

Literature Cited

- Baad, M.F. 1988. Soil-vegetation correlations within the riparian zone of Butte Sink in the Sacramento Valley of northern California. U.S. Fish and Wildlife Service, Biological Report 88(25), National Ecology Research Center, Ft. Collins, CO. 48 pp.
- Bailey, R.G. 1976. Ecoregions of the United States. U.S. Forest Service, Ogden, UT. (Map only: scale 1:7,500,000).
- Baldwin, E.M. 1964. Geology of Oregon. Kendall/Hunt Publishing Company. 170 pp.
- Batchelor, R., M. Erwin, R. Martinka, D. McIntosh, R. Pfister, E. Schneegas, J. Taylor, and K. Walther. 1982. A taxonomic classification system for Montana riparian vegetation types. Montana rural Area Development Committee, Bozeman, Montana. 13 pp.
- Boggs, K., P. Hansen, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in northwestern Montana, draft version 1, Montana Riparian Association, School of Forestry, University of Montana. 217 pp.
- Brown, D.E. 1978. Southwestern wetlands — their classification and characterization. *in*: Proceedings of the National Riparian Ecosystems Symposium, Callaway Gardens, Georgia, Dec. 11-13, 1978. pp. 269-282.
- _____. 1973. The natural vegetative communities of Arizona (map, scale 1:500,000). State of Ariz., Arizona Resources Information System (ARIS), Phoenix.
- _____. and C.H. Lowe. 1973. A proposed classification for natural and potential vegetation in the Southwest with particular reference to Arizona. Ariz. Game and Fish Dep., Fed. Aid Proj. Rpt. W-53-R-22 WP-4JI:1-26.
- _____. 1974a. A digitized computer compatible classification for natural and potential vegetation in the Southwest with particular reference to Arizona. J. Ariz. Acad. Sci. (9) Supp. 2:1-11.
- _____. 1974b. The Arizona system for natural and potential vegetation—illustrated summary through the fifth digit for the North American Southwest. J. Ariz. Acad. Sci., (9). Suppl. 3:31-56.
- _____. C.H. Lowe, and C.P. Pase. 1977. A digitized systematic classification for the natural vegetation of North America with a hierarchical summary of world ecosystems. U.S. Fish and Wildlife Service. *in*: Symposium on Classification, Inventory and Analysis of Fish and Wildlife Habitat. Jan. 24-27, 1977. Phoenix, Arizona.
- Brown, K.F. and R.M. Kerr. 1979. Physiographic regions map. Am. Geographic Soc., New York, NY.
- Cowardin L.M., V. Carter, F. Golet, and E. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States, 1979. U.S. Department of the Interior, Fish and Wildlife Service, FWS/OBS-79/31, Washington, DC. 103 pp.

- Daubenmire, R.D. 1959. A canopy-coverage method of vegetation analysis. *Northwest Science* 33:43-66.
- _____. 1968. Plant Communities. Harper and Row, Publishers, New York, NY. 300 pp.
- _____. 1970. Steppe vegetation of Washington. Technical Bulletin 62. Washington Agricultural Experiment Station, Washington State University, Pullman, WA. 131 pp.
- _____. 1978. Plant geography with special reference to North America. Academic Press, New York, NY. 338 pp.
- _____ and J.B. Daubenmier. 1968. Forest vegetation of eastern Washington and northern Idaho. Technical Bulletin 60. Washington Agricultural Experiment Station, Washington State University, Pullman, WA. 104 pp.
- Dick-Peddie, W.A. and J.P. Hubbard. 1977. Classification of riparian vegetation. in: Symposium on the Importance, Preservation and Management of the Riparian Habitat, July 9, 1977, Tucson, Arizona.
- Fenneman, N.M. 1931. Physiography of Western United States. McGraw-Hill Book Co., Inc. New York and London. 534 pp.
- Franklin, J.F. and C.T. Dymess. 1973. Natural vegetation of Oregon and Washington. Gen. Tech. Rep. PNW-8. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1973. 417 pp.
- Gebhardt, K., W.S. Platts, M. Hill. 1990. Instream flow considerations for maintenance of wetland/riparian systems. Unpublished presentation at the Society of Wetland Scientists spring meeting, Breckenridge, Colorado.
- Hann, W.J. and M.E. Jensen. 1987. Ecosystem classification handbook. Chapter 4 - Ecodata sampling methods. Region I, USDA, Forest Service. Missoula, Montana.
- Hansen, P. 1989. Inventory, classification, and management of riparian sites along the upper Missouri National Wild and Scenic River. Montana Riparian Association, School of Forestry, University of Montana, 213 pp.
- _____. Plant Ecologist. University of Montana, Missoula, Montana. Personal Communication.
- _____. S.W. Chadde, R. Pfister, 1988. Riparian dominance types of Montana. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana, Misc. Publ. No. 49. 411 pp.
- _____. K. Boggs, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in southwestern Montana, draft version 2a, Montana Riparian Association, School of Forestry, University of Montana. 292 pp.

- _____. K. Boggs, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in central and eastern Montana, draft version 2, Montana Riparian Association, School of Forestry, University of Montana. 279 pp.
- Johnson, R.R., S.W. Carothers, and J.M. Simpson. 1984. A riparian classification system. in: R.E. Warner and K.M. Hendrix [eds]. *California Riparian Ecosystems—Ecology, Conservation, and Productive Management*. Univ. California, Berkeley. pp. 375-382.
- Kovalchik, B.L. 1987. Riparian zone associations: Deschutes, Ochoco, Fremont, and Winema National Forests. USDA Forest Service Region 6 Ecology Technical Paper 279-87 Pacific Northwest Region, Portland, Oregon. 171 pp.
- Kroetsch, D.J., C. Tamocai, and A. Eagle. 1988. The Canadian wetland registry users manual (draft manuscript). Land Resource Research Center, Ottawa, Ontario. 69 pp.
- Kuchler, A.W. 1964. Potential natural vegetation of the conterminous United States. Serial Publication No. 36. Am. Geographic Soc., New York, NY. 55 pp.
- Layser, E.F. 1974. Vegetative classification: its application to forestry in the northern Rocky Mountains. *J. For.* 72:354-357.
- National Wetlands Working Group, Canada Committee on Ecological Land Classification. 1986. *Wetlands of Canada*. 466 pp.
- _____. 1987. The Canadian wetland classification system (provisional edition). Lands Conservation Branch, Canadian Wildlife Service, Environment Canada, Ecological Land Classification Series No. 21. 18 pp.
- Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana. USDA Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station, Ogden, UT. 175 pp.
- Platts, W., S. Jensen, F. Smith, 1988. Preliminary classification and inventory of riverine riparian habitats livestock/fishery study areas, Nevada. Progress Report I. Nevada Department of Wildlife, Elko, Nevada. 127 pp.
- Rosgen, D.L. 1985. A stream classification system. in: *Riparian Ecosystems and Their Management—An Interagency North American Riparian Conference*. Gen. Tech. Rpt. ROM-120. Rocky Mountain Forest and Range Exp. Sta., Forest Service, U.S. Dept. Agr., Fort Collins, CO. pp. 91-95.
- Rubec, C.D.A. Environment Canada. Hull, Canada. Personal Communication.
- Swanson S., R. Miles, S. Leonard, and K. Genz. 1988. Classifying rangeland riparian areas: the Nevada task force approach. *Journal of Soil and Water Conservation*, 1988. 43:3.
- Szaro, R.C. 1989. Riparian forest and scrubland community types of Arizona and New Mexico. *Desert Plant* 9:3-4, pp. 70-138.
- Trewartha, G.T. and L.H. Horn. 1980. An Introduction to Climate. McGraw-Hill Book Company. 415 pp.

- U.S. Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy—a basic system of soil classification for making and interpreting soil surveys. Ag. Handb. No. 436. Washington, DC. 754 pp.
- _____. 1976. National range handbook, as amended. Washington, DC. 143 pp.
- _____. 1983. National soils handbook, as amended. Washington, DC. 619 pp.
- U.S. Department of Interior. 1990. National range handbook. BLM Manual Handbook H-4410-1. Bureau of Land Management, Washington, DC.
- Windell, J., B. Willard, D. Cooper, S. Foster, C. Knud-Hansen, L. Rink, and G. Kiladis. 1986. An ecological characterization of Rocky Mountain montane and subalpine wetlands. National Ecology Center, Division of Wildlife and Contaminant Research, USDI, Fish and Wildlife Service, Washington, DC. Biological Report 86(11). 298 pp.
- Youngblood, A.P., W.G. Padgett, and A.H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service, Intermountain Region, R4-Ecol-85-01. 78 pp.

Appendix A

Riparian Classification Comparison ^{*}

Name of Classification or Description	Physiographic Features	Geologic Features	Climatic Features
1. Standard Ecological Site Description	General orientation, geomorphic landform, slope ranges, elevation ranges.	Specific formations, parent rock or material included.	Range of average and seasonal distribution of precipitation and temperature for soil and ambient air.
2. Southwest Wetlands	Inherent to some degree in biogeographic realm.	Not provided.	Inherent in climate zone.
4. Riparian Zone Associations	Provided in description.	Provided in description.	Provided in description.
5. Riparian-Wetland Sites in Montana	Geomorphic landform & orientation, elevation ranges, provided for in narrative.	Provided.	Provided.
6. Nevada Task Force Approach	Provided at ecological site description level as in (1) above.		
7. Riverine Riparian Habitats	Provided as geologic district, land type association, and land type.	Provided as geologic district, land type association.	Provided as domain and division (Trewartha and Horn 1980).
9. Ecosystem Classification Handbook	Includes geomorphic landform, valley bottom type and subtype, Horton stream order.	Parent material description.	Not provided.
10. Wetland and Deepwater Habitats	General, from Bailey 1976.	Not provided.	General, from Bailey 1976.
11. Riparian Community Types	Provided.	Provided.	Provided.

* Classifications 3 and 8 are not included.

Riparian Classification Comparison (Continued)

Name of Classification or Description	Soils Features	Water Features	General Physical Features
1. Standard Ecological Site Description	Description of major properties, association of soils, SCS conventions, and soil taxonomy standards.	Stream type as defined by Rosgen. Flow regime, surface-ground-water features.	Given in site description. Similar to a site type.
2. Southwest Wetlands	Not provided.	Not provided.	Not provided.
4. Riparian Zone Associations	Provided.	Riverine systems are not specifically discussed, but water regime and fluvial process are generally covered.	Basic unit is riparian landform. Includes soils, fluvial process and water regime.
5. Riparian - Wetland Sites in Montana	Provide as standard SCS soil taxonomy.	Flow regime and sub-surface features are generally covered.	Given in site description. Includes soils, fluvial processes and water regimes.
6. Nevada Task Force Approach	Provided in naming convention.	Stream type as defined by Rosgen. Moisture condition as defined by Johnson and Carothers, 1981.	Provided in naming convention.
—Also provided at the ecological site level of classification—			
7. Riverine Riparian Habitats	Provided in land type, valley bottom units.	Described in riverine - riparian complexes and in riverine types.	Described at the riverine site level.
9. Ecosystem Classification Handbook	Uses SCS conventions.	Stream type as defined by Rosgen.	Basic physical description is called site type.
10. Wetlands and Deep-water Habitats	Provided as modifiers. Uses SCS hydric soils descriptions.	Identified at the sub-system level, substrate at the class and sub-class level, water persistence at the subsystem level.	Provided as modifiers.
11. Riparian Community Types	Provided, SCS standard.	Not provided.	Provided.

Riparian Classification Comparison (Continued)

Name of Classification or Description	Ecosystem Description	Existing Vegetation			
		Class	Subclass	Dominance	Composition
1. Standard Ecological Site Description	Major land resource area (MLRA) given.	Can be derived from dominance and composition.		Provided.	Provided.
2. Southwest Wetlands	Inherent in biogeographic realm, formation type, vegetation, regional formation (biome).	Obtained from formation type and regional formation.		Series and association.	Provided.
4. Riparian Zone Associations	Provided.	Can be obtained from dominance information.		Provided.	Provided.
5. Riparian-Wetland Sites in Montana	Provided. Can be used with USFWS (10).	Provided. (called formation class and subclass).	Provided.	Provided.	Provided.
6. Nevada Task Force Approach	Generally provided by land classes.	Provided.	Provided.	Provided.	Can be provided.
—Also provided at the ecological site level of classification—					
7. Riverine Riparian Habitats	Provided.	Can be obtained from dominance information.		Provided.	Provided.
9. Ecosystem Classification Handbook	Provided.	Provided in range, ecosystem, and vegetation type.		Provided.	Provided.
10. Wetland and Deep-water Habitat	Generally provided at system level as marine, estuarine, riverine, etc.	Provided.	Provided.	Provided.	Not required.
11. Riparian Community Types	Provided.			Provided.	Provided.

Riparian Classification Comparison (Continued)

Name of Classification or Description	Functional Ecological Description	PNC	Ecological Units Ecological Site	Community Type
1. Standard Ecological Site Description	Provided in site narrative.	Provided.	Provided.	Provided in site interpretation narrative.
2. Southwest Wetlands	Inherent to some degree at all levels.	Not specifically provided.		Association.
4. Riparian Zone Associations	Provided.	Provided.	Riparian association.	Provided.
5. Riparian - Wetland Sites in Montana	Provided in site interpretation.	Provided; called habitat type, or riparian association in describing what could occur on a riparian site type.		Provided in site description.
6. Nevada Task Force Approach	We assume a site description would accompany the site name.	Provided.	Provided.	Provided, called riparian community.
7. Riverine Riparian Habitats	Provided. - Also includes riverine-riparian complexes which appear very useful in relating riparian and riverine sites -	Provided.	Provided.	Provided.
9. Ecosystem Classification Handbook	Provided.	Provided; called habitat type, and a more detailed habitat type phase.		Provided; includes broader unit, called vegetation type, which groups similar community types.
10. Wetland and Deepwater Habitats	Not included.	Not required Could be placed as modifiers.		
11. Riparian Community Types	Provided.	Not given. Stable community given.	Not provided.	Provided.

Riparian Classification Comparison (Continued)

Name of Classification or Description	Description of Procedures Relevance to Site Management
1. Standard Ecological Site Description	Provided in site interpretation narrative. Relates various seral stages or community types with management actions such as grazing, wild fire, recreation. Also provides water-soil interaction description and related limiting factors.
2. Southwest Wetlands	Not provided, but could be easily accommodated in a site description, provided cause and effect and site correlation information is collected.
4. Riparian Zone Associations	Provided in site interpretation narrative. Relates various plant zone associations and community types with management actions such as grazing, wildfire, and recreation. Also provides water-soil interaction, Kovalchik description, and related limiting factors.
5. Riparian-Wetland Sites in Montana	Provided in site interpretation narrative. Relates various community types with management actions such as livestock, timber, wildlife, in fisheries, fire, soil management and rehabilitation opportunities, and recreational uses and considerations.
6. Nevada Task Force Approach	The reference provides an example of how site management relates to the classification system. It is assumed that site management features would be included in a classification conducted by the procedure.
7. Riverine Riparian Habitats	Provided in site interpretation narrative. Relates various community types with management actions such as grazing, wildfire, recreation, etc. Also provides water-soil interaction description and related limiting factors.
9. Ecosystem Classification Handbook	The ECODATA procedure includes a number of analysis techniques specifically for management. It is assumed that site management features would be included in classification documentation produced as a part of the interpretation and analysis of the ECODATA data base.
10. Wetland and Deep-water Habitats	Not provided.
11. Riparian Community Types	Some information is given on application to site management. Management information is given under succession/management sections.

Appendix B

Converting Between Classification Procedures (Vegetation)

Users of riparian classification procedures may want to convert from one procedure to another or may want to structure their inventory data to fit more than one classification process. Generally, it is difficult, if not impossible, to take a classification of lesser detail and fit it into a classification of greater detail. For example, it would be impossible, without additional data, to take information from National Wetlands Inventory, which utilizes the procedure of Classification of Wetlands and Deepwater Habitats, Cowardin et al. (1979), at a very general level, and place it into a process designed for community types and/or associations (potential natural community). On the other hand, an inventory that utilizes a very detailed level of vegetation inventory (dominance of species), within Cowardin's (1979) procedure, could be used in most of the other classification processes with some adjustment.

Where a procedure of classification has developed a key, such as in Montana, parts of Oregon, and eastern Idaho, general information on the composition of vegetation sites from less detailed classifications may require only minor field checking to make use of the information.

Users will have a much easier time classifying sites utilizing an existing classification in an area where it is applicable compared to developing new classifications in areas where none exist.

When transferring management recommendations from existing classifications to new areas, it is important that site information be collected to ensure that not only the vegetation is comparable, but that the site functions are comparable as well.

The following information in Appendices C-E should help in understanding and applying classification systems to a particular area.

Appendix C

Definition Crosswalk

(Vegetation Classification Terms)

Major terms are given with the applicable reference shown in parentheses. Terms having similar definitions are indented and given below with their applicable reference shown in parentheses.

Association
(4,5,6,9)

In normal usage, this is a climax community type or potential natural community. In riparian systems, because of their dynamic nature, a true climax community may not have an opportunity to occur (Youngblood et al. 1985). An association for a riparian environment is therefore a plant community type representing the latest successional stage attainable on a specific hydrologically influenced surface (Kovalchik 1987, Hansen 1989). Hansen (1989) uses the term "riparian association" while Youngblood et al. (1985) chose the term "potential stable community type" that approaches an association.

Community Type
(1,4,5,6,7,9)
Association (2)

All sites in which the dominant and/or indicator species are similar. The aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. The method in which community types are determined varies between procedure. Generally some type of statistical procedure is applied to composition or structural data that has been collected through a stratified mapping procedure. The discreteness of the mapping unit reflects the complexity of representative community type. In procedure (7), Platts et al. (1988) has a unit called a complex which may contain several community types that appear to be associated to similar riverine sequences. Community type names are generally determined from the name of the dominant or codominant species. Also, Dick-Peddie and Hubbard (1977) stress the importance of using obligate riparian species when determining the dominant species. This convention, however, is not specifically stated in all of the riparian classification procedures.

Dominant Species
(1,2,3,4,5,6,7,9,10)

Those species in a stand that have the greatest foliar canopy volume per unit area (9). Those species with at least 25 percent [30 percent in (10)] canopy coverage in the tallest layer of a site (5). Therefore, the method by which dominant species is collected should be known. Also, Dick-Peddie and Hubbard (1977) stress the importance of using obligate riparian species when determining the dominant species. This convention, however, is not specifically stated in all of the riparian classification procedures.

<p>Ecological Site (1,6) Range Site (1) Site Type (9) Riparian Site Type (5) Riverine Site (7) Riparian Site (7)</p>	<p>A distinctive type of land that differs from other kinds of land in its ability to produce a characteristic potential natural community. (This definition has been modified to not limit the natural community to just plants.) For example, as used in (7), a riverine site would be similar to the above but would produce a characteristic natural stream community.</p>
<p>Potential Natural Community (1,9) Climax Community(1)</p>	<p>The biotic community that would become established if all successional sequences were completed without interferences by man under the present environmental conditions. Often, the potential natural community of a site has to be estimated, since most managed sites support seral plant communities due to ongoing disturbance. Climax plant community as defined in (9) is the culminating stage in plant succession for a given environment that develops and perpetuates itself in the absence of disturbance (see habitat type).</p>
<p>Habitat Type (4, 5, 9)</p>	<p>All the land capable of producing similar communities at climax. A habitat type name incorporates those indicator plant species which best define the environment to be classified. A habitat type may or may not be synonymous with a range site/ecological site; most often it is a somewhat broader classification than the range site.</p>

Appendix D

Stream Classification - Wetland and Deepwater Habitats (10) Compared to Rosgen, 1985

- Riverine (10, 7, 6, 5)** Habitats contained within a channel and/or wetland (assuming also riparian) habitats dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens and habitats with water containing ocean-derived salts in excess of 0.5 parts per thousand (10). [This definition generally fits well with (7).]
- Tidal (10)** Low gradient with water velocity under tidal influence. Streambed is mainly mud with occasional patches of sand (10). Would be similar to a Rosgen C4, C5, C6, F4, F5.
- Lower Perennial (10)** Low gradient, low velocity water, no tidal influence with water flowing throughout the year. Substrates consists mainly of sand and mud (10). Would be similar to Rosgen C4, C5, C6, F4, F5.
- Upper Perennial (10)** High gradient, high velocity. The substrate consists of rock, cobbles, or gravel with occasional patches of sand (10). Similar to Rosgen A and B stream types.
- Intermittent (10)** The channel contains nontidal flowing water for only part of the year. When the water is not flowing, it may remain in pools or surface water may be absent (10). (This definition would also include ephemeral streams, those that only flow in response to precipitation.)

Appendix E

Classification of Wetland and Deepwater Habitats(10) Compared to Other Procedures (at the Class and Subclass Levels)

Class, Subclass (10)	The class is the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Subclasses are used for finer differentiation.
Emergent	<p>Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (10). Named marshland in (2).</p> <p>Emergent/saturated/organic soil is equivalent to fen (3, 10). In (3), this includes: Atlantic ribbed fen, basin fen, channel fen, collapse scar fen, feather fen, floating fen, horizontal fen, ladder fen, lowland polygon fen, net fen, northern ribbed fen, palsa fen, shore fen, slope fen, snowpatch fen, spring fen, and stream fen.</p> <p>An emergent/saturated/Palustrine area in (10) would be called herbaceous in (8).</p> <p>Emergent/saturated, fresh water/mineral soil is equivalent to marsh, fresh water in (8), or in (3), a subclass could be tidal fresh water marsh, floodplain marsh, stream marsh, channel marsh, active delta marsh, inactive delta marsh, terminal basin marsh, shallow basin marsh, kettle marsh, seepage track marsh, and shore marsh.</p> <p>Emergent/saturated/mixosaline/mineral soil is equivalent to marsh, saline water in (8) or estuarine high marsh, estuarine low marsh, coastal high marsh, and coastal low marsh in (3).</p>
Moss-Lichen	A saturated regime where mosses or lichens cover substrate other than rock and where emergents, shrubs, or trees make up less than 30 percent of the areal cover (10). Called a bog in (8). In (3) this includes: Atlantic plateau bog, basin bog, blanket bog, collapse scar bog, domed bog, flat bog, floating bog, lowland polygon bog, mound bog, northern plateau bog, palsa bog, peat mound bog, peat plateau bog, polygonal peat plateau bog, shore bog, slope bog, string bog, or veneer bog.
Aquatic Bed	Wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season (10). Called floating, rooted submerged, rooted floating, rooted emergent in (8). Called floating or submerged in (3). Called submergents in (2).

Scrub-shrub	<p>Areas dominated by woody vegetation less than 6 meters (20 feet) tall (10). Called a Swampscrub in (2); however, height is less than 12 m (35 feet). Called shrub type in (3).</p> <p>Scrub-shrub/saturated/organic soil is called a carr in (8).</p> <p>Scrub-shrub, saturated, fresh (acidic), organic soil in (10) called a shrub bog in (8).</p> <p>Scrub-shrub, seasonally flooded, fresh water, mineral soil in (10) called a shrub wetland, mineral soil, fresh water in (8).</p> <p>Scrub-shrub, seasonally flooded, hypersaline water, mineral soil in (10), called shrub wetland mineral soil, saline water in (8).</p>
Forested	<p>Characterized by woody vegetation that is 6 m tall or taller (20 feet) in (10). Called swampforest or riparian forest if taller than 35 feet, (12 m) in (2), treed in (3), coniferous or deciduous angiosperm forest in (8) [which relates to the subclasses of deciduous or evergreen in (10)].</p>
Streambed	<p>Wetlands contained between channels and that are not considered permanently exposed to water (10). Subclasses included bedrock, rubble, cobble-gravel, sand, mud, organic, and vegetated streambeds. Called a strand in (2).</p>
Unconsolidated Shore	<p>All wetlands having unconsolidated substrates with less than 75 percent areal cover of stones, boulders, or bedrock; less than 30 percent areal cover of vegetation other than pioneering plants; and not considered permanently covered by water throughout the growing season [see (10) for exact water regime definitions]. Subclasses include cobble-gravel, sand, mud, organic, and vegetated. Called a strand in (2).</p>
Rock Bottom	<p>All wetlands having an areal cover of stones, boulders, or bedrock 75 percent or greater (25 percent or greater for unconsolidated bottom), vegetative cover less than 30 percent, and are generally covered throughout the growing season with water.</p>

Appendix F

Processes and Associated Factors Controlling Riparian Function

Moisture/Inundation

Discharge	Climate/weather, watershed roughness/detention, slope.
Stage/Inundation/ Velocity	Discharge, channel geometry, energy dissipation (hydraulic controls, channel/flood plain roughness), hydraulic gradient.
Flood Plain Recharge	Substrate texture and configuration, stage/inundation (depth, extent, duration), vegetation.
Flood Plain Storage and Release	Substrate texture and configuration, flood plain recharge.
Saturated Surface	Recharge, substrate texture and configuration, hydraulic gradient.
Capillarity	Substrate texture and configuration, saturated surface.
Evapotranspiration Vegetation	Shading and wind, capillarity.

Physical and Chemical Water Quality

Aerobic State	Substrate texture and configuration, hydraulic gradient, vegetation density.
Salt Flux (flood plain)	Dissolved solids in saturated surface, capillarity, evapotranspiration, flood plain recharge.
Nutrient Flux	Transport/deposition, capillarity, recharge, evapotranspiration, biological processes.
Material Flux	Transport/deposition, vegetation, substrate texture, discharge.
Cation Exchange	Substrate texture and composition, vegetation.
Shading, Wind	Vegetation, geomorphology, topography.
Biologic Input/Release	Temperature, organisms, water chemistry.

Transport/Deposition

Degradation/Aggradation	Substrate, slope, stage, vegetation.
General Material	Availability of material, protection removal/transport (armoring), filtration, adsorption, stage (velocity).
Ice	Temperature, geomorphology, stage, velocity.

Geomorphology/Channel Geometry

Channel Cross-Section	Substrate texture and configuration, discharge, transport/deposition.
Sinuosity	Substrate texture and configuration, discharge, transport/deposition, hydraulic gradient.
Ice	Weather, stage/inundation/velocity, substrate.

Recruitment/Reproduction

Seed, Sprout	Transport/deposition, substrate texture, moisture/inundation.
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Survival

Moisture	Moisture/inundation.
Nutrients, Water Quality	Physical/chemical water quality, transport/deposition.
Solar	Shading.
Disturbance Factors	Stage/inundation/velocity, moisture factors, aerobic state, salt flux, shading, aggradation/degradation, material transport, ice, community dynamics (competition).

Community Dynamics

Community dynamics incorporates all of the reproduction/recruitment and survival factors.