventory and assessment of riverine/riparian habitat, Clark Fork River, Bison Creek, Big Hole River, Beaverhead River, Ruby River basins, Montana.* 1991. Applied a hierarchical classification to identify stream and riparian habitat of distinctive ecological potential and to identify areas of similar state. The project area was about 7,334,400 acres and about 652 linear miles were intensively studied. Results were used to select reference streams for a Natural Resource Damage Assessment of the upper Clark Fork River. *Conducted for Chapman Consultants under direction of Montana Attorney General, Boise, ID.*
- *Pine Creek watershed assessment, Lassen County, California.* 1990. Applied a hierarchical classification, mapped and evaluated conditions influencing stream and riparian habitat critical for reproduction of Eagle Lake trout. Recommended structural and management alternatives to enhance restoration of Pine Creek. *Conducted for Lassen National Forest; Susanville, CA.*

- *Classification and assessment of riverine/riparian habitats, Bull Run Mountains, Nevada.* 1990. Applied a hierarchical classification to identify similar achievable state and assessed condition relative to a progression of states. Results were used for assessing cumulative impacts of livestock and mining over a 1,000 square mile watershed. *Conducted for Freeport-McMoran Gold under direction of the Humboldt National Forest; Elko, NV.*
- *Classification of riverine/riparian habitats and assessment of non-point source impacts, North Fork Humboldt River basin, Nevada.* 1989. Entailed preparation of a Technical Guidance Document for assessment of non-point source impacts and demonstration of the recommended approach in a Pilot Study that was conducted in the watershed of the North Fork Humboldt River. A Geographical Information System (GIS) was used to facilitate a hierarchical inventory of stream and riparian habitats. The project area was 382,080 acres and included 1,626 linear miles of stream. *Conducted for Forest Service Intermountain Research Station, Boise, ID under grant from EPA, Corvallis, OR.*