

# Appendix I. Reprinted from the Journal of the Arizona-Nevada Academy of Science 14 (Suppl. 1):1-16. 1979.

## A DIGITIZED CLASSIFICATION SYSTEM FOR THE BIOTIC COMMUNITIES OF NORTH AMERICA, WITH COMMUNITY (SERIES) AND ASSOCIATION EXAMPLES FOR THE SOUTHWEST<sup>1/</sup>

DAVID E. BROWN, Arizona Game & Fish Department, Phoenix

CHARLES H. LOWE, University of Arizona, Tucson

CHARLES P. PASE, USDA Forest Service

**INTRODUCTION.** — In previous publications on the North American Southwest System we have addressed primarily the North American Southwest region as outlined in Fig. 1 (Brown and Lowe 1973, 1974a,b). Responses to both the classification system and the classification have been favorable in both general interest and use: e.g., Lacey, Ogden, and Foster 1975; Turner and Cochran 1975; Carr 1977; Dick-Peddie and Hubbard 1977; Ellis et al. 1977; Glinski 1977; Hubbard 1977; Pase and Laysen 1977; Steenbergh and Warren 1977; Patton 1978; BLM 1978a,b; Turner et al. 1979. In this report we expand the classification nomenclature at digit levels 1-4 to represent the North American continent.

The Southwest System is evolutionary in basis and hierarchical in structure. It is a natural biological system rather than primarily a geography-based one in the sense of Dice 1943; Bailey 1978; and others. The resulting *classifications* are, therefore, *natural hierarchies*.

Because of the open-ended characteristic of a natural hierarchical system, resulting classification provides for orderly change. The inherent accordion-type flexibility provides for expansion and contraction at all levels. It permits accommodation of new information into the classification — addition, transference, and deletion of both (a) ecological taxa, and (b) quantitative data on ecological parameters concerning taxa, as our knowledge accumulates on either or both. Digit levels 7 to n accommodate the latter and digit levels 1-6 accommodate the former (ecological taxa) on a world-wide basis.

The system's potential is the provision of a truly representative picture for biotic environment. It permits but does not require inclusion of any and all biotic criteria in a given classification — animals as well as plants. Thereby included in the system's uses are the mapping of wildlife habitats and the determination and delineation of natural areas on a local to world-wide basis (Brown, Lowe, and Pase 1977). On a local basis, overlapping soil mapping units can provide "habitat-types" with their implied biotic potential for land use planning purposes.

The digitation of hierarchy makes the system computer-compatible; e.g., a system or subsystem for storing and retrieving biotic resource data within or parallel to an overall management system. The Southwest System is currently in use in the RUNWILD program developed for field unit use on remote terminals by Region 3 of the Rocky Mountain Forest and Range Experiment Station, U.S. Forest Service (Patton 1978). The system and classification is similarly incorporated in the State of Arizona Resources Inventory System (ARIS). It is currently used by both industry and agencies for biological studies, resource inventories, and procedures for environmental analysis, for example as required by the National Environmental Policy Act.

The system is responsive to scale. The hierarchical sequence permits mapping at any scale, and various levels of the system have been mapped at 1:1,000,000 (1 inch represents ca. 16 miles), 1:500,000, 1:250,000, 1:62,500 (1 inch represents ca. 1 mile), and others. Moreover, the use of hierarchical sequence permits the needed flexibility for mapping those complex communities where more intensive levels are impractical or needlessly time consuming in a given investigation.

The classification has been expanded to include the major biotic communities of North America (Brown, Lowe, and Pase 1977, 1979). To facilitate communication with potential users, we provide, in addition to some structural modification of the original classification, a number of additional definitions and explanations. Our fourth level (biome) examples for North America are representative; they are not intended as either a definitive or final classification. Examples of the use of the system to the fifth (series = community) and sixth (association) levels are given here for those biomes located wholly or partially within the North American Southwest.

Incorporated in the present classification are contributions from approximately one hundred investigators, primarily biogeographers, wildlife biologists, and ecologists, all of which pertain to or are in general use in the Southwest today. Additional references are given in Brown and Lowe 1974a,b, 1977.

### A DIGITIZED HIERARCHY OF THE WORLD'S NATURAL ECOSYSTEMS

Where:

1,000 = Biogeographic (Continental) Realm

1,100 = Vegetation

1,110 = Formation-type

1,111 = Climatic (Thermal) Zone

1,111.1 = Regional Formation (Biome)

1,111.11 = Series (Community of generic dominants)

1,111.111 = Association (Community of specific dominants)

1,111.1111 = Composition-structure-phase

A number preceding the comma (e.g., 1,000) refers to the world's *biogeographic realms* (see Table 1). Origin and evolutionary history are recognized as primary in importance in the determination and classification of natural ecosystems. The mapable reality of the world's biogeographic realms is interpretive in part and dependent on criteria used. In those regions where the components of one realm merge gradually with those of another and the assignment of biogeographic origin is difficult, we include such transitional areas (wide ecotones) in both realms. The following seven realms are adapted from Wallace 1876; see also Hesse et al. 1937; Dansereau 1957; Darlington 1957; Walter 1973; I.U.C.N. 1974; DeLaubenfels 1975; Cox et al. 1976:

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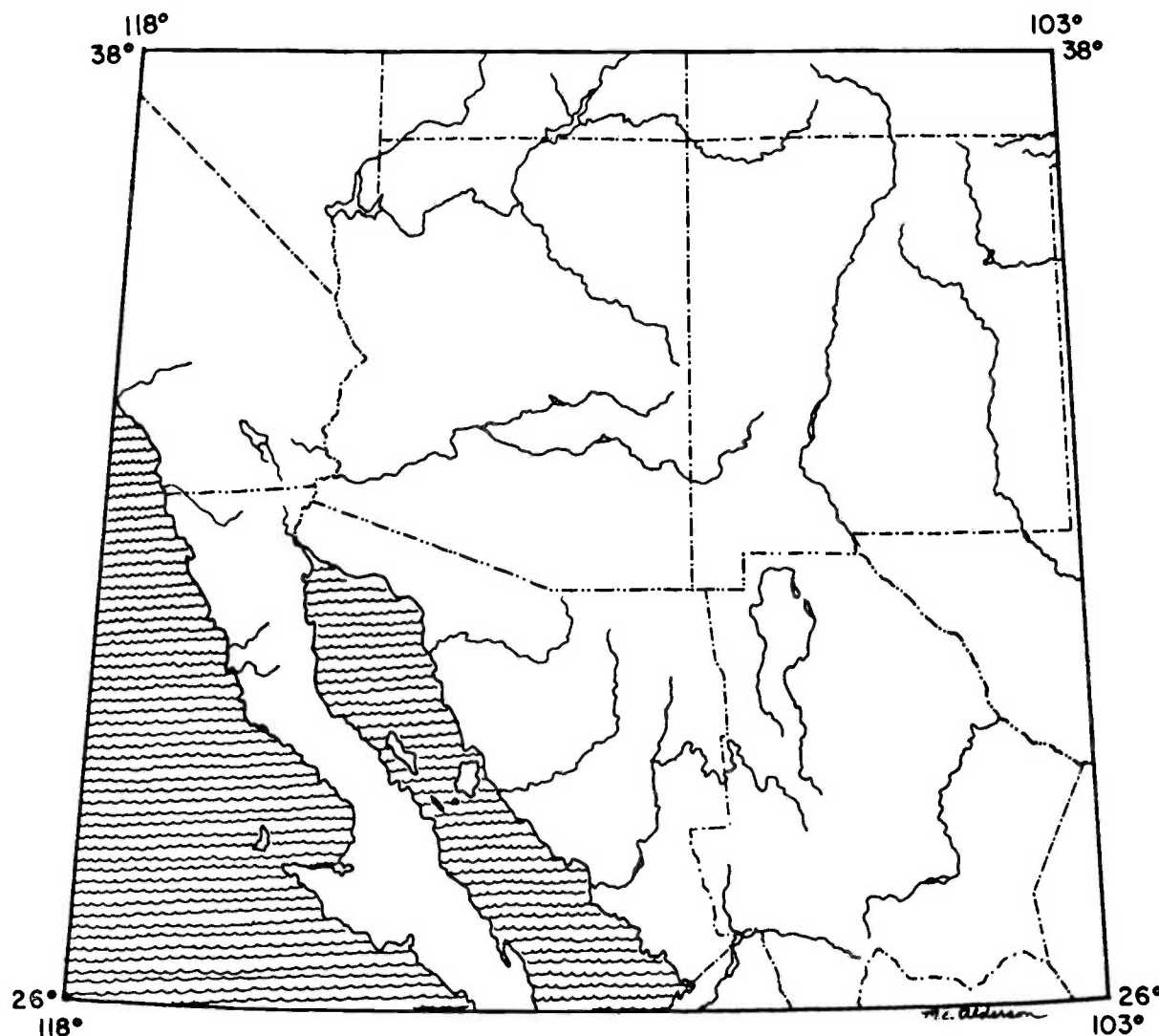


Figure 1. The Southwest. In delineating a *natural* Southwest region, approximately one half of the area falls in the Republic of Mexico and one half in the United States; the U.S. states of "Arizona and New Mexico" constitute less than half of the "American Southwest." Parts or all of the following states are included: Arizona, Baja California, California, Chihuahua, Coahuila, Colorado, Nevada, New Mexico, Sonora, Texas, Utah. All of Baja California and its associated islands (not completely shown) are included in our concept of a natural North American Southwest region; extreme northern Durango and Sinaloa are also included at Lat. 26° N.

1000 Nearctic	Continental North America exclusive of the tropics and certain highland areas south of the Tropic of Cancer. We include those tropic-subtropical regions in and adjacent to the North American Southwest and the Caribbean.	4000 Oriental	Southeast Asia, the Indian subcontinent; the Phillipines, Indonesia, etc.
2000 Palaearctic	Eurasia exclusive of the tropics. Africa north of the Sahel.	5000 Ethiopian	Africa south of the Sahara, Malagasy, and parts of the Arabian peninsula.
3000 Neotropical and Antarctic	Continental South America, Central America, and most of Mexico south of the Tropic of Cancer. Antarctica.	6000 Australian	Australia and Tasmania.
		7000 Oceanic	Oceanic islands processing a high degree of endemism.

*First Level.* — The first digit after the comma (e.g., 1,100) refers to vegetation, the structural and readily measurable reality of ecosystems. Included are all potential and/or existing plant communities that are presumed to be established naturally under existing climate and the cessation of artificially disruptive (man-caused) influences<sup>2/</sup> (Table 1).

Table 1. Summary for the Natural Vegetation of the World to the First Digit level.

Biogeographic Realm	1. Upland Vegetation	2. Wetland Vegetation
1,000. Nearctic	1,100.	1,200.
2,000. Palaeartic	2,100.	2,200.
3,000. Neotropical-Antarctican	3,100.	3,200.
4,000. Oriental	4,100.	4,200.
5,000. Ethiopian	5,100.	5,200.
6,000. Australian	6,100.	6,200.
7,000. Oceanic	7,100.	7,200.

All existing and potential natural vegetation (PNV) is classified as belonging to uplands (1,100) or wetlands (1,200) as in Table 1. Cultivated lands are designated 1,300 (cultivated uplands) and 1,400 (cultivated wetlands). The evolutionary distinctions between plants and animals of terrestrial (upland) ecosystems and those of aquatic or hydric (wetland) ecosystems is recognized by this dichotomy (see Ray 1975).

As discussed here, wetlands include those periodically, seasonally or continually submerged ecosystems populated by species and/or life forms different from the immediately adjacent (upland) climax vegetation, and which are dependent on conditions more mesic than provided by the immediate precipitation. Certain ecosystems having both upland and wetland characteristics and components (e.g., riparian forests) could be properly considered as belonging to both divisions. They are treated in this report as wetlands (1,200).

*Second Level.* — The second digit after the comma (e.g., 1,110) refers to one of the following recognized ecological formations, which on a worldwide basis are the *formation-types* (biome-types); see Tables 2 and 3. On continents these are referred to as formations, which are

vegetative responses (functions) to integrated environmental factors, most importantly plant-available moisture.

UPLAND FORMATIONS

- Tundra<sup>3/</sup> Communities existing in an environment so cold that moisture is unavailable during most of the year, precluding the establishment of trees, and in which maximum vegetation development is of herbaceous root perennials, shrubs, lichens and mosses, with grasses poorly represented or at least not dominant.
- Forest and Woodland
- Forest Communities comprised principally of trees potentially over 15 meters (50 ft) in height, and frequently characterized by closed and/or multilayered canopies.
- Woodland Communities dominated by trees with a mean potential height usually under 15 meters in height, the canopy of which is usually open — sometimes very open<sup>4/</sup> — or interrupted and singularly layered.
- Scrubland Communities dominated by sclerophyll or microphyll shrubs and/or multi-stemmed trees, generally not exceeding 10 meters (31 ft) in height and usually presenting a closed physiognomy, or, if open, interspersed with other perennial vegetation.
- Grassland Communities dominated actually or potentially by grasses and/or other herbaceous plants.
- Desertland Communities in an arid environment — usually less than 300 mm (12 in) precipitation per annum — in which plants are separated by significant areas devoid of perennial vegetation.

Table 2. Summary for the Natural UPLAND Vegetation of the World to the Second Level (Formation-Type).

Biogeographic Realm	Formation Type					
	1. Tundra	2. Forest	3. Scrubland	4. Grassland	5. Desertland	6. Nonvegetated
1,000 Nearctic	1,110	1,120	1,130	1,140	1,150	1,160
2,000 Palaeartic	2,110	2,120	2,130	2,140	2,150	2,160
3,000 Neotropical-Antarctican	3,110	3,120	3,130	3,140	3,150	3,160
4,000 Oriental	4,110	4,120	4,130	4,140	4,150	4,160
5,000 Ethiopian	5,110	5,120	5,130	5,140	5,150	5,160
6,000 Australian	6,110	6,120	6,130	6,140	6,150	6,160
7,000 Oceanic	7,110	7,120	7,130	7,140	7,150	7,160

<sup>2/</sup>Our thinking on the complex question of determining climax, successional, and potential vegetation is to consider (and map) ecosystems on the basis of the existing or presumed vegetation of the foreseeable future.

<sup>3/</sup>The holistic integrity of a "Tundra" formation is not without question. Treated here, tundra may also be composed of grasslands, scrublands, marshlands (wet tundra), and desertlands in an Arctic-Boreal climatic zone (Billings and Mooney 1968; Billings 1973; and others).

<sup>4/</sup>The "savanna" formation (Dansereau 1957; Dyksterhuis 1957; and others) is here recognized (in North America) as an ecotone between woodland and grassland. Those homogeneous areas in which the crowns of trees normally cover less than approximately 15 percent of the ground space are classified as grasslands where grasses are actually or potentially dominant (= savanna grassland). Mosaics of grassland and smaller or larger stands of trees and shrubs are "parklands" and are composed of two or more ecologically distinct plant formations (Walter 1973).

Table 3. Summary for the Natural WETLAND Vegetation of the World to the Second Level (Formation-Type).

Biogeographic Realm	Formation Type					
	1. Wet Tundra	2. Forest <sup>1/</sup>	3. Swamp-scrub, Riparian Scrub	4. Marshland	5. Strandland	6. Submergent Aquatic
1,000 Nearctic	1,210	1,220	1,230	1,240	1,250	1,260
2,000 Palaearctic	2,210	2,220	2,230	2,240	2,250	2,260
3,000 Neotropical-Antarctican	3,210	3,220	3,230	3,240	3,250	3,260
4,000 Oriental	4,210	4,220	4,230	4,240	4,250	4,260
5,000 Ethiopian	5,210	5,220	5,230	5,240	5,250	5,260
6,000 Australian	6,210	6,220	6,230	6,240	6,250	6,260
7,000 Oceanic	7,210	7,220	7,230	7,240	7,250	7,260

<sup>1/</sup>Swampforests, bog-forests and riparian forests.

## WETLAND FORMATIONS

Wet Tundra <sup>2/</sup>	Wetland communities existing in an environment so cold that available plant moisture is unavailable during most of the year, precluding the establishment of trees and all but a low herbaceous plant structure in a hydric matrix.
Swampforest; Riparian Forest	Wetland communities possessing an overstory of trees potentially over 10 meters (31 ft) in height, and frequently characterized by closed and/or multilayered canopies.
Swampscrub; Riparian Scrub	Wetland communities dominated by short trees and/or woody shrubs, generally under 10 meters (31 ft) in height and often presenting a closed physiognomy.
Marshland	Wetland communities in which the principal plant components are herbaceous emergents which normally have their basal portions annually, periodically, or continually submerged.
Strandland	Beach and river channel communities subject to infrequent but periodic submersion, wind driven waves and/or spray. Plants are separated by significant areas devoid of perennial vegetation. <sup>3/</sup>
Submergent Aquatic	Aquatic communities comprised entirely or essentially of plants mostly submerged or lacking emergent structures.

Some localized upland and wetland areas are essentially without vegetation or are sparingly populated by simple organisms, e.g., on some dunes, lava flows, playas, sinks, etc. For purposes of classification certain of such areas could be considered as belonging to a *non-vegetated formation-type* (Tables 2 and 3).

*Third Level.* — *The third digit beyond the comma* (e.g., 1,111) refers to one of four world *climatic zones* (c.f. Walter 1973; Ray 1975; Cox et al. 1976), in which minimum temperature remains a major evolutionary control of and within the zonation and the formation-types (Tables 4 and 5). All four of these broad climatic zones are found in North America and in the "Southwest."

<sup>1/</sup>Treated here, tundra may also be composed of grasslands, scrublands, marshlands (wet tundra), and desertlands in an Arctic-Boreal climatic zone; see footnote 3.

<sup>2/</sup>Strand communities are situated in harsh physical environments that produce their characteristic physiognomy. Accordingly, strandland is treated as the wetland equivalent of desertland. While occurring in the usual sense on beaches and other seacoast habitats, freshwater (or interior) strands also occur in river channels, along lake margins, and below reservoir high water lines.

Arctic-Boreal (Antarctic-Austreal)

Characterized by lengthy periods of freezing temperatures, with growing season of short duration (generally 60-150 days), occasionally interrupted by nights of below freezing temperatures.

Cold Temperate

Freezing temperatures of short duration although of frequent occurrence during winter months. Potential growing season generally 100-200 days and confined to spring and summer when freezing temperatures are infrequent or absent.

Warm Temperate

Freezing temperatures of short duration but generally occurring every year during winter months. Potential growing season over 200 days with an average of less than 125-150 days being subject to temperatures lower than 0 °C or to chilling fogs.

Tropical-Subtropical

Infrequent or no 24-hour periods of freezing temperatures, chilling fogs or wind.

*Fourth Level.* — *The fourth digit beyond the comma* (e.g., 1,111.1) refers to a subcontinental unit that is a *major biotic community* (=biome). Biomes are natural communities characterized by a distinctive vegetation physiognomy within a formation; accordingly, the natural geography of biomes is commonly *disjunctive*. A single biome is not to be confused with a single biotic (biogeographic) province; in distribution, a province is always a *continuous* (non-disjunctive) biogeographic area that may include several (e.g., five or more) biomes.<sup>4/</sup>

Our nomenclature at the biome (fourth) level incorporates useful geographic terms in the same sense of Weaver and Clements (1938). While such terms are also associated with biotic provinces (as in Fig. 2) we are classifying biomes, not biotic provinces. Biomes are characterized by a distinctive evolutionary history within a formation; thus they tend to be centered in, but are not restricted to particular biogeographic regions or provinces (e.g., see Weaver and Clements 1938; Clements and Shelford 1939; Pitelka 1941, 1943; Dice 1939, 1943; Odum 1945; Allee et al. 1949; Kendeigh 1954, 1961; Dansereau 1957; Shelford 1963; Daubenmire and Daubenmire 1968; Udvardy 1975; Dasmann 1976).

This fourth level and the fifth level (below) have provided the most successful and useful mapping of states, regions, and continents (e.g., in North America, Harshberger 1911; Shreve 1917, 1951; Shantz and Zon 1924; Bruner 1931; Morris 1935; Wieslander 1935; Brand 1936;

<sup>4/</sup>Originally termed *biotic provinces* by Lee Dice (1943) who developed this biogeographic concept in North America between 1922 (biotic areas) and 1943 (biotic provinces), they have been referred to variously in recent literature as "biotic provinces" (Dasmann 1972, 1974; IUCN 1973), "biogeographic provinces" (Udvardy 1975; Dasmann 1976), "ecoregions" (Bailey 1976, 1978), and "biogeographic provinces" (Franklin 1977).

Table 4. Summary for the Natural UPLAND Vegetation of Nearctic and Adjacent Neotropical North America to the Third Level.

Formation	Climatic (Thermal) Zone			
	1. Arctic-Boreal	2. Cold Temperate	3. Warm Temperate	4. Tropical-Subtropical
1,110 Tundra	1,111			
1,120 Forest & Woodland	1,121	1,122	1,123	1,124
1,130 Scrubland	1,131	1,132	1,133	1,134
1,140 Grassland	1,141	1,142	1,143	1,144
1,150 Desertland	1,151	1,152	1,153	1,154
1,160 Nonvegetated	1,161	1,162	1,163	1,164

Table 5. Summary for the Natural WETLAND Vegetation of Nearctic and Adjacent Neotropical North America to the Third Level.

Formation	Climatic (Thermal) Zone			
	1. Arctic-Boreal	2. Cold Temperate	3. Warm Temperate	4. Tropical-Subtropical
1,210 Wet Tundra	1,211			
1,220 Forest <sup>‡</sup>	1,221	1,222	1,223	1,224
1,230 Swampscrub	1,231	1,232	1,233	1,234
1,240 Marshland	1,241	1,242	1,243	1,244
1,250 Strandland	1,251	1,252	1,253	1,254
1,260 Submergent Aquatic	1,261	1,262	1,263	1,264

<sup>‡</sup>Swampforests, bog-forests and riparian forests.

Nichol 1937; LeSueur 1945; Jensen 1947; Leopold 1950; Castetter 1956; Küchler 1964, 1977; Brown 1973; Franklin and Dyrness 1973; Brown and Lowe 1977). Biomes and biogeographic provinces are also the bases for the biosphere reserve program (MAB) in the United States and elsewhere (IUCN 1974; Franklin 1977).

A partial summary of the biotic communities (biomes) for Nearctic and adjacent Neotropical America is given in Tables 6 and 7.

*Fifth Level.* — *The fifth digit beyond the comma* (e.g., 1,111.1) refers to the principal plant-animal communities within the biomes, distinguished primarily on taxa that are distinctive climax plant dominants. Daubenmire and Daubenmire (1968) organized their data according to major dominants in climax communities referred to as *climax series*. "Series," or "cover-types" (sensu Society of American Foresters 1954), or "vegetation-types" (sensu Flores et al. 1971), are each composed of one or more biotic associations characterized by shared climax dominants within the same formation, zone, and biome (Oosting 1950; Lowe 1964; Franklin and Dyrness 1973; Pfister et al. 1977). For example, within Rocky Mountain montane conifer forest (122.3), the Pine Series (122.32) includes all of the Rocky Mountain forest associations in which *Pinus ponderosa* is a dominant.

Community diversity of tropical and subtropical upland climax dominants is inherently more complex than in boreal and temperate communities. Moreover, some taxa may exhibit polymorphism to the extent that the same species may be dominant — and ecotypically differentiated — in more than a single formation. As an extreme case in southwestern North America, mesquite (*Prosopis juliflora*) may be a dominant life-form in certain desertland, disclimax grassland, scrubland, woodland, and riparian forest communities, and exhibit phenotypic and presumably genotypic population differentiation across the complex gradient. Facultative growth-form is exhibited by dominant plant taxa in both cold and warm climatic zones.

The distribution of some plant dominants also may span more than a single climatic zone, as in *Larrea*, *Prosopis*, and the introduced

*Tamarix*. However, important plant and animal associates of these dominant species are usually encountered when passing from one formation or climatic zone to another. When specific and generic dominants are shared by more than one biome, closer investigation may reveal genetic geographic variation within the shared species, as in the chromosome races of creosotebush (*Larrea divaricata*, Yang and Lowe 1968; Yang 1970).

It is clear that the determination of fifth and sixth (below) level communities in particular will require modification and revision in the classification as field data accumulate. Some of the more widely distributed and commonly recognized series in the Southwest are given in Tables 6 and 7 under the appropriate biome.

*Sixth Level.* — *The sixth digit beyond the comma* (e.g., 1,111.11) refers to distinctive plant associations, and associates (successional associations), based on the occurrence of particular dominant species more or less local or regional in distribution and generally equivalent to habitat-types as outlined by the Daubenmires (1968), Laysen (1974), Pfister et al. (1977), and others. While we give examples for certain communities within southwestern biomes, the enormous numbers of sets precludes presentation here for the treatments given in Tables 6 and 7. Associations may be added at length for regional studies by using a, b, c, sets as is also indicated in the tables in Brown and Lowe (1974a,b).

*Seventh Level.* — *The seventh digit beyond the comma* (e.g., 1,111.111) accommodates detailed measurement and assessment of quantitative structure, composition, density and other attributes for dominants, understories, and other associated species. This level and additional ones in the system provide the flexibility required for encompassing data for ecological parameters measured in intensive studies on limited areas (see e.g., Dick-Peddie and Moir 1970).

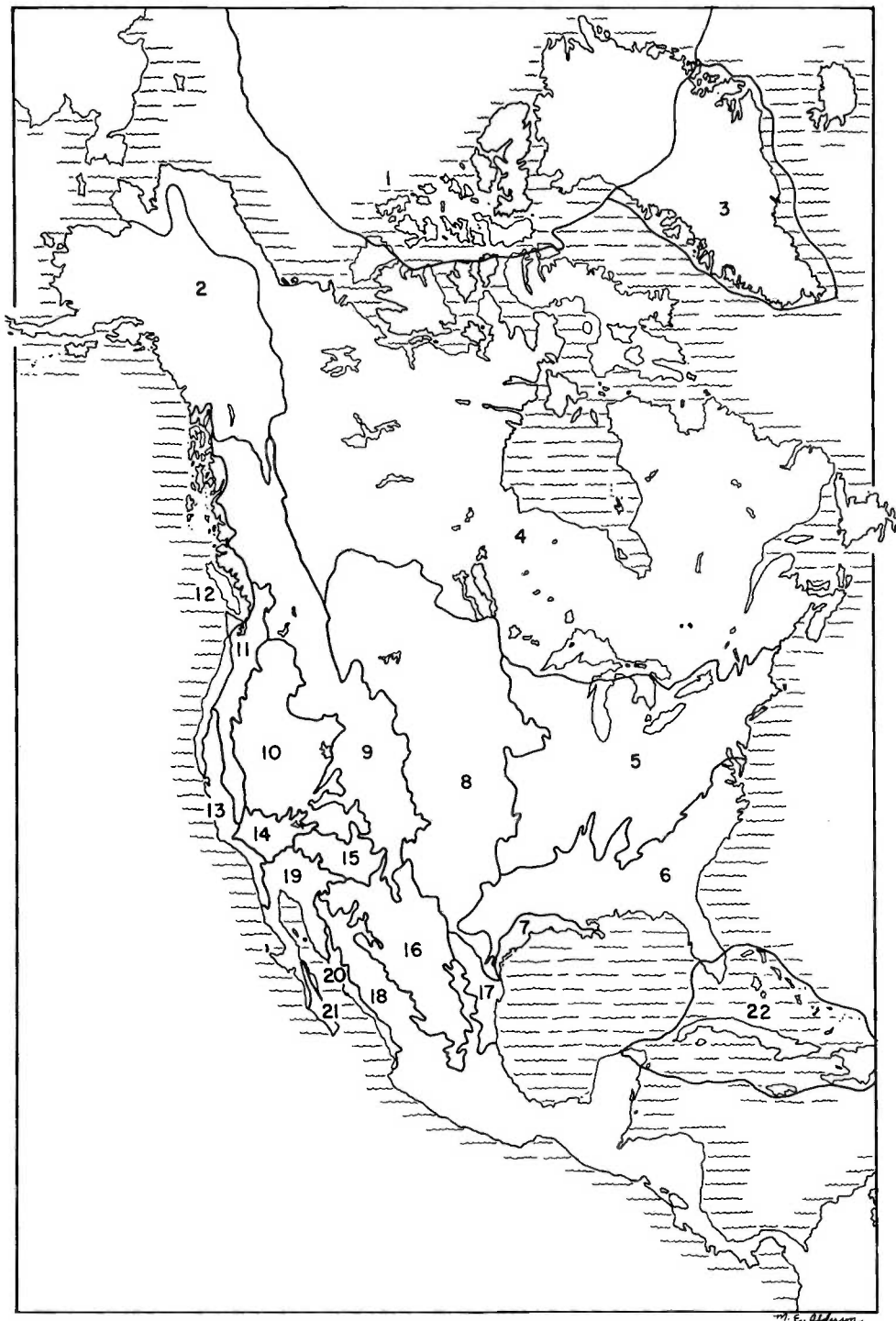


Figure 2. Biogeographic provinces of Nearctic and adjacent Neotropical North America (modified after Dice 1943, and Dasmann 1974), discussed in text under fourth (Biome) digit level.

- |                 |                      |                         |
|-----------------|----------------------|-------------------------|
| 1. Polar        | 8. Plains            | 15. Mogollon (Interior) |
| 2. Alaskan      | 9. Rocky Mountain    | 16. Chihuahuan          |
| 3. Greenlandian | 10. Great Basin      | 17. Tamaulipan          |
| 4. Canadian     | 11. Sierran-Cascade  | 18. Madrean             |
| 5. Northeastern | 12. Sitkan-Oregonian | 19. Sonoran             |
| 6. Southeastern | 13. Californian      | 20. Sinaloan            |
| 7. Gulf Coastal | 14. Mohavian         | 21. San Lucan           |
|                 |                      | 22. Carribean           |

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Table 6. Nomenclature of UPLAND Biotic Communities of Nearctic and Adjacent Neotropical North America with Community (Series) and Association Examples for the North American Southwest.

1,100 Nearctic Upland Vegetation	122.311 <i>Pseudotsuga menziesi</i> Association*
1,110 Tundra Formation	122.312 <i>Pseudotsuga menziesi-Abies concolor</i> Association*
1,111 Arctic Tundras	122.313 <i>Pseudotsuga menziesi</i> -mixed conifer ( <i>Abies concolor</i> , <i>Pinus flexilis</i> , <i>Acer glabrum</i> , <i>Populus tremuloides</i> , <i>Pinus ponderosa</i> ) Association*
1,111.1 Polar (High Arctic) Tundra	122.314 <i>Populus tremuloides</i> subclimax Association*
1,111.2 Alaskan (Low Arctic) Coastal Tundra	122.32 Pine Series*
1,111.3 Canadian (Barren Ground = Low Arctic) Tundra	122.321 <i>Pinus ponderosa</i> Association*
1,111.4 Arctic Alpine Tundra	122.322 <i>Pinus ponderosa</i> -mixed conifer Association*
1,111.5 Rocky Mountain Alpine Tundra	122.323 <i>Pinus ponderosa-Quercus gambeli</i> Association*
1,111.51 <sup>1/2</sup> Lichen-Moss Series*	122.324 <i>Pinus ponderosa-Quercus arizonica</i> Association*
111.511 <i>Rhizocarpon geographicum</i> Association*	122.325 <i>Pinus ponderosa-Juniperus deppeana</i> Association*
111.52 Mixed Herb Series*	122.326 <i>Populus tremuloides</i> subclimax Association*
111.53 Avens-Sedge Series*	122.327 <i>Pinus flexilis reflexa</i> Association*
111.531 <i>Geum turbinatum</i> Association*	122.328 <i>Pinus ponderosa-Pinus leiophylla</i> Association*
111.532 <i>Geum turbinatum-Carex bella</i> Association*	122.33 Gambel Oak Series*
111.54 Woodrush Series*	122.331 <i>Quercus gambeli</i> Association*
111.541 <i>Kobresia bellardi</i> -grass-forb Association*	122.4 Great Basin Conifer Woodland
111.6 Sierran-Cascade Alpine Tundra	122.41 Pinyon-Juniper Series*
111.61 Lichen-Moss Series*	122.411 <i>Pinus edulis-Juniperus scopulorum</i> Association*
111.62 Mixed Herb Series*	122.412 <i>Pinus edulis</i> Association*
111.621 <i>Selaginella watsoni-Eriogonum umbellatum</i> et al. Association*	122.413 <i>Juniperus scopulorum</i> Association*
111.7 Adirondack-Appalachian Alpine Tundra	122.414 <i>Pinus edulis-Juniperus monosperma</i> Association*
120 Forest and Woodland Formation	122.415 <i>Juniperus monosperma</i> Association*
121 Boreal Forests and Woodlands	122.416 <i>Pinus monophylla-Juniperus osteosperma</i> Association*
121.1 Canadian Subarctic Conifer Forest and Woodland (North American Taiga)	122.417 <i>Pinus monophylla</i> Association*
121.2 Appalachian Subalpine Conifer Forest	122.418 <i>Juniperus osteosperma</i> Association*
121.3 Rocky Mountain Subalpine Conifer Forest and Woodland <sup>2/3</sup>	122.419 <i>Pinus monophylla-Juniperus californica</i> Association*
121.31 Engelmann Spruce-Alpine Fir Series*	122.411a <i>Juniperus californica</i> Association*
121.311 <i>Picea engelmanni-Abies lasiocarpa</i> Association*	122.412a <i>Pinus quadrifolia-Juniperus californica</i> Association*
121.312 <i>Picea engelmanni</i> Association*	122.413a <i>Pinus quadrifolia</i> Association*
121.313 <i>Abies lasiocarpa</i> Association*	122.414a <i>Pinus monophylla-Juniperus californica-chaparral</i> Association*
121.314 <i>Abies lasiocarpa arizonica</i> Association*	122.5 Sierran-Cascade Montane Conifer Forest
121.315 <i>Picea pungens</i> Association*	122.51 Mixed Conifer Series*
121.316 <i>Populus tremuloides</i> subclimax Association*	122.511 <i>Abies concolor</i> -mixed conifer ( <i>Pinus contorta murrayana</i> , <i>Pinus jeffreyi</i> et al.) Association*
121.32 Bristlecone Pine-Limber Pine Series*	122.52 Pine Series*
121.321 <i>Pinus aristata-Pinus flexilis</i> Association*	122.521 <i>Pinus ponderosa</i> Association*
121.322 <i>Pinus aristata</i> Association*	122.522 <i>Pinus ponderosa-P. jeffreyi</i> Association*
121.323 <i>Pinus flexilis</i> Association*	122.523 <i>Pinus ponderosa-Quercus kelloggii</i> Association*
121.4 Sierran-Cascade Subalpine Conifer Forest	122.524 <i>Pinus jeffreyi</i> Association*
121.41 Limber Pine-Lodgepole Pine Series*	122.53 Black Oak Series
121.411 <i>Pinus flexilis-Pinus contorta murrayana</i> Association*	122.531 <i>Quercus kelloggii</i> Association*
121.412 <i>Pinus flexilis</i> Association*	122.6 Madrean Montane Conifer Forest
121.5 Madrean Subalpine Conifer Forest	122.61 Douglas-fir-Mixed Conifer Series*
122 Cold Temperate Forests and Woodlands	122.611 <i>Pseudotsuga menziesi</i> Association*
122.1 Northeastern Deciduous Forest	122.612 <i>Pseudotsuga menziesi-Pinus flexilis, Acer glabrum, Populus tremuloides, Pinus ponderosa</i> et al. Association*
122.2 Pacific Coastal (Oregonian) Conifer Forest	122.62 Pine Series*
122.3 Rocky Mountain (= Petran) Montane Conifer Forest	122.621 <i>Pinus flexilis ayacahuite</i> Association*
122.31 Douglas-fir-White Fir (= Mixed Conifer) Series*	122.622 <i>Pinus ponderosa</i> Association*
	122.623 <i>Pinus ponderosa</i> -mixed conifer Association*
	122.624 <i>Pinus ponderosa-Quercus</i> spp. Association*
	122.625 <i>Pinus ponderosa-Juniperus deppeana</i> Association*
	123 Warm Temperate Forests and Woodlands
	123.1 Southeastern Mixed Deciduous and Evergreen Forest
	123.2 Californian Mixed Evergreen Forest
	123.21 Mixed Mesophytic Series*

\*Examples only.

<sup>1/2</sup>The first "1" (in front of comma and representing the Nearctic Realm) is understood, and cropped for tabular convenience only, from this point onward.

<sup>2/3</sup>Separation of this biotic community into Rocky Mountain and Great Basin units may be warranted.

- 123.211 Mixed hardwood Association\*
- 123.212 *Quercus chrysolepis*-mixed hardwood Association\*
- 123.22 Big-cone Spruce Series\*
- 123.221 *Pseudotsuga macrocarpa* Association\*
- 123.3 Madrean Evergreen Forest and Woodland
- 123.31 Encinal (Oak) Series\*
- 123.311 Mixed *Quercus* spp. (= *Quercus* spp.) Association\*
- 123.312 *Quercus grisea* Association\*
- 123.313 *Quercus emoryi* Association\*
- 123.314 *Quercus chihuahuensis* Association\*
- 123.315 *Quercus arizonica* Association\*
- 123.316 *Quercus* spp.-*Pinus cembroides*-*Juniperus* spp. Association\*
- 123.317 *Pinus cembroides* Association\*
- 123.318 *Juniperus deppeana* Association\*
- 123.32 Oak-Pine Series\*
- 123.321 *Quercus hypoleucoides*-*Quercus rugosa* Association\*
- 123.322 *Quercus* spp.-*Pinus leiophylla* Association\*
- 123.323 *Quercus* spp.-*Pinus engelmanni* Association\*
- 123.324 *Quercus* spp.-*Pinus* spp. Association\*
- 123.325 *Quercus* spp.-*Arbutus xalapensis*-*Pinus* spp. Association\*
- 123.4 Californian Evergreen Woodland
- 123.41 Encinal (Oak) Series\*
- 123.411 Mixed *Quercus* Association\*
- 123.412 *Quercus agrifolia* Association\*
- 123.413 *Quercus agrifolia*-*Juglans californica* Association\*
- 123.414 *Quercus engelmanni* Association\*
- 123.42 Walnut Series\*
- 123.421 *Juglans californica* Association\*
- 123.5 Relict Conifer Forest and Woodland
- 123.51 Closed-cone Pine Series\*
- 123.511 *Pinus attenuata* Association\*
- 123.512 *Pinus muricata* Association\*
- 123.513 *Pinus torreyana* Association\*
- 123.52 Cypress Series\*
- 123.521 *Cupressus arizonica arizonica* Association\*
- 123.522 *Cupressus arizonica glabra* Association\*
- 123.523 *Cupressus arizonica stephensi* Association\*
- 123.524 *Cupressus arizonica montana* Association\*
- 123.525 *Cupressus forbesi* Association\*
- 123.526 *Cupressus forbesi*-*Pinus muricata* Association\*
- 124 Tropical-Subtropical Forests and Woodlands
- 124.1 Caribbean Montane Rain Forest
- 124.2 Caribbean Cloud Forest
- 124.3 Caribbean Evergreen Forest
- 124.4 Caribbean Deciduous Forest
- 124.5 Tamaulipan Deciduous Forest
- 124.6 Sinaloa Deciduous Forest
- 124.61 Mixed Short Tree Series\*
- 124.611 Mixed Deciduous Association\*
- 124.612 *Lysiloma watsoni*-mixed deciduous Association\*
- 124.613 *Conzattia sericea* Association\*
- 124.614 *Ceiba acuminata*-mixed deciduous Association\*
- 124.615 *Bursera inopinata*-mixed deciduous Association\*
- 130 Scrubland Formation
- 131 Arctic-Boreal Scrublands
- 131.1 Alaskan (Low Arctic) Coastal Scrub
- 131.2 Canadian (Low Arctic, Barren Ground) Subpolar Scrub
- 131.3 Alaskan Alpine and Subalpine Scrub
- 131.4 Adirondack-Appalachian Alpine and Subalpine Scrub
- 131.5 Rocky Mountain Alpine and Subalpine Scrub
- 131.51 Willow Series\*
- 131.511 *Salix brachycarpa* Association\*
- 131.512 *Salix planifolia* Association\*
- 131.513 *Salix nivalis* Association\*
- 131.52 Spruce Elfinwood Series\*
- 131.521 *Picea engelmanni* Association\*
- 131.53 Bristlecone Pine Elfinwood Series\*
- 131.531 *Pinus aristata* Association
- 131.6 Sierran-Cascade Alpine and Subalpine Scrub
- 131.61 Limber Pine-Lodgepole Pine Elfinwood Series\*
- 131.611 *Pinus flexilis* Association\*
- 132 Cold Temperate Scrublands
- 132.1 Great Basin Montane Scrub
- 132.11 Oak-scrub Series\*
- 132.111 *Quercus gambeli* Association\*
- 132.12 Mountain mahogany Series\*
- 132.121 *Cercocarpus montanus* Association\*
- 132.13 Maple-scrub Series\*
- 132.131 *Acer grandidentatum* Association\*
- 132.14 Serviceberry Series\*
- 132.141 *Amelanchier alnifolia* Association\*
- 132.15 Bitterbush Series\*
- 132.151 *Purshia tridentata* Association\*
- 132.16 Mixed Deciduous Series\*
- 132.161 Mixed Scrub Association\*
- 132.2 Sierran-Cascade Montane Scrub
- 132.21 Manzanita Series\*
- 132.211 *Arctostaphylos glauca* Association\*
- 132.212 *Arctostaphylos glandulosa* Association\*
- 132.22 Mixed Scrub Series\*
- 132.221 Mixed scrub Association\*
- 132.3 Plains Deciduous Scrub
- 132.31 Oak-Scrub Series\*
- 132.311 *Quercus harvardi* Association\*
- 132.32 Sumac Series\*
- 132.321 *Rhus lanceolata* Association\*
- 132.33 Mixed Deciduous Series\*
- 132.331 *Prunus americana* et al. Association\*
- 133 Warm Temperate Scrublands
- 133.1 Californian Chaparral
- 133.11 Chamise Series\*
- 133.111 *Adenostoma fasciculatum* Association\*
- 133.112 *Adenostoma fasciculatum*-mixed sclerophyll Association\*
- 133.113 *Adenostoma sparsifolium* Association\*
- 133.12 Scrub Oak Series\*
- 133.121 *Quercus dumosa* Association\*
- 133.122 *Quercus dumosa*-mixed sclerophyll Association\*
- 133.123 *Quercus dumosa*-*Quercus wislizeni* Association\*
- 133.13 Manzanita Series\*
- 133.131 *Arctostaphylos glauca* Association\*
- 133.132 *Arctostaphylos glandulosa* Association\*
- 133.133 *Arctostaphylos glandulosa*-*Pinus coulteri* Association\*
- 133.134 *Arctostaphylos glandulosa*-mixed sclerophyll Association\*
- 133.14 Ceanothus Series\*
- 133.141 *Ceanothus cordulatus* Association\*
- 133.142 *Ceanothus* spp.-mixed sclerophyll Association\*
- 133.2 Californian Coastalscrub
- 133.21 Sage Series\*
- 133.211 *Artemisia californica* Association\*
- 133.212 *Artemisia californica*-*Salvia* spp. Association\*
- 133.22 Mixed Shrub Series\*
- 133.221 *Eriogonum fasciculatum*-*Simmondsia chinensis* et al. Association\*
- 133.222 *Encelia californica* a-Mixed shrub Association\*

\*Examples only.



- 133.3 Interior Chaparral
- 133.31 Scrub Oak Series\*
- 133.311 *Quercus turbinella* Association\*
- 133.312 *Quercus turbinella-Cercocarpus breviflorus* Association\*
- 133.313 *Quercus turbinella-Cercocarpus betuloides* Association\*
- 133.314 *Quercus turbinella*-mixed sclerophyll Association\*
- 133.315 *Quercus intricata* Association\*
- 133.316 *Quercus intricata-Cercocarpus* spp. Association\*
- 133.317 *Quercus intricata-Quercus* spp. Association\*
- 133.318 *Quercus intricata*-mixed sclerophyll Association\*
- 133.319 *Quercus pungens* Association\*
- 133.311a *Quercus pungens*-mixed sclerophyll Association\*
- 133.32 Manzanita Series\*
- 133.321 *Arctostaphylos pringlei* Association\*
- 133.322 *Arctostaphylos pungens* Association\*
- 133.33 Ceanothus Series\*
- 133.331 *Ceanothus greggi* Association\*
- 133.332 *Ceanothus greggi*-mixed sclerophyll Association\*
- 133.34 Mountain mahogany Series\*
- 133.341 *Cercocarpus breviflorus* Association\*
- 133.342 *Cercocarpus montanus* Association\*
- 133.35 Silktassel Series\*
- 133.351 *Garrya wrightii* Association\*
- 133.352 *Garrya ovata* Association\*
- 133.36 Mixed Evergreen Sclerophyll Series\*
- 133.361 Mixed sclerophyll Association\*
- 133.4 Southeastern Maritime Scrub
- 134 Tropical-Subtropical Scrublands
- 134.1 Caribbean Thornscrub
- 134.2 Tamaulipan Thornscrub
- 134.3 Sinaloan Thornscrub
- 134.31 Mixed Deciduous Series\*
- 134.311 Mixed scrub-*Fouquieria macdougalii* Association\*
- 134.312 Mixed scrub-*Ipomoea arborescens* Association\*
- 134.313 Mixed scrub-*Lysiloma divaricata* Association\*
- 134.314 Mixed scrub-*Acacia cymbispina* Association\*
- 134.315 Mixed scrub-*Ceiba acuminata* Association\*
- 134.316 Mixed scrub-Mixed tree Association\*
- 134.32 Mesquite Disclimax Series\*
- 134.321 *Prosopis juliflora velutina*-mixed scrub Association\*
- 140 Grassland Formation
- 141 Arctic-Boreal Grasslands
- 141.1 Alaskan (Low Arctic) Coastal Grassland
- 141.2 Canadian (Low Arctic) Grassland
- 141.3 Appalachian Subalpine (Balds) Grassland
- 141.4 Rocky Mountain Alpine and Subalpine Grassland
- 141.41 Bunchgrass Series\*
- 141.411 *Festuca thurberi* Association\*
- 141.412 *Festuca arizonica* Association\*
- 141.413 Mixed grass-forb Association\*
- 141.42 Sedge-Forb-Grass Series\*
- 141.421 *Carex* spp.-mixed forb-grass Association\*
- 141.5 Sierran Cascade Alpine and Subalpine Grassland
- 141.51 Bunchgrass Series\*
- 141.511 *Sitanion hystrix*-mixed forb Association\*
- 141.512 Mixed grass-forb Association\*
- 141.52 Sedge-Forb-Grass Series\*
- 141.521 *Carex* spp.-mixed forb-grass Association\*
- 141.6 Madrean Alpine and Subalpine Grassland
- 142 Cold Temperate Grasslands
- 142.1 Plains Grassland
- 142.11 Bluestem "tall-grass" Series\*
- 142.111 *Andropogon scoparius* Association\*
- 142.112 *Andropogon* spp.-mixed tall-grass Association\*
- 142.113 *Andropogon* spp.-*Quercus harvardi* Association\*
- 142.114 Mixed tall-grass Association\*
- 142.115 *Artemisia filifolia*-mixed scrub disclimax Association\*
- 142.12 Grama "short-grass" Series\*
- 142.121 *Bouteloua gracilis* Association\*
- 142.122 *Bouteloua* spp. Association\*
- 142.123 *Bouteloua* spp.-mixed grass Association\*
- 142.124 *Bouteloua* spp.-mixed grass-mixed scrub Association\*
- 142.13 Buffalo-grass Series\*
- 142.131 *Buchloe dactyloides*-mixed grass Association\*
- 142.14 Mixed "Short-grass" Series\*
- 142.141 *Aristida* spp.-*Bouteloua gracilis*-*Buchloe dactyloides* Association\*
- 142.15 Shrub-Grass Disclimax Series\*
- 142.151 *Gutierrezia sarothrae* Association\*
- 142.2 Great Basin Shrub-Grassland
- 142.21 Wheatgrass Series\*
- 142.211 *Agropyron smithi* Association\*
- 142.212 *Agropyron smithi*-mixed scrub Association\*
- 142.213 *Agropyron smithi-Artemisia tridentata* Association\*
- 142.22 Mixed Bunchgrass Series\*
- 142.221 Mixed grass Association\*
- 142.222 Mixed grass-*Artemisia tridentata* Association\*
- 142.23 Ricegrass Series\*
- 142.231 *Oryzopsis hymenoides* Association\*
- 142.24 Sacaton Series\*
- 142.241 *Sporobolus airoides* Association\*
- 142.242 *Sporobolus airoides-Atriplex canescens* Association\*
- 142.3 Pacific Coastal (Oregonian) Grassland
- 142.4 Rocky Mountain Montane Grassland
- 142.41 Mixed Meadow Series\*
- 142.411 Mixed forb-grass Association\*
- 142.42 Rush Series\*
- 142.421 *Juncus* spp. Association\*
- 142.43 Fern Series\*
- 142.431 *Pteridium aquilinum* Association\*
- 142.44 Iris Disclimax Series\*
- 142.441 *Iris missouriensis* Association\*
- 142.5 Sierran-Cascade Montane Grassland
- 142.51 Mixed Meadow Series\*
- 142.511 Mixed forb-grass Association\*
- 142.52 Rush Series\*
- 142.521 *Juncus* spp. Association\*
- 143 Warm Temperate Grasslands
- 143.1 Scrub-Grassland (Semidesert Grassland)
- 143.11 Grama Grass-Scrub Series\*
- 143.111 *Bouteloua eriopoda-Yucca elata* Association\*
- 143.112 *Bouteloua eriopoda-Prosopis juliflora* Association\*
- 143.113 *Bouteloua eriopoda*-mixed grass-mixed scrub Association\*
- 143.114 *Bouteloua* spp.-mixed grass-mixed scrub Association\*
- 143.12 Tobosa Grass-Scrub Series\*
- 143.121 *Hilaria mutica* Association\*
- 143.122 *Hilaria mutica-Prosopis juliflora* Association\*

\*Examples only.

- 143.123 *Hilaria mutica*-mixed scrub Association\*
- 143.13 Curlymesquite grass-scrub Series\*
- 143.131 *Hilaria belangeri*-mixed scrub Association\*
- 143.14 Sacaton-Scrub Series\*
- 143.141 *Sporobolus wrightii* Association\*
- 143.142 *Sporobolus wrightii*-*Prosopis juliflora* Association\*
- 143.15 Mixed Grass-Scrub Series\*
- 143.151 Mixed grass-*Yucca elata* Association\*
- 143.152 Mixed grass-*Prosopis juliflora* Association
- 143.153 Mixed grass-*Acacia greggi* Association\*
- 143.154 Mixed grass-*Fouquieria splendens* Association\*
- 143.155 Mixed grass-mixed scrub Association\*
- 143.16 Shrub-Scrub Disclimax Series\*
- 143.161 *Aplopappus tenuisectus* Association\*
- 143.162 *Aplopappus tenuisectus*-*Yucca elata* Association\*
- 143.163 *Aplopappus tenuisectus*-*Prosopis juliflora* Association\*
- 143.164 *Aplopappus tenuisectus*-mixed scrub Association\*
- 143.165 *Gutierrezia sarothrae*-*Prosopis juliflora* Association\*
- 143.2 Californian Valley Grassland
- 143.21 Annual Disclimax Series\*
- 143.211 Mixed annual grass Association\*
- 143.212 *Avena fatua* Association\*
- 143.213 *Bromus rubens* Association\*
- 143.214 Mixed forb Association\*
- 144 Tropical-Subtropical Grasslands
- 144.1 Caribbean Savanna Grassland
- 144.2 Gulf Coastal (Tamaulipan) Grassland
- 144.3 Sonoran Savanna Grassland
- 144.31 Mixed Root-perennial Grass Series\*
- 144.311 *Heteropogon contortus*-*Bouteloua* spp.-*Aristida* spp.-mixed scrub Association\*
- 144.32 Grama Series\*
- 144.321 *Bouteloua rothrockii*-*Prosopis juliflora* Association\*
- 144.322 *Bouteloua* spp.-mixed scrub Association\*
- 144.33 Three-awn Series\*
- 144.331 *Aristida* spp.-*Prosopis juliflora* Association\*
- 144.332 *Aristida* spp.-mixed scrub Association\*
- 150 Desertland Formation
- 151 Arctic-Boreal Desertlands
- 151.1 Polar Desertscrub
- 152 Cold Temperate Desertlands
- 152.1 Great Basin Desertscrub
- 152.11 Sagebrush Series\*
- 152.111 *Artemisia tridentata* Association\*
- 152.112 *Artemisia tridentata*-mixed scrub-grass Association\*
- 152.113 *Artemisia nova* Association\*
- 152.12 Shadscale Series\*
- 152.121 *Atriplex confertifolia* Association\*
- 152.122 *Atriplex confertifolia*-mixed scrub Association\*
- 152.13 Blackbrush Series\*
- 152.131 *Coleogyne ramosissima* Association\*
- 152.14 Rabbitbrush Series\*
- 152.141 *Chrysothamnus nauseosus* Association\*
- 152.15 Winterfat Series\*
- 152.151 *Eurotia lanata* Association\*
- 152.152 *Eurotia lanata*-mixed scrub Association\*
- 152.16 Mixed scrub Series\*
- 152.161 *Ephedra viridis*-*Eriogonum* spp.-mixed scrub Association\*
- 152.17 Saltbush Series\*
- 152.171 *Sarcobatus vermiculatus* Association\*
- 152.172 *Atriplex canescens* Association\*
- 153 Warm Temperate Desertlands
- 153.1 Mohave Desertscrub
- 153.11 Creosotebush Series\*
- 153.111 *Larrea divaricata* Association\*
- 153.112 *Larrea divaricata*-*Ambrosia dumosa* Association\*
- 153.113 *Larrea divaricata*-*Yucca* spp. Association\*
- 153.12 Blackbrush Series\*
- 153.121 *Coleogyne ramosissima* Association\*
- 153.122 *Coleogyne ramosissima*-*Yucca* spp. Association\*
- 153.13 Mesquite Series\*
- 153.131 *Prosopis juliflora torreyana* Association\*
- 153.14 Bladdersage Series\*
- 153.141 *Salazaria mexicana* Association\*
- 153.15 Joshua tree Series\*
- 153.151 *Yucca brevifolia*-*Acamptopappus sphaerocephalus*-*Larrea divaricata*-mixed scrub Association\*
- 153.152 *Yucca brevifolia*-*Coleogyne ramosissima* Association\*
- 153.153 *Yucca brevifolia*-*Larrea divaricata* Association\*
- 153.16 Catclaw Series\*
- 153.161 *Acacia greggi*-mixed scrub Association\*
- 153.17 Saltbush Series\*
- 153.171 *Suaeda torreyana* Association\*
- 153.172 *Atriplex* spp. Association\*
- 153.2 Chihuahuan Desertscrub
- 153.21 Creosotebush-Tarbrush Series\*
- 153.212 *Larrea divaricata*-*Parthenium incanum*-mixed scrub Association\*
- 153.213 *Larrea divaricata*-*Flourensia cernua* Association\*
- 153.214 *Flourensia cernua* Association\*
- 153.22 Whitethorn Series\*
- 153.221 *Acacia neovernicosa* Association\*
- 153.222 *Acacia neovernicosa*-*Larrea divaricata* Association\*
- 153.23 Sandpaperbush Series\*
- 153.231 *Mortonia scabrella* Association\*
- 153.232 *Mortonia scabrella*-*Rhus microphylla* Association\*
- 153.24 Mesquite Series\*
- 153.241 *Prosopis juliflora glandulosa* (shrub hummock) Association\*
- 153.242 *Prosopis juliflora glandulosa*-*Artemisia filifolia* Association\*
- 153.25 Succulent Series\*
- 153.251 *Agave lecheguilla* Association\*
- 153.252 *Agave lecheguilla*-*Yucca* spp. Association\*
- 153.253 *Opuntia* spp.-*Agave* spp.-*Larrea divaricata* Association\*
- 153.26 Mixed Scrub Series\*
- 153.261 *Fouquieria splendens*-mixed scrub Association\*
- 153.27 Saltbush Series\*
- 153.271 *Suaeda torreyana* Association\*
- 153.272 *Atriplex canescens* Association\*
- 153.273 *Atriplex* spp.-*Artemisia filifolia* Association\*
- 154 Tropical-Subtropical Desertlands
- 154.1 Sonoran Desertscrub
- 154.11 Creosotebush-Bursage ("Lower Colorado Valley") et al Series\*
- 154.111 *Larrea divaricata* Association\*
- 154.112 *Larrea divaricata*-*Ambrosia dumosa* Association\*
- 154.113 *Ambrosia dumosa* Association\*
- 154.114 *Prosopis juliflora torreyana* (shrub hummock) Association\*
- 154.115 *Cercidium floridum*-*Olneya tesota*-*Dalea spinosa* riparian Association\*
- 154.116 *Fouquieria splendens*-*Agave deserti* Association\*

\*Examples only.

- 154.117 *Opuntia bigelovi* Association\*
- 154.12 Paloverde-Mixed Cacti ("Arizona Upland") Series\*
- 154.121 *Ambrosia deltoidea-Cercidium microphyllum*-mixed scrub Association\*
- 154.122 *Ambrosia deltoidea-Carnegiea gigantea*-mixed scrub Association\*
- 154.123 *Simmondsia chinensis*-mixed scrub Association\*
- 154.124 *Larrea divaricata-Canotia holacantha* Association\*
- 154.125 *Larrea divaricata*-mixed scrub Association\*
- 154.126 *Encelia farinosa*-mixed scrub Association\*
- 154.127 Mixed shrub-*Cercidium microphyllum-Olneya tesota*-mixed scrub Association
- 154.13 Brittlebush-Ironwood ("Plains of Sonora") Series\*
- 154.131 *Encelia farinosa-Olneya tesota* Association\*
- 154.132 *Encelia farinosa*-mixed scrub Association\*
- 154.133 Mixed shrub-mixed scrub Association\*
- 154.134 Mixed shrub-*Prosopis juliflora velutina* Association\*
- 154.135 Mixed shrub-*Forchammeria watsoni* Association\*
- 154.14 Copal-Torote ("Central Gulf Coast") Series\*
- 154.141 *Jatropha cinerea-Bursera microphylla* Association\*
- 154.142 *Jatropha* spp.-*Bursera microphylla-Pachycereus pringlei* Association\*
- 154.143 *Jatropha* spp.-*Idria columnaris*-mixed scrub Association\*
- 154.15 Agave-Bursage ("Vizcaino") Series\*
- 154.151 *Ambrosia chenopodiifolia-Agave shawi* Association\*
- 154.152 *Ambrosia* spp.-*Agave shawi-Pachycormus discolor-Idria columnaris*-mixed scrub Association\*
- 154.153 *Ambrosia* spp.-*Agave shawi-Pachycereus pringlei*-mixed scrub Association\*
- 154.154 Mixed shrub-*Agave shawi* Association\*
- 154.155 *Eriogonum fasciculatum*-mixed scrub Association\*
- 154.16 Paloblanco-Agría ("Magdalena") Series\*
- 154.161 *Machaerocereus gummosus*-mixed scrub Association\*
- 154.17 Saltbush Series
- 154.171 *Suaeda torreyana* Association\*
- 154.172 *Allenrolfea occidentalis* Association\*
- 154.173 *Atriplex* spp.-*Prosopis juliflora torreyana* Association\*
- 154.174 *Atriplex polycarpa-Lycium* spp.-*Prosopis juliflora velutina* Association\*
- 154.175 *Frankenia palmeri-Atriplex julacea* Association\*
- 221.1 Canadian Swampforest
- 222 Cold Temperate Swamp and Riparian Forests
- 222.1 Northeastern Bog, Swamp and Riparian Forests
- 222.2 Plains and Great Basin Riparian Deciduous Forest
- 222.21 Cottonwood-Willow Series\*
- 222.211 *Populus sargentii* Association\*
- 222.212 *Populus sargentii-Salix amygdaloides* Association\*
- 222.213 *Populus wislizeni* Association\*
- 222.214 *Populus* spp.-*Salix* spp. Association\*
- 222.215 *Salix exigua* Association\*
- 222.3 Rocky Mountain Riparian Deciduous Forest
- 222.31 Cottonwood-Willow Series\*
- 222.311 *Populus angustifolia-Salix* spp. Association\*
- 222.32 Mixed Broadleaf Series\*
- 222.321 *Acer negundo-Populus angustifolia*-mixed deciduous Association\*
- 222.322 *Acer grandidentatum* Association\*
- 222.4 Sierran-Cascade Riparian Deciduous Forest
- 222.41 Cottonwood-Willow Series\*
- 222.411 *Populus trichocarpa-Salix* spp. Association\*
- 222.42 Mixed Broadleaf Series\*
- 222.412 *Acer macrophyllum-Populus trichocarpa-Alnus rhombifolia*-mixed deciduous Association\*
- 223 Warm Temperate Swamp and Riparian Forests
- 223.1 Southeastern Swamp and Riparian Forest
- 223.2 Interior Southwestern Riparian Deciduous Forest and Woodland
- 223.21 Cottonwood-Willow Series\*
- 223.221 *Populus fremonti-Salix* spp. Association\*
- 223.212 *Populus fremonti* Association\*
- 223.213 *Populus wislizeni* Association\*
- 223.214 *Populus acuminata* Association\*
- 223.22 Mixed Broadleaf Series\*
- 223.221 *Platanus wrightii-Fraxinus velutina-Populus fremonti*-mixed deciduous Association\*
- 223.222 *Platanus wrightii* Association\*
- 223.223 *Fraxinus velutina* Association\*
- 223.224 *Alnus oblongifolia* Association\*
- 223.225 *Juglans major* Association\*
- 223.3 Californian Riparian Deciduous Forest and Woodland
- 223.31 Cottonwood-Willow Series
- 223.311 *Populus fremonti-Salix* spp. Association\*
- 223.32 Mixed Broadleaf Series
- 223.321 *Platanus racemosa*-mixed deciduous Association\*
- 223.322 *Alnus rhombifolia* Association\*
- 224 Tropical-Subtropical Swamp, Riparian and Oasis Forests.
- 224.1 Caribbean Interior Swamp and Riparian Forests
- 224.2 Caribbean Maritime Swampforest
- 224.3 Tamaulipan Interior Swamp and Riparian Forests
- 224.4 Sinaloan Interior Swamp and Riparian Forests
- 224.41 Mixed Evergreen Series\*
- 224.411 *Ficus* spp.-mixed evergreen and deciduous Association\*
- 224.412 *Taxodium mucronatum* Association\*
- 224.413 *Populus* sp.-mixed evergreen and deciduous Association\*
- 224.42 Palm Series\*
- 224.421 *Sabal uresana* Association\*
- 224.5 Sonoran Riparian and Oasis Forests
- 224.51 Palm Series\*
- 224.511 *Washingtonia filifera* Association\*
- 224.512 *Washingtonia filifera-Populus fremonti* Association\*
- 224.513 *Washingtonia filifera-Brahea armata* Association\*

**Table 7. Nomenclature of WETLAND Biotic Communities (Fourth Level) of Nearctic and Adjacent Neotropical North America with Some Community (Series) and Association Level Examples for the North American Southwest.**

1,200 Nearctic Wetland Vegetation

1,210 Wet Tundra Formation

1,211 Arctic Wet Tundra

211.1 Polar (High Arctic) Wet Tundra<sup>1/</sup>

211.2 Greenlandian Wet Tundra

211.3 Alaskan (Coastal) Wet Tundra

211.4 Canadian (Low Arctic) Wet Tundra

220 Forest Formation

221 Boreal Swamp and Riparian Forests

\*One or more examples only are given for these levels.

<sup>1/</sup>The first "1" (in front of comma and representing the Nearctic Realm) is understood, and cropped for tabular convenience only, from this point onward.

- 224.514 *Brahea armata* Association\*
- 224.515 *Phoenix dactylifera-Washingtonia filifera* Association\*
- 224.52 Mesquite Series\*
- 224.521 *Prosopis juliflora velutina* Association\*
- 224.522 *Prosopis juliflora velutina*-mixed short tree Association\*
- 224.53 Cottonwood-Willow Series\*
- 224.531 *Populus fremonti-Salix gooddingi* Association\*
- 224.532 *Populus fremonti* Association\*
- 224.533 *Salix gooddingi* Association\*
- 230 Swampscrub Formation
- 231 Arctic-Boreal Swampscrubs
- 231.1 Polar (High Arctic) Swampscrub
- 231.2 Greenlandian Swampscrub
- 231.3 Alaskan Swampscrub
- 231.4 Canadian Swampscrub
- 231.5 Adirondack-Appalachian Alpine and Subalpine Swamp and Riparian Scrub
- 231.6 Rocky Mountain Alpine and Subalpine Swamp and Riparian Scrub
- 231.61 Willow Series\*
- 231.611 *Salix bebbiana* Association\*
- 231.7 Sierran-Cascade Alpine and Subalpine Swamp and Riparian Scrub
- 231.71 Willow Series\*
- 231.711 *Salix* spp. Association\*
- 232 Cold Temperate Swamp and Riparian Scrubs
- 232.1 Northeastern Deciduous Swampscrub
- 232.2 Plains and Great Basin Swamp and Riparian Scrub
- 232.21 Willow Series\*
- 232.211 *Salix* spp.-mixed scrub Association\*
- 232.22 Saltcedar Disclimax Series\*
- 232.221 *Tamarix chinensis* Association\*
- 232.3 Rocky Mountain Riparian Scrub
- 232.31 Willow-Dogwood Series\*
- 232.311 *Salix* spp.-mixed deciduous Association\*
- 232.4 Sierran-Cascade Riparian Scrub
- 232.41 Willow Series\*
- 232.411 *Salix* spp. Association
- 232.5 Pacific Coastal (Oregonian) Swamp and Riparian Scrub
- 233 Warm Temperate Swamp and Riparian Scrubs
- 233.1 Southeastern Mixed Deciduous and Evergreen Swampscrub
- 233.2 Interior Southwestern Swamp and Riparian Scrub
- 233.21 Mixed Narrowleaf Series\*
- 233.211 *Cephalanthus occidentalis-Baccharis glutinosa*-mixed scrub Association\*
- 233.22 Saltcedar Disclimax Series\*
- 233.221 *Tamarix chinensis*-mixed deciduous Association\*
- 233.3 Californian Deciduous Swamp and Riparian Scrub
- 233.31 Mixed Narrowleaf Series\*
- 233.311 *Salix lasiolepis* Association\*
- 234 Tropical-Subtropical Swamp and Riparian Scrub
- 234.1 Caribbean Interior Swampscrub
- 234.2 Caribbean Maritime Swampscrub
- 234.3 Tamaulipan Interior Swampscrub
- 234.4 Tamaulipan Maritime Swampscrub
- 234.5 Sinaloan Interior Swamp and Riparian Scrub
- 234.51 Mixed Evergreen Series\*
- 234.511 *Vallesia glabra-Baccharis glutinosa-Salix bonplandiana* Association\*
- 234.6 Sinaloan Maritime Swampscrub
- 234.61 Mangrove Series\*
- 234.611 *Avicennia germinans* Association\*
- 234.612 *Rhizophora mangle* Association\*
- 234.7 Sonoran Deciduous Swamp and Riparian Scrub
- 234.71 Mixed Scrub Series\*
- 234.711 *Prosopis pubescens-Prosopis juliflora torreyana-Pluchea sericea* Association\*
- 234.72 Saltcedar Disclimax Series\*
- 234.721 *Tamarix chinensis* Association\*
- 234.722 *Tamarix chinensis*-mixed scrub Association\*
- 240 Marshland Formation
- 241 Arctic-Boreal Marshlands
- 241.1 Polar (High Arctic) Marshland
- 241.2 Greenlandian Marshland
- 241.3 Alaskan Maritime (Coastal) Marshland
- 241.4 Canadian Interior Marshland
- 241.5 Canadian Maritime (Coastal) Marshland
- 241.6 Adirondack-Appalachian Alpine and Subalpine Marshland
- 241.7 Rocky Mountain Alpine and Subalpine Marshland
- 241.71 Rush Series\*
- 241.711 *Juncus balticus* Association\*
- 241.72 Manna Grass Series\*
- 241.721 *Glyceria borealis* Association\*
- 241.8 Sierran-Cascade Alpine and Subalpine Marshland
- 241.81 Rush Series\*
- 241.811 *Juncus* spp. Association\*
- 242 Cold Temperate Marshlands
- 242.1 Northeastern Interior Marshland
- 242.2 Northeastern Maritime (Coastal) Marshland
- 242.3 Plains Interior Marshland
- 242.31 Rush Series\*
- 242.311 *Juncus tenuis* Association\*
- 242.32 Bur-reed Series\*
- 242.321 *Sparganium angustifolium* Association\*
- 242.33 Cattail Series\*
- 242.331 *Typha latifolia* Association\*
- 242.34 Bulrush Series\*
- 242.341 *Scirpus validus* Association\*
- 242.4 Rocky Mountain Montane Marshland
- 242.41 Rush Series\*
- 242.411 *Juncus saximontanus* Association\*
- 242.5 Great Basin Interior Marshland
- 242.51 Rush Series\*
- 242.511 *Juncus* spp. Association\*
- 242.52 Saltgrass Series\*
- 242.521 *Distichlis stricta* Association\*
- 242.6 Sierran-Cascade Montane Marshland
- 242.61 Rush Series\*
- 242.611 *Juncus* spp. Association\*
- 242.7 Pacific Coastal (Oregonian) Interior Marshland
- 242.8 Pacific Coastal (Oregonian) Maritime Marshland
- 243 Warm Temperate Marshlands
- 243.1 Southeastern Interior Marshland
- 243.2 Southeastern Maritime Marshland
- 243.3 Chihuahuan Interior Marshland
- 243.31 Saltgrass Series\*
- 243.311 *Distichlis stricta* Association\*
- 243.4 Mohavian Interior Marshland
- 243.41 Rush Series\*
- 243.411 *Juncus cooperi* Association\*
- 243.42 Saltgrass Series\*
- 243.421 *Distichlis stricta* Association\*
- 243.5 Madrean Marshland
- 243.51 Rush Series\*
- 243.511 *Juncus mexicanus* Association\*

\*Examples only.

- 243.6 Californian Interior Marshland  
 243.61 Cattail Series\*  
 243.611 *Typha latifolia* Association\*  
 243.612 *Typha domingensis* Association\*  
 243.7 Californian Maritime Marshland  
 243.71 Cordgrass Series\*  
 243.711 *Spartina foliosa* Association\*  
 243.72 Glasswort Series\*  
 243.721 *Salicornia virginica* Association\*
- 244 Tropical-Subtropical Marshland  
 244.1 Caribbean Interior Marshland  
 244.2 Caribbean Maritime Marshland  
 244.3 Tamaulipan Interior Marshland  
 244.4 Gulf Coast Maritime Marshland  
 244.5 Sinaloan Interior Marshland  
 244.51 Cattail Series\*  
 244.511 *Typha domingensis* Association\*  
 244.6 Sinaloan Maritime Marshland  
 244.61 Glasswort Series\*  
 244.611 *Salicornia* spp. Association\*  
 244.7 Sonoran Interior Marshland  
 244.71 Cattail Series\*  
 244.711 *Typha domingensis* Association\*  
 244.72 Giant Reed Series\*  
 244.721 *Phragmites communis* Association\*  
 244.73 Bulrush Series\*  
 244.731 *Scirpus americanus* Association\*  
 244.74 Threesquare Series\*  
 244.741 *Scirpus olneyi* Association\*  
 244.8 Sonoran Maritime Marshland  
 244.81 Saltgrass Series\*  
 244.811 *Distichlis stricta* Association\*  
 244.82 Glasswort Series\*  
 244.821 *Salicornia* spp. Association\*
- 250 Strand Formation  
 251 Arctic-Boreal Strands  
 251.1 Polar Maritime Strand  
 251.2 Greenlandian Strand  
 251.3 Alaskan Maritime Strand  
 251.4 Canadian Interior (Stream and Lake) Strand  
 251.5 Canadian Maritime Strand  
 251.6 Adirondack-Appalachian Alpine and Subalpine Stream and Lake Strand  
 251.7 Rocky Mountain Alpine and Subalpine Stream and Lake Strand\*\*  
 251.8 Sierran-Cascade Alpine and Subalpine Stream and Lake Strand\*\*
- 252 Cold Temperate Strands  
 252.1 Northeastern Interior (Stream and Lake) Strand  
 252.2 Northeastern Maritime Strand  
 252.3 Plains Interior (Stream and Lake) Strand  
 252.31 Annual Series\*\*  
 252.311 *Xanthium saccharatum*-mixed annual Association\*  
 252.4 Rocky Mountain Montane Stream and Lake Strand\*  
 252.41 Annual Series\*\*  
 252.5 Great Basin Interior Strand\*  
 252.51 Annual Series\*\*  
 252.6 Sierran-Cascade Montane Stream and Lake Strand\*  
 252.61 Annual Series\*\*  
 252.7 Pacific Coastal (Oregonian) Interior Strand  
 252.8 Pacific Coastal (Oregonian) Maritime Strand
- 253 Warm Temperate Strands  
 253.1 Southeastern Interior Strand  
 253.2 Southeastern Maritime Strand  
 253.3 Chihuahuan Interior Strand  
 253.31 Annual Series\*  
 253.311 *Xanthium saccharatum* Association\*  
 253.4 Mohavian Interior Strand  
 253.41 Annual Series\*  
 253.411 *Xanthium saccharatum* Association\*  
 253.42 Mixed Scrub Series\*  
 253.421 *Tamarix chinensis*-mixed shrub Association\*  
 253.5 Madrean Stream and Lake Strand  
 253.51 Annual Series\*  
 253.511 Mixed annual Association\*  
 253.6 Californian Stream and Lake Strand  
 253.61 Annual Series\*  
 253.611 *Nicotiana attenuata* Association\*  
 253.7 Californian Maritime Strand  
 253.71 Mixed Scrub Series\*  
 253.711 *Abronia maritima*-*Atriplex leucophylla*-*Cakile maritima* et al. Association\*  
 253.72 Sea-grass Series\*  
 253.721 *Phyllospadix scouleri* Association\*  
 253.73 Green Algae Series\*  
 253.731 *Ulva californica* Association\*  
 253.74 Brown Algae Series\*  
 253.741 *Pelvetia fastigiata* Association\*  
 253.75 Red Algae Series\*  
 253.751 *Gigartina canaliculata* Association\*
- 254 Tropical-Subtropical Strands  
 254.1 Caribbean Interior Strand  
 254.2 Caribbean Maritime Strand  
 254.3 Tamaulipan Interior Strand  
 254.4 Gulf Coast (Tamaulipan) Maritime Strand  
 254.5 Sinaloan Interior Strand\*  
 254.51 Annual Series\*\*  
 254.6 Sinaloan Maritime Strand\*\*  
 254.61 Mixed Scrub Series\*  
 254.7 Sonoran Interior Strand  
 254.71 Mixed Scrub Series\*  
 254.711 *Baccharis glutinosa*-*Solanum nodiflorum*-*Nicotiana* spp.-*Rumex hymenosepalus* et al. Association\*  
 254.72 Annual Series\*  
 254.721 *Amaranthus palmeri* Association\*  
 254.8 Sonoran Maritime Strand  
 254.81 Mixed Scrub Series  
 254.811 *Abronia maritima*-*Helianthus niveus*-*Jouvea pilosa* et al. Association\*
- 260 Submergent Aquatic Vegetation  
 261 Arctic-Boreal Submergent Aquatics  
 261.1 Polar Marine Submergents  
 261.2 Greenlandian Inland Submergents  
 261.3 Alaskan Marine Submergents  
 261.4 Canadian Inland Submergents  
 261.5 Canadian Marine Submergents  
 261.6 Adirondack-Appalachian Alpine and Subalpine Submergents  
 261.7 Rocky Mountain Alpine and Subalpine Submergents  
 261.71 Pondweed Series\*  
 261.711 *Potamogeton natans* Association\*  
 261.8 Sierran-Cascade Alpine and Subalpine Submergents  
 261.81 Pondweed Series\*  
 261.811 *Potamogeton alpinus* Association\*
- 262 Cold Temperate Submergent Aquatics

\*Examples only.

\*\*Our incomplete knowledge of these biotic communities precludes presentation of representative fifth (series) and sixth level (association) examples.

- 262.1 Northeastern Inland Submergents  
 262.2 Northeastern Marine Submergents  
 262.3 Plains Inland Submergents  
   262.31 Pondweed Series\*  
     262.311 *Potamogeton foliosus* Association\*
- 262.4 Rocky Mountain Montane Submergents  
   262.41 Pondweed Series\*  
     262.411 *Potamogeton foliosus* Association\*
- 262.5 Great Basin Inland Submergents  
   262.51 Pondweed Series\*  
     262.511 *Potamogeton foliosus* Association\*
- 262.6 Sierran-Cascade Montane Submergents  
   262.61 Pondweed Series\*  
     262.611 *Potamogeton pusillus* Association\*
- 262.7 Pacific Coastal (Oregonian) Inland Submergents  
 262.8 Pacific Coastal (Oregonian) Marine Submergents
- 263 Warm Temperate Submergent Aquatics  
 263.1 Southeastern Inland Submergents  
 263.2 Southeastern Marine Submergents  
 263.3 Chihuahuan Inland Submergents  
   263.31 Pondweed Series\*  
     263.311 *Potamogeton pectinatus* Association\*
- 263.4 Mohavian Inland Submergents  
   263.41 Pondweed Series\*  
     263.411 *Potamogeton pectinatus* Association\*
- 263.5 Madrean Inland Submergents  
   263.51 Pondweed Series\*  
     263.511 *Potamogeton pectinatus* Association\*
- 263.6 Californian Inland Submergents  
   263.61 Pondweed Series\*  
     263.611 *Potamogeton pectinatus* Association\*  
   263.62 Milfoil Series\*
- 263.621 *Myriophyllum exalbescens* Association\*
- 263.7 Californian Marine Submergents  
   263.71 Ruppia Series\*  
     263.711 *Ruppia maritima* Association\*
- 263.72 Eelgrass Series\*  
   263.721 *Zostera marina* Association\*
- 263.73 Giant Kelp Series\*  
   263.731 *Macrocystis pyrifera* Association\*
- 263.74 Feather-boa kelp Series\*  
   263.741 *Egria laevigata* Association\*
- 263.75 Southern Sea Palm Series\*  
   263.751 *Eisenia arborea* Association\*
- 264 Tropical-Subtropical Submergent Aquatics  
 264.1 Caribbean Inland Submergents  
 264.2 Caribbean Marine Submergents  
 264.3 Tamaulipan Inland Submergents  
 264.4 Gulf Coastal Marine Submergents  
 264.5 Sinaloa Inland Submergents  
   264.51 Pondweed Series\*\*
- 264.6 Sinaloa Marine Submergents\*  
   264.61 Phytoplankton Series\*\*
- 264.7 Sonoran Inland Submergents\*\*  
   264.71 Pondweed Series\*  
     264.711 *Potamogeton pectinatus* Association\*
- 264.72 Milfoil Series\*  
   264.721 *Myriophyllum brasiliense* Association\*
- 264.8 Sonoran Marine Submergents  
   264.81 Ruppia Series\*  
     264.811 *Ruppia maritima* Association\*
- 264.82 Eelgrass Series\*  
   264.821 *Zostera marina* Association\*

## References

To save space the *Literature Cited* section for Appendix I is not reprinted here since all citations can be found in the *References* section (pgs. 288 to 301) of the present volume.

\*Examples only.

\*\*Our incomplete knowledge of these biotic communities precludes presentation of sixth level (association) examples.