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A TAXONOMIC CLASSIFICATION SYSTEM FOR MONTANA RIPARIAN VEGETATION TYPES

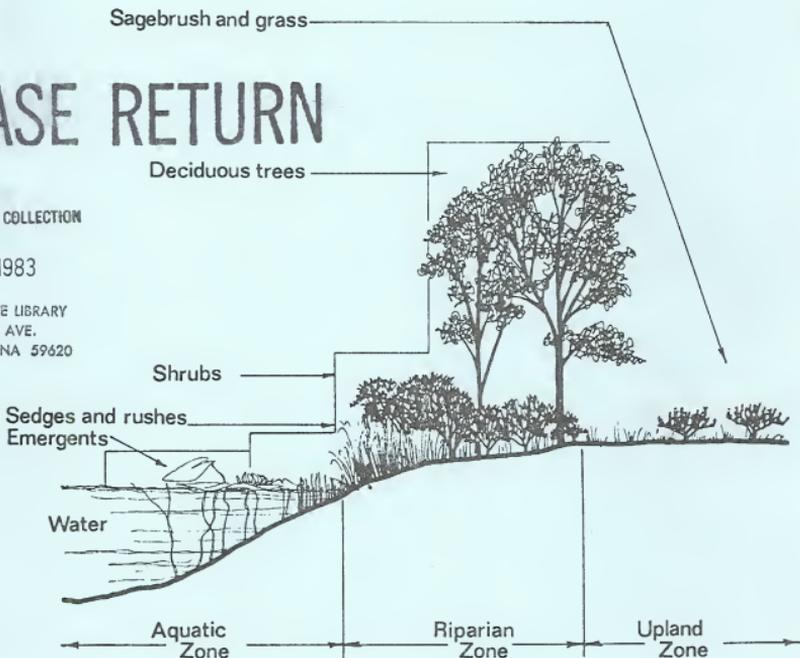
An Interagency Approach to Classifying Montana's Riparian Ecosystems

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Montana State Rural Areas Development Committee
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Bozeman, Montana
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ERRATA

The following line was omitted from the last paragraph on page 11,
"It is not to establish water or land use policy."

The paragraph should read: Riparian does not describe the purpose of this report and study. RAD's endorsement is for standardizing the vegetation classification in the state of Montana to facilitate meaningful communication among all concerned. It is not to establish water or land use policy.



A TAXONOMIC CLASSIFICATION SYSTEM
FOR
MONTANA RIPARIAN VEGETATION TYPES

An Interagency Approach to Classifying
Montana's Riparian Ecosystems

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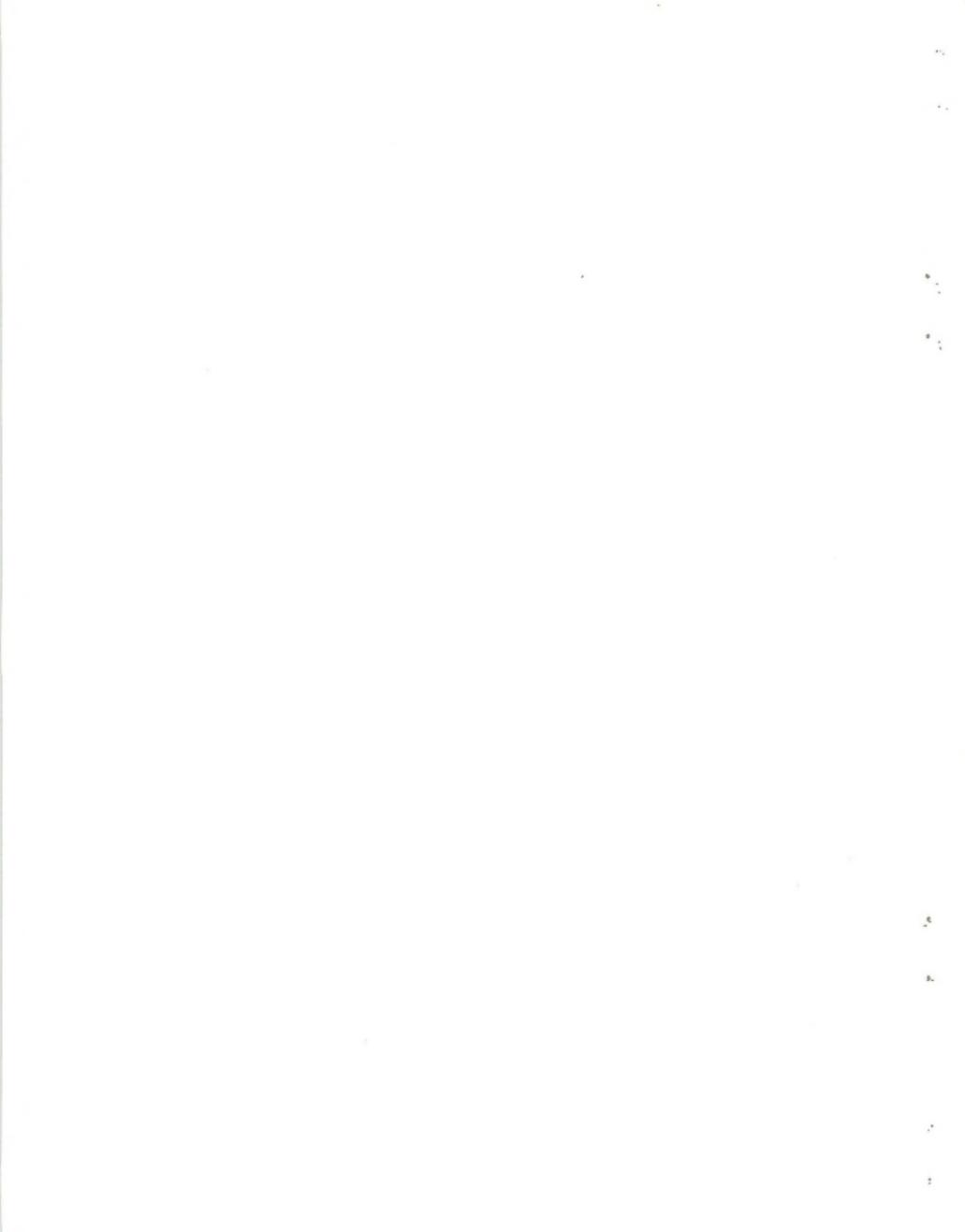
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Bozeman, Montana
March 1982



A TAXONOMIC CLASSIFICATION SYSTEM FOR
MONTANA RIPARIAN VEGETATION TYPES

A. INTRODUCTION

Riparian ecosystems are now recognized as being among the most productive of all ecosystems and are vitally important to the maintenance, stability, and productivity of their associated terrestrial and aquatic environments. These areas are subjected to a broad range of uses: wildlife and fish, livestock grazing, crop production, timber harvest, recreation, transportation corridors, and mining. Their management is complex, and coordination of these many uses is essential. Knowledge is limited.

A number of interesting and useful vegetation and ecological classification systems have evolved in recent years. Some have not been sufficiently developed to be applicable for western use; others are adaptable, but do not encompass riparian vegetation sufficiently to warrant serious consideration for "off-the-shelf" use. Virtually none of these classification systems gives more than passing attention to riparian systems.

Most riparian systems are intensely linear and dendritic in pattern. Standard polygonal or zonal systems with which we are accustomed are not suitable for riparian classification. With respect to riparian systems, there is still less uniformity of view and a considerably more restricted data base.

Resource managers in Montana do not presently have a riparian vegetation classification system. This lack of an accepted system has resulted in problems with communication of terms, condition assessment, planning, and proper management. The purpose of this system is to provide a uniform hierarchical sequence to the classification of Montana's riparian vegetation.

Descriptions of riparian vegetation and constituent elements are a basic requirement. The data base is restricted. However, the quantification of components and attributes in an orderly manner is dependent upon common descriptive terms. This system is an orderly process which will demonstrate ecological relationships, facilitate storage and retrieval of information in a uniform manner, and assist in the definition of problems and solutions. The system is designed to aggregate to the UNESCO, Cowardin, et al. (Classification of Wetlands and Deepwater Habitats of the United States) and the Intergency Component Land Classification for the United States (Driscoll, et al, 1981)

B. CLASSIFICATION CRITERIA AND APPROACHES

Efforts to build a working riparian classification for immediate multiagency and multidiscipline needs should be guided by several principles:

1. Potential users of a classification system should develop and test it cooperatively to insure common application upon completion.
2. The classification framework should be based on measurable or readily inferable features so that identification of units is consistent and repeatable (Driscoll, et al, 1981).

3. The classification system should have a formal taxonomy to allow consistent naming, identification, and communication (Bailey, et al, 1978). Taxonomic rules should be specified to allow consistent usage--both within and among users and geographic areas.
4. The classification should be hierarchical so that it can provide decisionmaking information at several geographic or administrative levels (Nelson, et al, 1978).
5. Maximum compatibility and consistency should be maintained with existing classification systems (Witmer, 1978).
6. Open-endedness and flexibility should be retained so that additional levels or taxonomic units can be added as knowledge accumulates (Witmer, 1978).
7. The classification should be field tested to demonstrate its technical soundness (Frayer, et al, 1978).
8. A clear distinction should be made between development of a taxonomic classification and development of a mapping system. Mapping systems of classification should be clearly tied to a taxonomic foundation (Bailey, et al, 1978).

The ideal riparian classification would require detailed knowledge of vegetation-site-management interactions. However, immediate management needs for inventory, mapping, and management prescriptions are ongoing and cannot wait until all the details are known. Recognizing this dilemma, the RAD Riparian Program Team suggests a three-phase approach to riparian classification needs:

Phase I. Development of an interagency taxonomic classification for existing vegetation types for immediate application to current management activities. Include provision for refinement, testing, and accumulation of shared knowledge.

Phase II. Carry out field investigations necessary to support and improve the classification and to gather information necessary for management of vegetation units identified.

Phase III. Encourage and actively support research essential to the development of a riparian classification that reflects site potential. Pioneering work in this area is being carried out by Tuhy and Jensen, Haglund and Weaver, and Foot.

C. TERMINOLOGY

Part of the difficulty in communicating about riparian ecosystems is in terminology and definitions. It must be recognized that no single descriptive definition, no matter how elegant, can effectively encompass all conceptual elements of riparian phenomena. Because of these problems, it is necessary to go back to the basic dictionary definitions and then reach common agreement on usage.

Riparian (adj.) - of or adjacent to water (dictionary). Since it is a commonly used and accepted term, we feel that it should be used in this taxonomic classification system. The word "riparian" is, however, avoided in the publication, Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al, 1979).

Because "riparian" is an adjective, it can usefully modify a multitude of other accepted terms. Warner (1979) has prepared a functional and easily understood riparian glossary. The following definitions are offered:

1. Riparian: pertaining to the banks and other adjacent terrestrial environs of freshwater bodies, watercourses, and surface-emergent aquifers whose transported waters provide soil moisture sufficiently in excess of that otherwise available locally to support a mesic vegetation differentiated from that of the contiguous, more xeric (arid) uplands.

2. Zone: an area delimited by determinable boundary lines; a region or area set off as distinct from surrounding or adjoining parts.

3. Habitat: the ecological and/or physical place, determined and delimited by the needs of a population or community, that contains a particular combination of environmental conditions sufficient for its survival. Perhaps equivalent to "niche."

4. Vegetation: the total plant cover of a zone or area.

5. Faunation: the total animal life in a zone or area; the assemblance of animal individuals of all species occurring at a locality (the equivalent form for animals as "vegetation" is for plants).

6. Community: an aggregation of living organisms having mutual relationships among themselves and to their environment.

7. System: a group of related natural objects and/or forces; a regularly interacting or interdependent group of items forming a unified whole.

8. Environment: the complex of climatic, edaphic, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival.

9. Ecosystem: the complex of a community and its environment functioning as an ecological unit in nature.

D. SCOPE OF APPLICATION

This classification has been developed to describe riparian vegetation associated with ephemeral, intermittent, and perennial streams. Vegetation of overland flow areas such as draws and coulees that have deep soils with high available water capacity is included in this classification. Collectively, such vegetation commonly has been referred to as streambank, stream corridor, flood plain, and river island vegetation, wet mountain meadows, woody bottoms, and hardwood draws.

This classification was not developed specifically to characterize riparian vegetation associated with marshes, swamps, prairie potholes, bogs, ponds, lakes, or reservoirs. However, it can be used to describe such riparian vegetation should the need arise.

E. THE TAXONOMIC SYSTEM

In developing the classification we have attempted to emphasize a hierarchical framework, objectivity, flexibility, utility, consistency, credibility, and simple workability. We recognize that it is not an ideal system because it does not incorporate all aspects of structure and function necessary for many interpretations. Nevertheless, it can provide a common foundation for immediate needs and a framework adaptable to future refinement.

The classification is a three-level hierarchy:

- I. Formation Class (dominant life form of existing vegetation)
 - A. Formation Subclass (secondary physiognomic feature)
 - 1. Dominance Type (floristic species dominance)

The formation and subformation levels are:

- I. Forest and Woodland (>16' tall, >25% canopy coverage)
 - A. Broad-leaved Deciduous
 - B. Needle-leaved Evergreen
 - C. Mixed Deciduous and Evergreen
- II. Shrub-Scrubland (<16' tall, >25% canopy coverage)
 - A. Broad-leaved Deciduous
 - B. Needle-leaved Evergreen
- III. Herbland
 - A. Forbs
 - B. Grasses
 - C. Sedges
 - D. Rushes
 - E. Mixed Forbs, Grasses, Sedges, or Rushes

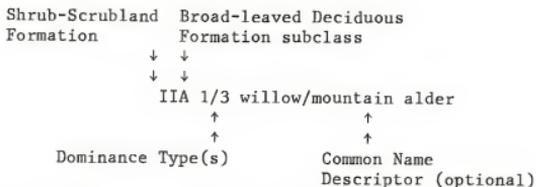
IV. Altered Environments

A. Non-native Vegetation

B. Non-vegetated

All three levels of the taxonomy are illustrated in Table 1. Simple plurality or dominance based on relative canopy coverage is the criterion for describing vegetation. A "mixed" category should not be used unless no individual species (or group) has greater than 25 percent canopy coverage.

Simple plurality affords a consistent base for aggregating data. Codominance is not explicitly provided for, but can be adopted for local usage or may be recorded routinely where a second species has greater than 25 percent canopy coverage. For example (refer to Table 1), a stand of willow 40 percent canopy coverage, mountain alder 30 percent, and hawthorn 20 percent would be described:



Hawthorn would not be included in the naming of the type because it accounts for less than 25 percent canopy coverage.

Successful use and refinement of this classification are completely dependent on developing a minimal data base to document major composition and distribution of these types.

Field personnel of cooperating agencies could collect a minimum of data on the composition and distribution of riparian vegetation in Montana. These data could be shared and accumulated at a central location and used to test, improve, and formally document information for future use. Involved agencies and other users should, therefore, designate and support a central data accumulation and analysis arrangement. This could be accomplished through establishment of a coordination committee consisting of representatives from the cooperating state and federal agencies, the two state universities, and other interested groups. Once designated, the committee could develop standard forms for collection of sample reconnaissance data by field workers and serve as a clearinghouse for implementing corrections, refinements, and additions to the classification system.

F. USING THE SYSTEM

The Montana riparian classification system was developed to describe vegetation from a broad perspective--from the extensive to the intensive. There has been an attempt, in the design of the system, to define the limits

of its application. The system contains, however, sufficient latitude to adequately describe vegetation units of a watershed, a stream reach, a coulee, or a research study site. The use and application of this classification system by cooperators will depend on their individual needs, goals, and management requirements. The classification has been designed for multiple resource use by a wide spectrum of resource disciplines (range, watershed, forestry, fisheries, wildlife, etc.) concerned with riparian vegetation.

Using the Montana riparian classification to describe vegetation units provides several advantages heretofore not available to resource specialists. Chief among these advantages are:

1. Quantifies vegetation components and attributes in an orderly manner, using common descriptive terms.
2. Uses standard common names in describing vegetation units.
3. Provides a common system of classification acceptable for multiple resource use by cooperating state and federal agencies and private entities.
4. Provides a framework for analysis, description, and interpretation of data.
5. Furnishes a facility for storage and retrieval of information in a uniform manner.
6. Provides criteria and description for identifying mapping units.

TABLE 1--A Taxonomic Framework for Montana Riparian Vegetation
Based on Existing Dominance

I. Forest and Woodland (>16' tall, >25% canopy cover)

A. Broad-leaved Deciduous¹

1. Black cottonwood (Populus trichocarpa)
2. Narrowleaf cottonwood (Populus angustifolia)
3. Eastern cottonwood (Populus deltoides)
4. Aspen (Populus tremuloides)
5. Birch (Betula papyrifera)
6. Ash (Fraxinus pennsylvanica)
7. Elm (Ulmus americana)
8. Boxelder (Acer negundo)
9. Russian-olive (Elaeagnus angustifolia)⁵
99. Mixed Broad-leaved²

TABLE 1 (continued)

TABLE 1--A Taxonomic Framework for Montana Riparian Vegetation
Based on Existing Dominance

B. Needle-leaved Evergreen¹

1. Interior ponderosa pine (Pinus ponderosa)
2. Interior Douglas-fir (Pseudotsuga menziesii)
3. Western larch (Larix occidentalis)
4. Grand fir (Abies grandis)
5. Western white pine (Pinus monticola)
6. Lodgepole pine (Pinus contorta)
7. Western redcedar (Thuja plicata)
8. Western hemlock (Tsuga heterophylla)
9. Spruce-subalpine fir (Picea spp. and/or Abies lasiocarpa)
10. Limber pine (Pinus flexilis)
99. Mixed needleleaf²

C. Mixed Deciduous and Evergreen¹

1. Black cottonwood/juniper (Populus trichocarpa/Juniperus scopulorum)
2. Narrowleaf cottonwood/juniper (Populus angustifolia/Juniperus scopulorum)
3. Eastern cottonwood/juniper (Populus deltoides/Juniperus scopulorum)
4. Black cottonwood/ponderosa pine (Populus trichocarpa/Pinus ponderosa)

II. Shrub-Scrubland (<16' >25% canopy cover)

A. Broad-leaved Deciduous¹

1. Willow (Salix spp. or Bebb willow Salix bebbiana, etc.)
2. Redosier dogwood (Cornus stolonifera)
3. Sitka alder (Alnus sinuata)
4. Mountain alder (Alnus tenuifolia)
5. Water birch (Betula occidentalis)
6. Chokecherry (Prunus virginiana)
7. Cherry (Prunus spp. or bittercherry Prunus emarginata, etc.)
8. Elder (Sambucus spp. or black elder Sambucus melanocarpa, etc.)
9. Hawthorn (Crataegus spp. or black hawthorn Crataegus douglasii, etc.)
10. Silverberry (Elaeagnus commutata)
11. Buffaloberry (Shepherdia argentea)
12. Shrubby cinquefoil (Potentilla fruticosa)
13. Currant (Ribes spp. or golden currant Ribes aureum, etc.)
14. Rose (Rosa spp. or Nootka rose Rosa nutkana, etc.)
15. Snowberry (Symphoricarpos spp. or common snowberry Symphoricarpos albus, etc.)
16. Silver sagebrush (Artemisia cana)
17. Alderleaf buckthorn (Rhamnus alnifolia)
18. Mountain maple (Acer glabrum)
99. Mixed broad-leaved²

TABLE 1 (continued)

TABLE 1--A Taxonomic Framework for Montana Riparian Vegetation
Based on Existing Dominance

- B. Needle-leaved Evergreen¹
1. Common juniper (Juniperus communis)
- III. Herbland
- A. Forbs¹
1. Cattail (Typha latifolia)
 2. Horsetail (Equisetum spp.)
 3. Cinquefoil (Potentilla spp. or silverweed cinquefoil Potentilla anserina, etc.)
- B. Grasses¹
1. Redtop (Agrostis alba)
 2. Sloughgrass (Beckmannia syzigachne)
 3. Tufted hairgrass (Deschampsia caespitosa)
- C. Sedges¹
1. Nebraska sedge (Carex nebraskensis)
 2. Inland sedge (Carex interior)
- D. Rushes¹
1. Baltic rush (Juncus balticus)
- E. Mixed Forbs, Grasses, Sedges, or Rushes²
- IV. Altered Environments
- A. Non-native Vegetation³
- B. Non-vegetated⁴

¹Vegetation components possible in the Dominance Type are not complete and are provided as examples only. Additional species can be added to the classification as identified.

²A plant community where no single species (or group, i.e., Forb or Grass) has greater than 25 percent canopy coverage.

³For use in describing those sites where naturally occurring vegetation has been removed or altered, and the site is devoted to crop production, hay, and/or pasture for domestic livestock.

⁴For use in describing those sites in urban buildup, industrial facilities, roads, railroads, livestock feedlots, farmsteads, etc.

⁵For convenience, Russian-olive, an introduced but naturalized tree, is considered a native species in this classification.

This classification system consists of four broad ecological systems--Forest and Woodland, Shrub-Scrubland, Herbland, Altered Environments--each of which contains a hierarchical structure that describes, in progressively greater detail, the vegetation components of the riparian environment.

In mapping, each element of the classification system is identified by either a letter or a number. The composite code identifying a particular riparian vegetation type consists of a series of numbers and letters and may contain the entire common name of the dominant plant species if judged of value to the user. The following is a typical illustration of how a riparian vegetation type is classified (from Table 1):

Formation Class	Forest and Woodland
↓Formation Subclass	Broad-leaved Deciduous
↓↓Dominance Type	Eastern Cottonwood
↓↓↓	
↓↓↓	
IA3 (Eastern cottonwood)	

In central Montana, this particular code would be indicative of a broad-leaved deciduous forest and woodland with eastern cottonwood (plains cottonwood subspecies) as the dominant species. Dominance types can be mixed where a second species has greater than 25 percent canopy coverage as shown in the following examples:

IIA 1/3 (willow/Sitka alder) - This particular code would denote a broad-leaved deciduous shrub-scrubland with willow and Sitka alder as codominants.

IIIE - This code would indicate a herbland dominated by a mix of forbs, grasses, sedges, or rushes.

For those sites where natural vegetation exists, but has been substantially altered (reduced canopy cover and/or plant vigor) by forces such as grazing, fire, or herbicide application, modifiers describing the alteration can be included in the naming of the type. A modifier to describe altered vegetation resulting from heavy grazing could be used as follows:

IIIA 1/2 (willow/redosier dogwood) heavily grazed

A vegetation type that has been visibly altered by fire could be named thus:

IA4 (aspen) recently burned

A stream corridor within an industrial site, urban residential development, livestock feedlot, etc., where the natural or native riparian vegetation has been removed, would be described as follows: IVB

For those sites where naturally occurring vegetation has been removed and replaced by introduced plant species, and the site is devoted to crop production, hay and/or pasture for domestic livestock, the following description would be used: IVA

G. RELATIONSHIP TO OTHER CLASSIFICATIONS

Forest Cover Types (Society of American Foresters 1980)

The proposed taxonomy is parallel in concept with the SAF cover types, although we are proposing consistent usage of canopy coverage rather than basal area. The conifer types are identical in either system. The SAF groups all cottonwoods in one type. This is not adequate for Montana riparian ecosystems; therefore, we are operating at the species level.

National Interagency Land (site) Classification System (Driscoll and Merkle 1981)

The proposed national land classification system is based on climax vegetation; we are using existing vegetation. For their upper hierarchy, however, Driscoll and Merkle are using the UNESCO classification. Our four levels are represented therein as five levels:

<u>UNESCO</u>		<u>MONTANA RIPARIAN WETLAND</u>
Closed Forest (>60% cover)	} → → →	Forest
Woodland (Open Forest) (25-60% cover)		
Shrub	} → → →	Scrub-Shrub
Dwarf Shrub		
Herbaceous		Herbaceous Altered Environments

Our classification system is compatible with that being developed by Driscoll and Merkle and will complement their system in describing riparian ecosystems in Montana.

Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al, 1979)

This Wetlands classification has five organizational levels:

- System (Marine, Estuarine, Riverine, Lacustrine, Palustrine)
- Sub-system (e.g., Intermittent Perennial, Upper Perennial, Lower Perennial)
- Class (1-Forested, 2-Scrub-Shrub, 3-Emergent, 4-Moss-Lichen, i.e., "Formation")
- Sub-class (Life-form, e.g., deciduous vs. coniferous)
- Dominance Type (Open-ended for species dominants)

The first two levels are place-proximity terms, useful for geographic perspective, but not essential for lower levels of taxonomic classification. The third level is similar to "Formation-Type" as used by Brown, Lowe, and Puse (1980). The fourth level is a useful subdivision of "Formation." The fifth level is a simple, dominance-by-species system for existing plant communities.

Our system generally follows the wetlands approach, recognizing that all persistent, emergent vegetation types will fall in Cowardin's "Palustrine" system. Some of Cowardin's categories (e.g., Broad-leaved Evergreen) are not

found in Montana. His "emergent, persistent class" is elevated to "Herbaceous" in our system to allow parallel subdivision to forest and shrub classes.

Brown, Lowe, and Pase (1980)

This seven-level hierarchical taxonomy is more complicated than necessary. We can relate to their second level (Formation-Type) and approximately to their fifth level (Series), although they use generic dominants where we prefer to use species dominants where feasible. Other levels in their system are based on climatic, geographic, and other features that unduly complicate a simple taxonomy at this stage of development. Their lower levels are inadequately defined and have internal contradiction between definitions and examples; therefore, we cannot clearly compare the two approaches.

H. COOPERATIVE OPPORTUNITIES

Because of joint responsibilities and expressed concerns relative to riparian zone management among the resource agencies, a cooperative approach would be the most cost-effective procedure. This will require a formalized structure with a definitive framework for cooperation. The need to integrate the classification system among agencies and other users is necessary and desirable. In addition, the cooperative approach provides ready access to new knowledge for refining procedures and applying them uniformly. Uniform application is essential if this classification is to function as a multiagency system.

The cooperative program committee should be chosen from the following organizations: Forest Service, Bureau of Land Management, Soil Conservation Service, U.S. Fish and Wildlife Service, Bureau of Reclamation, Montana Department of Fish, Wildlife and Parks, Montana Department of State Lands, Montana Department of Natural Resources and Conservation, University of Montana, Montana State University, utilities, water development associations, and agricultural interests.

A strong and active technical committee should be appointed from cooperators to furnish overall leadership and recommendations for shared funding, identification of research needs and necessary studies, application and dissemination of new knowledge, and program recommendations.

A research institution or organization should be designated to provide technical leadership and coordination for the purpose of sharing and accumulating data, evaluation, and publications. The first priority task could be coordination of a simple, efficient, rapid data collection effort to complete and document the taxonomic classification.

This document has been prepared by an ad hoc Riparian Program Team for the Wildlife Subcommittee of the Montana Rural Area Development Committee (RAD), Bozeman, Montana.

The paragraph should read: Riparian does not describe the purpose of this report and study. RAD's endorsement is for standardizing the vegetation classification in the state of Montana to facilitate meaningful communication among all concerned. It is not to establish water or land use policy.

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