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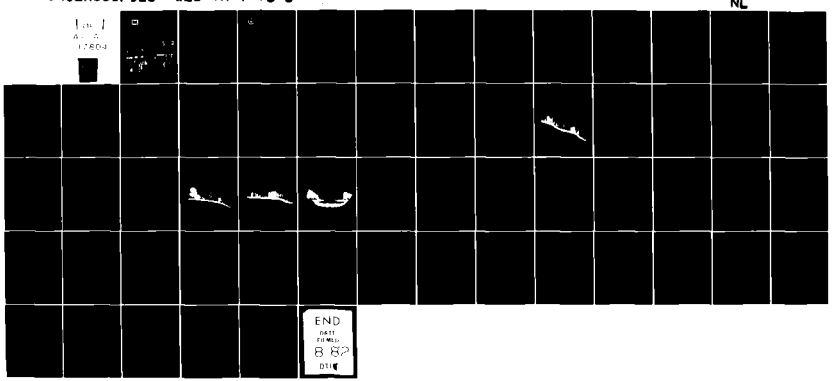

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TECHNICAL REPORT Y-78-8

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PRELIMINARY GUIDE TO THE ONSITE IDENTIFICATION AND DELINEATION OF THE WETLANDS OF THE NORTH ATLANTIC UNITED STATES

by

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U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

May 1982

Final Report

Approved For Public Release; Distribution Unlimited

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

PRELIMINARY GUIDE TO WETLANDS

Major Associations and Communities Identified

Technical Report No.	Region
Y-78-2	Peninsular Florida
Y-78-3	Puerto Rico
Y-78-4	West Coast States
Y-78-5	Gulf Coastal Plain
Y-78-6	Interior
Y-78-7	South Atlantic States
Y-78-8	North Atlantic States
Y-78-9	Alaska

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1 June 1982

SUBJECT: Transmittal of Technical Report Y-78-8

TO: All Report Recipients

The report transmitted herewith provides preliminary technical guidance on the onsite identification and delineation of wetlands to Corps of Engineers personnel responsible for the implementation of Section 404 of the Clean Water Act in the North Atlantic United States. This guide, sponsored by the Office, Chief of Engineers, represents one of a series of eight guides to the wetlands of the United States. Other guides include Alaska, peninsular Florida, Puerto Rico, West Coast States, Gulf Coastal Plain, Interior, and South Atlantic States.

TILFORD C. CREEL
Colonel, Corps of Engineers
Commander and Director

Unclassified

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This guide to the major plant associations and communities found in wetlands within the North Atlantic region of the United States is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U. S. Army Engineer Districts for use in the onsite technical identification and delineation of wetland boundaries. The classification system in this guide is adapted from that utilized by the National Wetland

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20. ABSTRACT (Continued).

Inventory (NWI) Project of the U. S. Fish and Wildlife Service, but frequently departs from NWI's system to describe common and/or distinct wetland communities or associations.

SUMMARY

This report represents one of a series of eight preliminary guides to the dominant plant associations and communities found in the major wetlands of the United States. The purpose of this guidebook is to aid Regulatory personnel with the onsite technical recognition and geographic delineation of wetland boundaries. This guidebook is designed to be self-contained and consists of three parts. An introduction covers the objective and use of the guidebook as well as general information about wetlands. The second part, entitled "Wetlands of the North Atlantic United States," consists of five major sections: Regional Environment, Values, Wetland Vegetation, Wetland Soils, and Wetland Hydrology. The third part describes the Regional Wetland Types.

PREFACE

At the request of the Office, Chief of Engineers, the Environmental Laboratory (EL) of the U. S. Army Engineer Waterways Experiment Station (WES) initiated production of a series of regional guidebooks designed to aid Regulatory personnel with the onsite technical recognition and geographic delineation of wetland boundaries. This report, which pertains to wetlands of the North Atlantic United States, is, therefore, one of a series of eight preliminary guidebooks to the country's wetlands. Other reports in the series apply to Alaska, Puerto Rico, West Coast, Interior, Gulf Coast, South Atlantic, and peninsular Florida. The reports are listed on the inside of the front cover.

Initial efforts to develop this preliminary guide were made under Purchase Order No. DACW39-77-M-1215, whereby Dr. Gene Silberhorn, Virginia Institute of Marine Sciences, Gloucester Point, Va., developed a report that provided an initial technical data base to be used for the preparation of this report. This effort was under the technical supervision of Dr. Luther F. Holloway, EL. Development of this report was under the technical direction of Dr. Robert Terry Huffman, EL. Other EL personnel, Dr. Gary E. Tucker, Dr. Jean Wooten, Dr. James S. Wilson, Mr. Charles V. Klimas, Mr. Mike Freel, Mr. Stephen W. Forsythe, and Ms. Linda Brown; together with Dr. Huffman, were instrumental in the final writing, critical review, and preparation of this report for publication.

The guide project was under the general supervision of Dr. Hanley K. Smith, Environmental Resources Division (ERD), EL; Dr. Conrad J. Kirby, Chief, ERD; Mr. Charles C. Calhoun, Program Manager, Dredging Operations Technical Support Program, EL; and Dr. John Harrison, Chief, EL.

The Commanders and Directors of WES during the study were COL George H. Hilt, CE, COL John L. Cannon, CE, and COL Nelson P. Conover, CE. Technical Director was Mr. F. R. Brown.

This report should be cited as follows:

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PRELIMINARY GUIDE TO THE ONSITE IDENTIFICATION AND DELINEATION OF THE WETLANDS OF THE NORTH ATLANTIC UNITED STATES

PART I: INTRODUCTION

Background

1. Under the various laws of the United States, Congress has assigned a number of nonmilitary functions to the U. S. Army Corps of Engineers. In addition to the more traditional roles of flood control, hydropower production, navigation, water supply storage, and recreation, the Corps has regulatory authority for the control of the discharge of dredged or fill material into waters of the United States. The primary legislative basis for the Corps' regulatory authority and subsequent program is the Clean Water Act. Section 404 of the Clean Water Act gives authority to the Secretary of the Army, acting through the Chief of Engineers, to regulate the discharge of dredged or fill material in the waters of the United States.

2. The objective of the above-described legislation is to maintain and restore the biological, physical, and chemical integrity of the Nation's water quality through regulation of the discharge of dredged and fill material into "Waters of the United States." "Waters of the United States" has broad meaning and incorporates both aquatic and wetland ecosystems, and includes the following (Federal Register 1977):

a. The territorial seas with respect to the discharge of fill material.

b. Coastal and inland waters, lakes, rivers, and streams that are navigable waters of the United States, including their adjacent wetlands.

c. Tributaries to navigable waters of the United States, including adjacent wetlands.

d. Interstate waters and their tributaries, including adjacent wetlands.

e. All other waters of the United States not identified above, such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not a part of a

tributary system to interstate waters or navigable waters of the United States, the degradation or destruction of which could affect interstate commerce.

3. The Federal Register (1977) defines wetland ecosystems as:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Objective

4. The objective of this report is to present information that can assist Regulatory personnel with the onsite technical identification and geographic delineation of wetland boundaries. The approach taken by this report is, therefore, to describe the diagnostic environmental characteristics of wetland ecosystems and to provide the user with a general description of the common wetland types of the North Atlantic region of the United States.

Wetland Identification and Boundary Determinations

5. Definition of jurisdictional limits is of obvious importance to any regulatory program. However, legislation authorizing the Corps' Section 404 Regulatory Program provided little guidance, except in a broad context, regarding the technical identification and geographic delineation of areas subject to jurisdiction. This is especially true in determining the landward extent of wetland areas.

6. Presently, the delineation of landward jurisdictional authority lies in the technical identification of ecosystems that have two key environmental characteristics:

a. Inundated or saturated soil conditions that are the result of periodic or permanent inundation by groundwater or surface water.

b. A prevalence of vegetation typically adapted for life in inundated or saturated soil conditions.

Often these characteristics can be readily identified in the field; however, field personnel are cautioned not to rely solely on vegetation, but to look for indicators of wetland soil and hydrology conditions such as those outlined in Part II, paragraphs 17 and 19. Evidence of one or more indicators of wetlands soil and hydrologic conditions will demonstrate a logical, as well as easily defensible, technical tie to why the vegetation is considered to be characteristic of wetland ecosystems for the particular situation of concern. Many wetland species can be found growing successfully in both wetland and nonwetland habitats. Combined use of wetland vegetation, soil, and hydrologic indicators can, therefore, greatly enhance the technical accuracy, consistency, and credibility of wetland determinations, particularly within the transition zone between wetland and nonwetland ecosystems.

PART II: WETLANDS OF THE NORTH ATLANTIC STATES

Regional Environment

7. This guide provides a general description and discussion of the major wetlands of the North Atlantic United States. Specifically, it applies to the area extending from Sandy Hook, N. J., north to the Canadian border; included in the region are part or all of New Jersey, eastern New York, Connecticut, Massachusetts, Rhode Island, New Hampshire, Vermont, and Maine (Figure 1).

8. The physiography of this area is quite diverse, but the major

Figure 1. Guidebook Regions

portion is composed of plateaus that range from 304 to 610 m in elevation. These are repeatedly interrupted by mountain peaks (up to 1917 m on Mt. Washington) and valleys. The coastline is often rugged and rocky, and the lagoon areas characteristically found behind the barrier islands in the South Atlantic States are uncommon. Major lowland areas include the Seaboard Lowlands of New England, the Ontario Plain in New York, and the valleys associated with the larger rivers, including the Connecticut, St. Lawrence, Mohawk, and Hudson. Lakes are numerous and range in size from that of small glacial ponds to the large 1500-km^2 Lake Champlain.

9. Geologically, the North Atlantic region is complex. In general, the plateaus are underlain by resistant crystalline rocks (granites, schists, and gneisses), which give rise to coarse, acidic soils. The lowlands are underlain with softer materials. These general patterns have been complicated, however, by the massive effects of Pleistocene glaciation. Where unsorted glacial till was deposited, soils may be deep and well drained, but where plains and glacial lakeshores occur, restricted drainage results because of the underlying fragipans. In many areas, glacial events have produced deep basins, or have blocked waterways and disrupted drainage patterns to create numerous ponds, lakes, swamps, and bogs.

10. Average temperatures and other climatic parameters are difficult to generalize for the region. Ocean and lake factors often result in highly variable local conditions. Inland areas, however, are usually under the influence of a cool, humid, typically continental climate. Precipitation, which is fairly evenly distributed over the region, averages about 102 cm per year. The number of frost-free days ranges from about 90 to over 180. Tropical storms frequently sweep across southeastern New England, and have caused major damage to forested areas on several occasions in the past century.

11. The area under consideration has been classified by Braun (1964) as including portions of two distinct regions within the Deciduous Forest Formation. The northern two thirds is considered to be part of the Hemlock-White Pine-Northern Hardwoods Region, while the remaining

third was in the Oak-Chestnut Region before the Chestnut was decimated (Rovichaud and Buell 1973).

12. It should be noted that in recent centuries the natural vegetation of the North Atlantic United States has undergone extensive alteration by man. Bottomlands of the major river valleys largely were cleared long ago, and since then have been intensively farmed. Forest lands have been repeatedly harvested but have regenerated well in some parts of the region. However, the coastal marshes have not faired well in the last 25 years; significant amounts have been lost to man's need for additional lands, particularly in Connecticut, Massachusetts, New York, and New Jersey.

Values

13. The wetlands of the North Atlantic United States often have certain useful attributes that make them valuable and productive resources of local, regional, or national significance. The following is a list of values that are of notable importance:

a. Wetlands often serve as key areas for biotic productivity and cycling of nutrients associated with the formation and maintenance of food chains.

b. Wetlands provide food, cover, rest, reproduction, and nursery habitat for associated biota.

c. Wetlands typically have a major influence on drainage, salinities, flushing characteristics, current, and sedimentation patterns.

d. Certain wetlands have influence on surface water and groundwater recharge.

e. Many wetlands provide physical protection against erosion and storm damage.

f. Many wetlands serve as storage areas for storm and floodwaters.

g. Wetlands affect water quality variables such as dissolved oxygen, temperature, turbidity, and nutrient load.

h. Wetlands provide opportunities for recreation, education, and research.

Wetland Vegetation

14. Wetland plant species are organisms that, because of morphological adaptation(s), physiological adaptation(s), and/or reproductive strategies, have the ability to perform certain requisite life functions that enable the species to achieve maturity in an environment where the soils within the root zone become inundated or saturated permanently or periodically.

15. The determination of whether a particular plant species can be found in wetlands is made by evidence provided by any one of the indicators given below:

a. Visual observation is made of survival of plant species in habitat conditions exhibiting any one of the wetland hydrology/soil-moisture regimes described in the following sections on wetland soils and wetland hydrology.

b. The technical literature indicates that the plant is associated with habitat conditions exhibiting any one of wetland hydrology/soil-moisture regimes described in the following sections on wetland soils and wetland hydrology.

c. The presence of morphological or physiological adaptations or reproductive strategies for survival in aquatic or wetland habitats is indicated in technical literature.

Wetland Soils

16. Wetland soils are those that become saturated permanently or periodically within the root zone during the growing season of the prevalent vegetation.

17. The determination of whether a particular soil is indicative of a wetland ecosystem can be made by finding evidence of any one of the indicators listed below:

a. There is mottling with a chroma (brightness) of 2 or less within a major part of the root zone.

b. There is a gleyed soil horizon within the root zone.

c. If there is no mottling or if mottles present have a chroma greater than 2, the soil below 25 cm has a chroma of 1 or less.

d. The soil examined has hydric soil characteristics other than a, b, or c above.

e. Presence of free water within the root zone.

f. Visual observation of soil saturation.

Wetland Hydrology

18. Wetland hydrology connotes the inundation or saturation of areas by surface water or groundwater either permanently or periodically during the growing season of the prevalent vegetation.

19. The determination of hydrologic conditions indicative of wetlands can be made by finding evidence of any one of the indicators listed below:

a. Drainage pattern.

b. Drift lines.

c. Silt deposition on vegetation.

d. Water marks.

e. Active water table within a major portion of the root zone.

f. Stream gage data and flood predictions.

g. Historic records.

h. Visual observation of inundation.

PART III: REGIONAL WETLAND TYPES

20. The wetland classes and definitions that follow are taken or adapted from "Classification of Wetland and Deepwater Habitats of the United States" (Cowardin *et al.* 1979), which was prepared for the National Wetland Inventory (NWI) Project of the U. S. Fish and Wildlife Service. The NWI classes are a secondary level of five *major systems*: Marine, Estuarine, Riverine, Lacustrine, and Palustrine; and eight subsystems. For the purposes of this discussion, the systems and subsystems are omitted. Below the class level, this guide will frequently depart from NWI's hierarchical classification system and describe common wetland plant communities or associations. These communities or associations are included to assist in the field identification and delineation of wetlands and do not preclude the use of NWI classification, though each of these plant communities or associations could be easily classified under this system.*

* See Appendix A for lists of common and scientific names used in this guide.

AQUATIC BED WETLANDS

DEFINITION: The Aquatic Bed Wetlands class includes areas having a prevalence of vegetation that grows principally on or below the surface of the water for most of the growing season in most years. Aquatic beds existing beyond a depth of 2 m (6.6 ft) are classified as deepwater habitats and, therefore, will not be considered in this guide.

21. By the hierarchical classification system of NWI, the Aquatic Bed Wetlands class can be categorized under each of the five major systems (Marine, Estuarine, Riverine, Lacustrine, and Palustrine). The class, itself, includes four subclasses: (a) Algal, (b) Aquatic Moss, (c) Rooted Vascular, and (d) Floating Vascular. To assist in field recognition, however, this guide will discuss Haline* Aquatic Bed Wetlands (Marine and Estuarine Systems) and Freshwater Aquatic Bed Wetlands (Riverine, Lacustrine, and Palustrine Systems). Use of recognized subclasses will be retained where applicable.

Aquatic Bed Wetlands (Haline)

22. Haline Aquatic Bed Wetland communities of the North Atlantic Region are composed primarily of submersed plants. These commonly called "sea grass beds," which are particularly important here, exist along the coast in the protected harbors, coves, salt ponds, and other embayed situations below the intertidal zone. Rockweed (*Fucus* spp.) communities are also common in the intertidal zone on rocky, high energy coastlines.

Vegetation

23. Growth form and physiognomy. This area is characterized by the presence of submersed, narrow-leaved herbs and macroscopic algae that often occur in dense stands.

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* Haline is a term used to indicate a dominance of ocean salt.

24. Species composition of the Aquatic Bed Wetlands (Haline). Prevalent species include:

a. Subclass: Algal.

Enteromorpha spp. (Green algae)

Fucus spp. (Brown algae, Rockweed)

Ulva lactuca (Green algae, Sea lettuce)

b. Subclass: Rooted Vascular.

Potamogeton pectinatus (Sago pondweed)

Ruppia maritima (Widgeon grass)

Zannichellia palustris (Horned pondweed)

Zostera marina (Eelgrass)

25. Species associations. The species diversity in most saltwater aquatic wetlands is usually quite limited. Eelgrass is quite common, particularly in the quiet, clear, high salinity ponds. Widgeon grass commonly occupies the less saline areas and the brackish ponds. Eelgrass is commonly absent in these areas, particularly in turbid waters. Some areas are dominated by algae, but only when eelgrass and widgeon grass are scarce. Rockweed is common on high energy shorelines, while sea lettuce is common on protected tidal flats.

Environmental conditions

26. The Haline Aquatic Bed Wetland community occurs under a variety of conditions. The substrates can be sand, rock, mud, or peat; the water movement is slow to fast; and the plant rooting depth is limited by the depth of effective light penetration. Aquatic beds existing beyond a depth of 2 m (6.6 ft), however, are classified as deepwater habitats; therefore, they are not considered in this guide. Salinity is also an important factor limiting species distribution (e.g., eelgrass is abundant in high salinity areas, whereas widgeon grass is not).

Aquatic Bed Wetlands (Freshwater)

27. This community occurs in streams, rivers, canals, ponds, lakes, and reservoirs throughout the North Atlantic Region. It frequently forms narrow bands of vegetation paralleling the shorelines, and

many of the shallower lakes, ponds, etc., often become covered by plants.

Vegetation

28. Growth form and physiognomy. This area is characterized by free-floating, attached, supported and buoyed by the water, floating-leaved, and/or submersed herbs (Figure 2).

> The reader is cautioned that the generalized floristic profiles contained within this guide are diagrammatic and are not necessarily representative of many sites that will be found in the field. Wetland systems are dynamic, and many variations will be found.

29. Species composition of Aquatic Bed Wetlands (Freshwater). Prevalent species include:

a. Subclass: Rooted Vascular.

Najas spp. (Naiad)
Nuphar luteum (Spatterdock)
Nymphaea odorata (Water lily)
Potamogeton spp. (Pondweed)
Vallisneria americana (Water-celery)

b. Subclass: Floating Vascular.

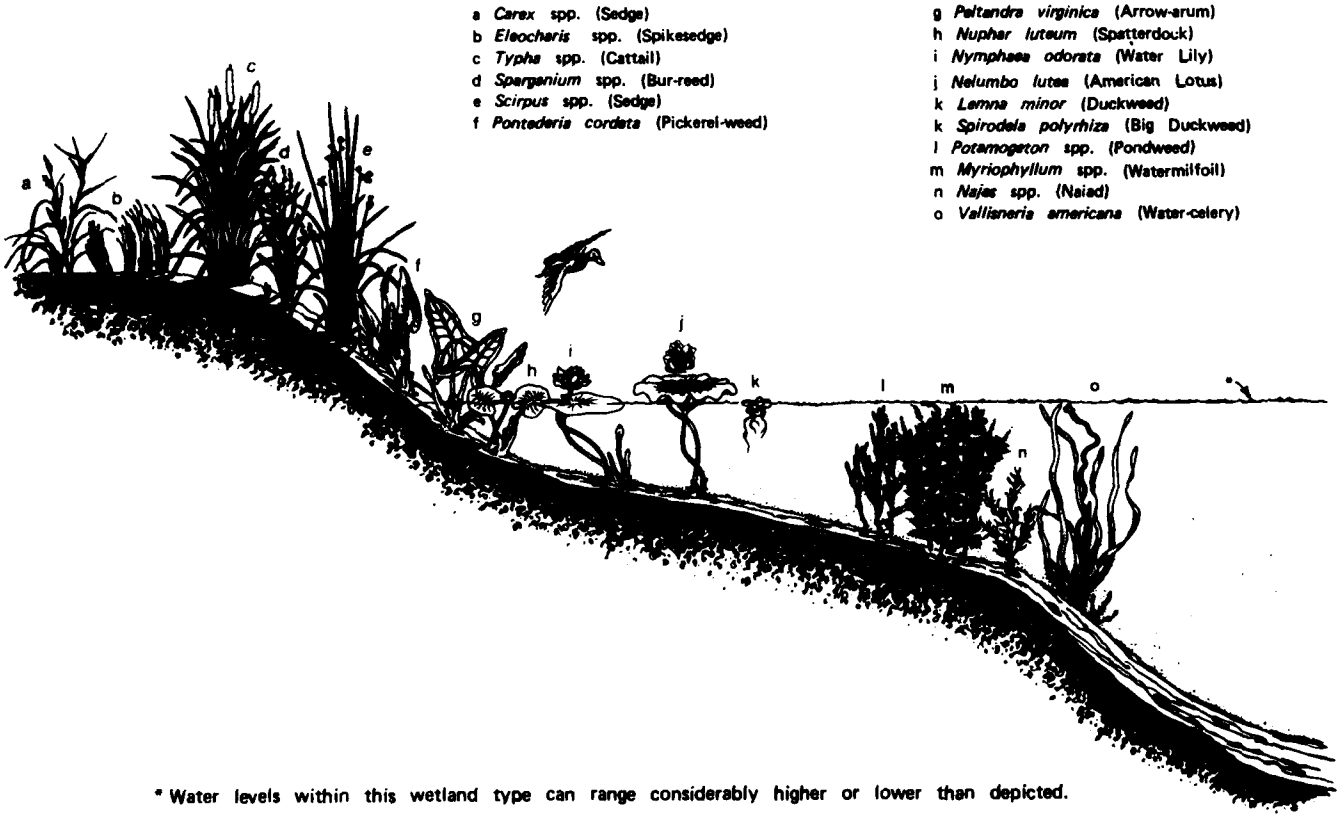
Lemna minor (Duckweed)
Spirodela polyrhiza (Big duckweed)

Common associated species include:

Eleocharis spp. (Spikesedge)
Isoetes spp. (Quillwort)
Myriophyllum spp. (Water milfoil)
Sparganium spp. (Bur-reed)
Utricularia spp. (Bladderwort)

30. Species associations. Water-depth-dependent zonation of the vegetation is usually apparent in this community. In ponds and lakes, deepwater areas are apt to be covered by free-floating plants such as duckweed and bladderwort. Well-lighted areas, less than 2 m deep, often contain submersed species such as quillwort and naiad. In even shallower areas (to about 1 m), rooted, floating-leaved plants

Figure 2. Generalized Profile of a Freshwater Aquatic Zone (Including Aquatic Bed Wetlands)



* Water levels within this wetland type can range considerably higher or lower than depicted.

(e.g., spatterdock) usually are dominant.

Environmental conditions

31. Open, freshwater communities are often dominated by rooted, floating, and submersed aquatics. Shallow areas, where inundation is more seasonal and siltation occurs, commonly become Emergent Wetlands.

32. Water quality in Freshwater Aquatic Bed Wetlands can be highly variable. Algal growth is often accelerated in shallow, warm waters, particularly where nutrient levels remain high. Where free-floating algae quickly grow and form surface mats, the submersed plants soon die and decompose, resulting in oxygen depletion. This condition commonly causes the death of fish and other aquatic animals.

EMERGENT WETLANDS

DEFINITION: The Emergent Wetlands class includes areas dominated by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

33. Within the Emergent Wetlands class, NWI includes two subclasses: (a) Persistent, and (b) Nonpersistent. These subclasses are based on the duration of the standing vegetation through the nongrowing season. Due to the large number of wetlands encompassed by the Emergent Wetlands class in the North Atlantic States and the variance of persistence/nonpersistence from one geographic area to another, this guide will describe four common plant communities to assist in field recognition: (a) Haline Coastal Flats, (b) Haline Marshes, (c) Freshwater Flats, and (d) Freshwater Marshes (including wet meadows and bogs).

Haline Coastal Flats

34. Coastal flats, which are irregularly flooded by tide waters, are sparsely vegetated intertidal areas (including the provincial hyperhaline (pan) sites). As these areas are quite saline, they are usually occupied by a group of salt-tolerant plants (halophytes).

Vegetation

35. Growth form and physiognomy. These areas are sparsely vegetated with scattered short succulent herbs.

36. Species composition of the Haline Coastal Flats. Prevalent and common associated species include:

Aster subulatus (Salt marsh aster)
Agalinus maritima (Seaside gerardia)
Limonium carolinianum (Sea lavender)
Salicornia bigelovii (Bigelow glasswort)
Salicornia europaea (Slender glasswort)

Salicornia virginica (Woody glasswort)
Spartina alterniflora (Saltmarsh cordgrass)
Suaeda linearis (Sea blite)

37. Species associations. Dominants here are usually scattered and often clumped. Coastal flats, because of their high salinities and wave energies, exhibit little diversity. Hyperhaline areas, such as pans that commonly occur behind haline coastal marshes, are usually occupied by succulent halophytic species such as sea blite and glassworts.

Environmental conditions

38. Many coastal flats are sparsely vegetated, primarily due to disturbance by wave action and detritus deposition. In hyperhaline areas (pans), which usually result from repeated inundation by storm tides and subsequent evaporation, soil salinities often exceed 120 ppt.*

Haline Marshes

39. The haline marshes of the North Atlantic Region are usually rather small and discontinuous when compared to those of the South Atlantic Region. For the most part, they occur in low energy coastal areas, such as protected harbors and behind spits, coves, or other embayed situations. Thus, substrates are usually characterized by deep layers of fibrous, decomposing marine peat. Silt accumulation is minor here as compared to that which occurs in the South Atlantic Region.

40. These communities often exist in close proximity to freshwater systems and consequently have varying salinity ranges (6 to 35 ppt). The low salinity marshes (brackish or mixohaline) often occur at the upper ends of tidal creeks and estuaries and in depressions behind coastal dunes. High salinity marshes are commonly in close proximity to the sea. Both low and high salinity marshes are treated separately below since the vegetation of the two is often quite different.

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* Parts per thousand.

Vegetation

41. Growth forms and physiognomy. Haline marshes are dominated by dense stands of graminoids. Cordgrasses are usually the dominant species here; shrubs and trees are infrequent. Contiguous brackish marshes usually have greater species diversity than higher salinity ones and contain numerous species of sedges and rushes.

42. Species composition of the Haline Marshes. Prevalent species of high salinity marshes include:

Distichlis spicata (Saltgrass)
Juncus gerardii (Black needlerush)
Scirpus robustus (Saltmarsh bulrush)
Spartina alterniflora (Saltmarsh cordgrass)
Spartina patens (Saltmeadow cordgrass)

Common associated species of high salinity marshes include:

Althaea officinalis (Marsh-mallow)
Aster spp. (Aster)
Carex spp. (Sedge)
Eleocharis spp. (Spikesedge)
Fimbristylis spadicea (Saltmarsh fimbristylis)
Limonium carolinianum (Sea lavender)
Plantago maritima (Seaside plantain)
Puccinellia spp. (Alkali-grass)
Sabatia spp. (Sea-pink)
Solidago sempervirens (Seaside goldenrod)

Prevalent species of low salinity marshes (brackish) include:

Juncus balticus (Baltic rush)
Juncus coriaceus (Tufted rush)
Scirpus americanus (American threesquare)
Scirpus olneyi (Olney threesquare)
Scirpus robustus (Saltmarsh bulrush)
Spartina cynosuroides (Big cordgrass)
Spartina pectinata (Prairie cordgrass)

Common associated species of low salinity marshes include:

Althaea officinalis (Marsh-mallow)

Amaranthus cannabinus (Water hemp)
Chenopodium rubrum (Red goosefoot)
Kosteletzkya virginica (Marsh mallow)
Phragmites australis (Reed grass)
Pluchea odorata (Marsh fleabane)
Polygonum spp. (Smartweed)
Ranunculus cymbalaria (Seaside crowfoot)
Scirpus acutus (Hardstem bulrush)
Scirpus maritimus (Maritime sedge)
Typha angustifolia (Cattail)

43. Species associations. The saline, lower elevation, regularly flooded parts of the Haline Marsh are dominated by saltmarsh cordgrass. Saltmeadow cordgrass and, to a lesser extent, saltgrass form mixed, dense salt meadows at slightly higher elevations. This is a well-developed zone and is typical of many New England haline marshes. At the approximate spring tide level, black needlerush often forms nearly pure stands at elevations slightly above the meadows. Some other common inhabitants here are seaside plantain, alkali-grass, and spikesedge.

44. Low salinity (brackish) marshes usually have a diverse species composition. In addition to the traditional haline marsh taxa, they often contain many sedges and rushes as dominants, as well as a variety of forbs. The dominant sedges here include saltmarsh bulrush, olney threesquare, and American threesquare. Less frequent, but still common, are hardstem bulrush and maritime sedge. The most common rushes are the baltic rush and tufted rush. Big cordgrass is common at higher elevations in areas of low salinity. Cattail often occurs farther inland in the muddy shallows of tidal rivers. This species along with reed grass are often common inhabitants in transition zones of brackish marshes and nonsaline habitats.

45. Four species of cordgrass occur in the Haline Marsh community. They are among the most important members of this habitat and often occur in nearly pure stands. Those areas that are tidally flooded on a regular basis often support nearly pure populations of saltmarsh cordgrass. The tidally inundated brackish water communities are mostly dominated by big

cordgrass and, to a lesser extent, by prairie cordgrass. In the zone between mean high water level and maximum height of storm and spring tides, there are usually large populations of saltmeadow cordgrass.

Environmental conditions

46. Species distributions in Haline Marshes are largely determined by the water regime and salinity. Here the vegetation usually occurs in distinct zones or bands. Saltmarsh cordgrass occurs mostly in the intertidal zone, saltmeadow cordgrass and saltgrass at slightly higher elevations, and black needlerush at or above this elevation. Salinity gradients are more difficult to delineate since they often vary from day to day and season to season in brackish waters. These low salinity marshes are often characterized by large populations of big cordgrass, several species of bulrushes and rushes, and a variety of other herbs.

Freshwater Flats

47. Freshwater Flats are most common on the periphery of areas with fluctuating water levels, such as reservoirs, or where the flood-stage of streams and rivers regularly scours the adjacent lands. These areas are scattered throughout the region.

Vegetation

48. Growth form and physiognomy. This community is characterized by vegetated areas with open stands of emersed herbs, shrubs, and trees.*

49. Species composition of Freshwater Flats. Prevalent species include:

Polygonum spp. (Smartweed)

Salix spp. (Willow)

Any of the dominant species listed under freshwater marsh

Common associated species include:

Any of the associated species listed under freshwater marsh

50. Species associations. Species diversity on flats is often

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* Freshwater Flats dominated by shrubs and/or trees are more properly classified as Scrub-Shrub Wetlands or Forested Wetlands.

high, although they are often sparsely vegetated. Substrate type, amount of shade, and time and duration of flooding affect species diversity. Flats in the southern part of the North Atlantic Region usually have greater species diversity than those in the northern portion.

Environmental conditions

51. There are several environmental factors affecting freshwater flats; two important ones are fluctuating water levels and the intense scouring activities of floods. Where flooding does not occur for an extended period, these areas are often invaded by marsh and/or swamp species.

Freshwater Marshes

52. Freshwater marshes include several distinct types. Those of the northeast are often found along tidal rivers and in upland depressions, flats, and shallow lake basins. Those on peaty substrates are often referred to as wet meadows and bogs. Bogs, in particular, have a characteristic flora that differs significantly from the other types.

Vegetation

53. Growth forms and physiognomy. These areas are usually dominated by dense stands of graminoids, except in many bogs that are characterized by dense mats of sphagnum moss and a scattering of woody vegetation (Figures 3-5).*

54. Species composition of the Freshwater Marshes. Prevalent species of freshwater marshes include:

Acorus americanus (Sweetflag)
Carex vulpinoidea (Sedge)
Cladium mariscoides (Twig-rush)
Cyperus strigosus (Redroot cyperus)
Echinochloa walteri (Walter's millet)

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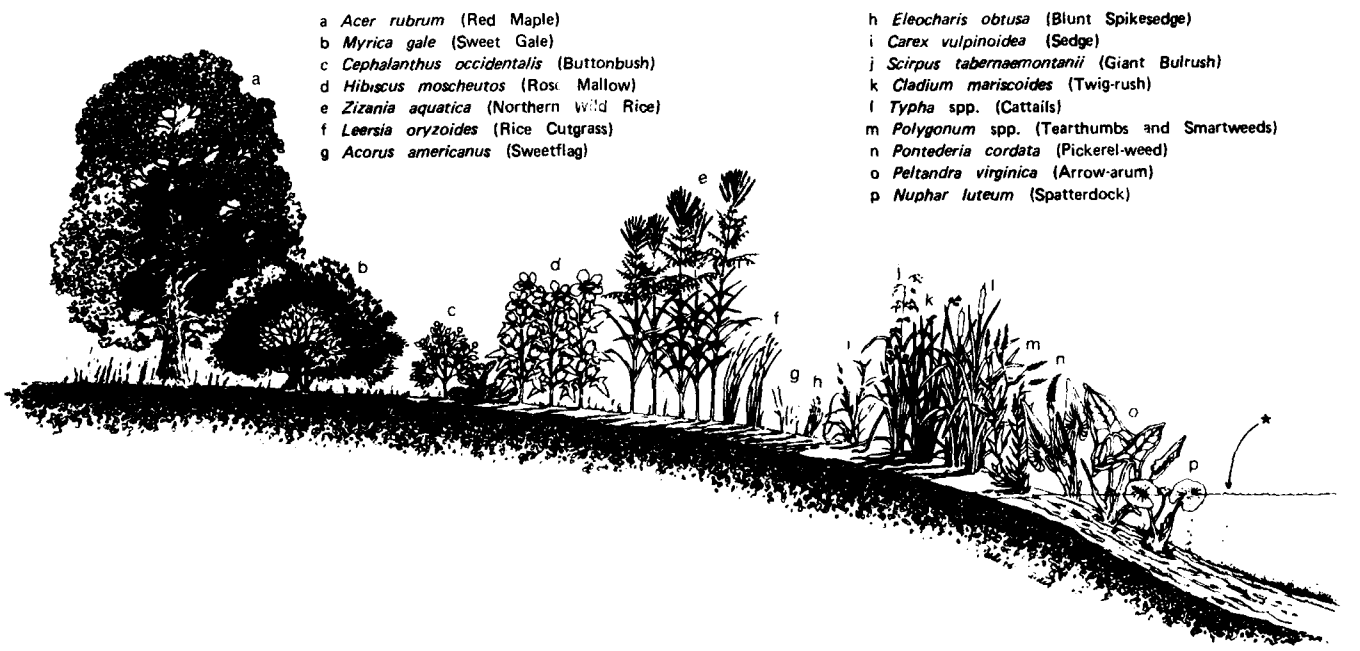
* Areas dominated by moss and/or lichens and sustaining an areal coverage of emergents, shrubs, or trees less than 30 percent are more properly classified as Moss-Lichen Wetlands (Cowardin et al. 1979).

Figure 3. Generalized Profile of a Freshwater Marsh



*Water levels within this wetland type can range considerably higher or lower than depicted

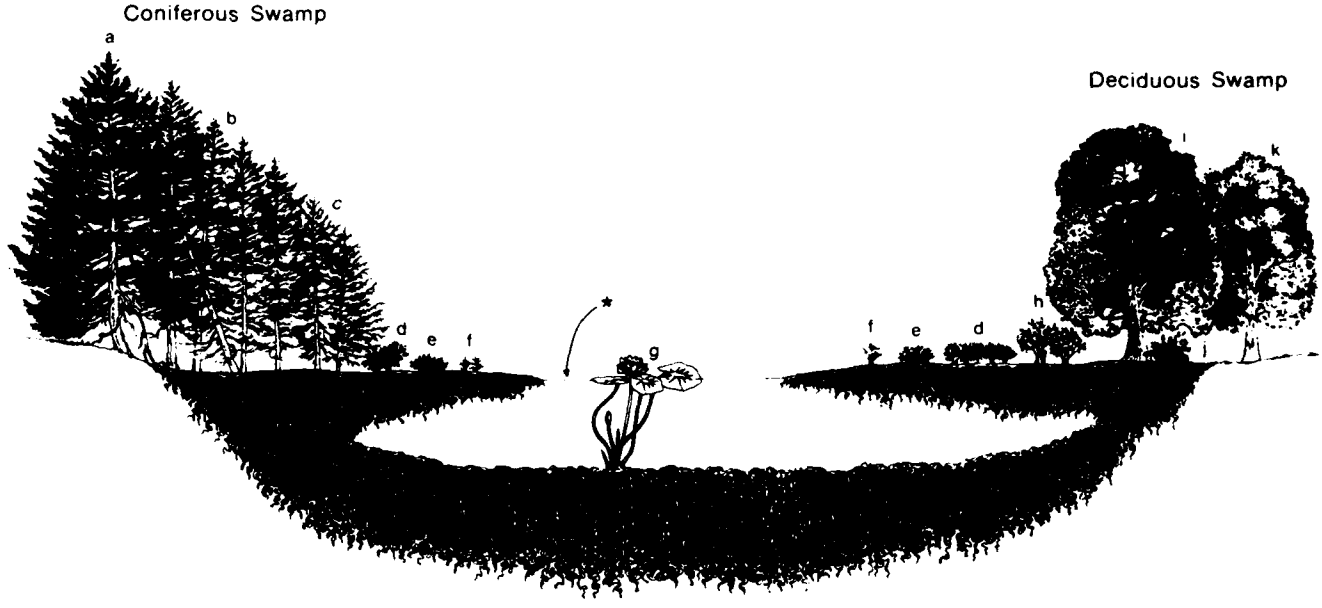
Figure 4. Generalized Profile of a Wet Meadow

a *Gylceria* spp. (Mannagrass)
b *Juncus effusus* (Softrush)
c *Carex* spp. (Sedges)
d *Cyperus* spp. (Umbrella Sedge)
e *Eleocharis obtusa* (Blunt Spikesedge)
f *Typha spp. (Cattails)*
g *Sparganium* spp. (Bur-reed)
h *Pontederia cordata* (Pickerel-weed)
i *Peltandra virginica* (Arrow Arum)
j *Nuphar luteum* (Spatterdock)
k *Nymphaea odorata* (Waterlily)

*Water levels within this wetland type can range considerably higher or lower than depicted

Figure 5. Generalized Profile of a Bog and a Freshwater Swamp

a *Picea glauca* (White Spruce)
b *Picea mariana* (Black Spruce)
c *Larix laricina* (Tamarack)
d *Chamaedaphne calyculata* (Leatherleaf)
e *Vaccinium macrocarpon* (Large Cranberry)
f *Carex* spp. (Sedges)
f *Cyperus* spp. (Sedges)
g *Nymphaea odorata* (Waterlily)
h *Myrica gale* (Sweet Gale)
i *Acer rubrum* (Red Maple)
j *Osmunda* spp. (Fern)
k *Fraxinus pennsylvanica* (Green Ash)



*Water levels within this wetland type can range considerably higher or lower than depicted.

Eleocharis palustris (Common spikesedge)

Juncus canadensis (Canada rush)

Leersia oryzoides (Rice cutgrass)

Nymphaea odorata (Water lily)

Peltandra virginica (Arrow-arum)

Phragmites australis (Reed grass)

Polygonum spp. (Smartweed)

Scirpus americanus (American threesquare)

Scirpus tabernaemontanii (Giant bulrush)

Sparganium eurycarpum (Big bur-reed)

Spartina pectinata (Prairie cordgrass)

Typha spp. (Cattail)

Zizania aquatica (Wild rice)

Prevalent species of wet meadows include:

Calamagrostis canadensis (Bluejoint reedgrass)

Cyperus spp. (Umbrella sedge)

Eleocharis obtusa (Blunt spikesedge)

Glyceria spp. (Mannagrass)

Juncus effusus (Softrush)

Phalaris arundinacea (Reed canarygrass)

Prevalent species of bogs include:

Sphagnum spp. (Sphagnum moss)

Common associated species of freshwater marshes include:

Asclepias incarnata (Swamp milkweed)

Boehmeria cylindrica (False nettle)

Carex spp. (Sedge)

Glyceria spp. (Mannagrass)

Hibiscus moscheutos (Rose mallow)

Impatiens capensis (Jewelweed)

Juncus spp. (Rush)

Lobelia cardinalis (Cardinal flower)

Nuphar luteum (Spatterdock)

Osmunda spp. (Fern)

Polygonum spp. (Tearthumb, Smartweed)

Pontederia cordata (Pickerel-weed)

Rumex spp. (Dock)

Sagittaria spp. (Arrowhead)

Scirpus spp. (Sedge)

Common associated species of wet meadows include:

Same as for freshwater marsh

Common associated species of bogs include:

Chamaedaphne calyculata (Leatherleaf)

Kalmia angustifolia (Sheep laurel)

Ledum groenlandicum (Labrador tea)

Myrica gale (Sweet gale)

Picea mariana (Black spruce)

Vaccinium spp. (Blueberry)

Vaccinium macrocarpon (Large cranberry)

55. Species associations of freshwater marsh. Graminoids usually dominate these shallow sites. Dominants in the least shallow water areas are arrow-arum, water lily, big bur-reed, cattail, and the grasses, sedges, and rushes listed under dominant and associated species. Some associated species include tearthumbs and smartweeds, cardinal flower, swamp milkweed, and ferns.

56. Species associations of wet meadows. The wet meadows have many associated species in common with the typical freshwater marsh, but the dominants are usually different. Furthermore, it is commonly divided into tall and short meadows. The former are dominated by reed canarygrass, bluejoint reedgrass, and mannagrass; the latter are dominated by softrush and blunt spikesedge with species of umbrella-sedge also common.

57. Species associations of bogs. Here mat-forming species of *Sphagnum* provide ground cover under a canopy of shrubs. A wide variety of specialized plants are unique to bogs. Some of the more interesting ones are the orchids, clubmosses, and carnivorous plants, few of which ever become dominant. In addition, there are numerous woody shrubs of importance such as blueberry, leatherleaf, sheep laurel, labrador tea, black spruce, sweet gale, and the trailing evergreen, large cranberry.

Environmental conditions

58. The water regime is the most important factor affecting most freshwater marsh systems. Water depth may be relatively constant in some marshes and fluctuate daily or seasonally in others. In general, however, the dominant growth form is related to the timing, depth, and duration of inundation. Forbs usually dominate permanently wet sites and graminoids the seasonally wet ones. In bog habitats, where substrate acidity and anaerobism are common, mats of *Sphagnum* predominate.

SCRUB-SHRUB WETLANDS AND FORESTED WETLANDS

DEFINITIONS: a. The Scrub-Shrub Wetlands class includes areas dominated by woody vegetation less than 6 m (20 ft) in height. The species include true shrubs and trees or shrubs that are small or stunted because of environmental conditions. Scrub-Shrub Wetlands include many of the young trees and shrub species found within Forested Wetlands.

b. The Forested Wetlands class includes areas dominated by woody vegetation equal to or greater than 6 m in height.

59. Within the Forested Wetlands class, NWI includes five subclasses: (a) Broad-leaved Deciduous, (b) Needle-leaved Deciduous, (c) Broad-leaved Evergreen, (d) Needle-leaved Evergreen, and (e) Dead. (For a more detailed description of these subclasses and specific dominance types, consult Cowardin et al. (1979).) To assist in the field recognition of wetlands, however, this guide will describe a common freshwater swamp association.

60. Freshwater swamps are quite common in this region. They frequently occur along sluggish, meandering streams, on floodplains of major rivers, along shallow lakes, and in the low areas behind coastal marshes. The substratum is often mucky, alluvial, or peaty, and is either periodically inundated, has saturated soils, or has water at or near the surface.

Vegetation

61. Growth forms and physiognomy. This area has a prevalence of medium to dense stands of trees, primarily evergreen coniferous in the northern parts of the region and deciduous broad-leaved forms in the southern parts of this region. Commonly, a shrub stratum with a fern-dominated understory is present beneath the tree canopy (Figure 5).

62. Species composition of the Freshwater Swamp. Prevalent species include:

Acer rubrum (Red maple)

Alnus incana (Speckled alder)
Alnus serrulata (Smooth alder)
Chamaedaphne calyculata (Leatherleaf)
Chamaecyparis thyoides (Atlantic white cedar)
Fraxinus pennsylvanica (Green ash)
Larix laricina (Tamarack)
Osmunda spp. (Cinnamon fern, Royal fern, Interrupted fern)
Picea glauca (White spruce)
Picea mariana (Black spruce)
Salix nigra (Black willow)
Sphagnum spp. (Sphagnum moss)
Thelypteris palustris (Marsh fern)
Thuja occidentalis (Arborvitae)
Ulmus americana (American elm)
Vaccinium macrocarpon (Large cranberry)
Woodwardia virginica (Virginia chain-fern)

Common associated species include:

Cephalanthus occidentalis (Buttonbush)
Clethra alnifolia (Pepper-bush)
Cornus amomum (Silky dogwood)
Ilex glabra (Inkberry)
Ilex verticillata (Winterberry)
Kalmia angustifolia (Laurel)
Ledum groenlandicum (Labrador tea)
Myrica gale (Sweet gale)
Onoclea sensibilis (Sensitive fern)
Osmunda spp. (Fern)
Rosa palustris (Swamp rose)
Vaccinium spp. (Blueberry)

63. Species associations. Wooded wetlands of the northern portion of this region are primarily coniferous and are commonly dominated by larch and arborvitae. In some situations, particularly where substrates are calcareous, Atlantic white cedar often occurs in pure stands.

64. In more southern parts of the region, especially at lower

elevations, the wooded wetlands are primarily deciduous. The dominants include red maple, black willow, and green ash. Atlantic white cedar and red maple predominate in coastal plain wooded wetlands. Common shrubs of the North Atlantic Region include alder, silky dogwood, button-bush, and pepper-bush. Ferns often dominate the herbaceous stratum; some important ones are cinnamon fern, royal fern, interruped fern, sensitive fern, marsh fern, and Virginia chain-fern.

65. One special wetland community, the bog-swamp, is included here. These are common in the glaciated regions and may sometimes have a shrub cover of 30 percent or more, and as such are classified as Scrub-Shrub Wetlands. These areas typically are characterized by the presence of the mat-forming sphagnum mosses which, upon decomposition, form deep, acidic peat substrates. A variety of specialized herbaceous plants are found here, including a number of orchid and carnivorous plants. Common woody species found in such areas are mostly shrubs, such as large cranberry, leatherleaf, laurel, and labrador tea.

Environmental conditions

66. The vegetation of the freshwater swamps and bog-swamp habitats has developed primarily in response to the water regime. Both are at least periodically flooded, and, in many instances, the substrate is saturated for the entire growing season. A further limiting factor, particularly in the bogs, is the high acidity of the substrate.

STREAMBED

DEFINITION: The Streambed class includes all wetlands restricted within a channel containing nontidal flowing water for only part of the year. When the water is not flowing, it may remain in isolated pools or surface water may be absent. This class also includes all channels of a river or estuary that are completely dewatered at low tide. Water regimes are restricted to irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, and intermittently exposed (Cowardin et al. 1979).

67. Within the Streambed class, NWI includes seven subclasses: (a) Bedrock, (b) Rubble, (c) Cobble-gravel, (d) Sand, (e) Mud, (f) Organic, and (g) Vegetated. Only the latter subclass will be considered in this guide.

Streambed (Vegetated)

68. The form and substrate of streambeds vary greatly depending upon the gradient of the channel, the velocity of the water, and the sediment load. Streambeds are usually not vegetated because of the scouring effect of moving water, but they may be colonized by annuals or perennials during periods of low flow (Cowardin et al. 1979).

Vegetation

69. Species composition of Streambeds (Vegetated). Prevalent species include:

Panicum capillare (Old witch grass)*

Environmental conditions

70. Vegetated Streambeds are exposed long enough to be colonized by herbaceous annuals or seedling herbaceous perennials (pioneer plants). This vegetation, unlike that of Emergent Wetlands, is usually killed by rising water levels or sudden flooding (Cowardin et al. 1979).

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* Cowardin et al. (1979). In addition to this species, those listed as dominants for the Unconsolidated Shores (Vegetated) subclass are also commonly found.

UNCONSOLIDATED SHORES

DEFINITION: The Unconsolidated Shores class includes all wetland habitats having the following characteristics: (a) unconsolidated substrates with less than 75 percent areal cover of stones, boulders, or bedrock; (b) less than 30 percent areal cover of vegetation other than pioneering plants; and (c) any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, or artifically flooded (Cowardin et al. 1979).

71. Within the Unconsolidated Shores class, NWI includes five subclasses: (a) Cobble-Gravel, (b) Sand, (c) Mud, (d) Organic, and (e) Vegetated. Only the latter subclass will be considered in this guide.

Unconsolidated Shores (Vegetated)

72. The substrates that characterize Unconsolidated Shores usually lack vegetation except for pioneering plants that become established during periods of favorable growth conditions. Unconsolidated Shores consist of landforms such as beaches, bars, and flats that are created by the erosion and deposition actions of waves and currents.

Vegetation

73. Species composition of Unconsolidated Shores (Vegetated). Prevalent species include:

Chenopodium rubrum (Goosefoot)
Echinochloa crusgalli (Barnyard grass)
Kochia scoparia (Summer cypress)
Xanthium strumarium (Cocklebur)

Environmental conditions

74. Some Unconsolidated Shores are exposed for a sufficient period to be colonized by herbaceous annuals or seedling herbaceous perennials (pioneer plants). This vegetation, unlike that of Emergent

Wetlands, is usually killed by rising water levels and may be gone before the beginning of the next growing season. Many of the pioneer species are not hydrophytes but are weedy mesophytes that cannot tolerate wet soil or flooding (Cowardin et al. 1979).

PART IV: REFERENCES AND SELECTED BIBLIOGRAPHY

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APPENDIX A: COMMON AND SCIENTIFIC NAMES OF PLANTS OF THE NORTH ATLANTIC STATES

Common/Scientific Names*

Alakli-grass
Puccinellia spp.
American elm
Ulmus americana L.
American lotus
Nelumbo lutea (Willd.) Pers.
American threesquare
Scirpus americanus Pers.
Arborvitae
Thuja occidentalis L.
Arror-arum
Peltandra virginica (L.) Schott.
Arrowhead
Sagittaria spp.
Aster
Aster spp.
Atlantic white cedar
Chamaecyparis thyoides (L.) B.S.P.
Baltic rush
Juncus balticus Willd.
Barnyard grass
Echinochloa crusgalli (L.) Beauv.
Big bur-reed
Sparganium eurycarpum Engelm.
Big cordgrass
Spartina cynosuroides (L.) Roth
Big duckweed
Spirodela polyrhiza (L.) Schleid.
Bigelow glasswort
Salicornia bigelovii Torr.
Black needlerush
Juncus gerardii Loisel.
Black spruce
Picea mariana (Mill.) B.S.P.
Black willow
Salix nigra Marsh.
Bladderwort
Utricularia spp.
Blueberry
Vaccinium spp.

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* Names are listed alphabetically by scientific name beginning on Page A6.

Bluejoint reedgrass
Calamagrostis canadensis (Michx.) Beauv.
Blunt spikesedge
Eleocharis obtusa (Willd.) Schultes
Brown algae, Rockweed
Fucus spp.
Bulrush
Scirpus spp.
Bur-reed
Sparganium spp.
Buttonbush
Cephalanthus occidentalis L.
Canada rush
Juncus canadensis J. Gay ex Laharpe
Cardinal flower
Lobelia cardinalis L.
Cattail
Typha angustifolia L.
Cattail
Typha spp.
Cinnamon fern
Osmunda cinnamomea L.
Cocklebur
Xanthium strumarium L.
Common reed, Reed grass
Phragmites australis (Cav.) Trin. ex Steud.
Common spikesedge
Eleocharis palustris (L.) R. & S.
Dock
Rumex spp.
Duckweed
Lemna minor L.
Eelgrass
Zostera marina L.
False nettle
Boehmeria cylindrica (L.) Sw.
Fern
Osmunda spp.
Giant bulrush
Scirpus tabernaemontanii K.C. Gmel.
Goosefoot
Chenopodium rubrum
Green algae
Enteromorpha spp.
Green algae, Sea lettuce
Ulva lactuca L.
Green ash
Fraxinus pennsylvanica Marsh.
Hardstem bulrush
Scirpus acutus Muhl. ex Bigelow

Horned pondweed
Zannichellia palustris L.
Inkberry
Ilex glabra (L.) Gray
Interrupted fern
Osmunda claytoniana L.
Jewelweed
Impatiens capensis Meerb.
Labrador tea
Ledum groenlandicum Oeder
Larch
Larix laricina (Du Roi) K. Koch
Large cranberry
Vaccinium macrocarpon Ait.
Laurel
Kalmia spp.
Leatherleaf
Chamaedaphne calyculata (L.) Moench
Mannagrass
Glyceria spp.
Maritime sedge
Scirpus maritimus L.
Marsh fern
Thelypteris palustris Schott
Marsh fleabane
Pluchea odorata (L.) Cass.
Marsh-mallow
Althaea officinalis L.
Marsh mallow
Kosteletzkya virginica (L.) Presl ex Gray
Naiad
Najas spp.
Old witch grass
Panicum capillare L.
Olney threesquare
Scirpus olneyi Gray
Pepper-bush
Clethra alnifolia L.
Pickerel-weed
Pontederia cordata L.
Pondweed
Potamogeton spp.
Prairie cordgrass
Spartina pectinata Link
Quillwort
Isoetes spp.
Red goosefoot
Chenopodium rubrum L.
Red maple
Acer rubrum L.

Redroot cyperus
Cyperus strigosus L.
Reed canarygrass
Phalaris arundinacea L.
Reed grass
Phragmites australis (Cav.) Trin. ex Steud.
Rice cutgrass
Leersia oryzoides (L.) Swartz
Rockweed
Fucus spp.
Rose mallow
Hibiscus moscheutos L.
Royal fern
Osmunda regalis L. var. *spectabilis* (Willd.) Gray
Rush
Juncus spp.
Sago pondweed
Potamogeton pectinatus L.
Saltgrass
Distichlis spicata (L.) Greene
Saltmarsh aster
Aster subulatus Michx.
Saltmarsh bulrush
Scirpus robustus Pursh
Saltmarsh cordgrass
Spartina alterniflora Loisel.
Saltmarsh fimbristylis
Fimbristylis spadicea (L.) Vahl
Saltmeadow cordgrass
Spartina patens (Ait.) Muhl.
Sea blite
Suaeda linearis (Ell.) Moq.
Sea lavender
Limonium carolinianum (Walt.) Britt.
Sea lettuce
Ulva lactuca L.
Sea-pink
Sabatia spp.
Seaside crowfoot
Ranunculus cymbalaria Pursh
Seaside gerardia
Agalinus maritima (Raf.) Raf.
Seaside goldenrod
Solidago sempervirens L.
Seaside plantain
Plantago maritima L.
Sedge
Carex vulpinoidea Michx.
Sedge
Carex spp.

Sedge
Scirpus spp.
Sensitive fern
Onoclea sensibilis L.
Sheep laurel
Kalmia angustifolia L.
Silky dogwood
Cornus amomum Mill.
Slender glasswort
Salicornia europaea L.
Small cranberry
Vaccinium oxycoccus L.
Smartweed
Polygonum spp.
Smooth alder
Alnus serrulata (Ait.) Willd.
Soft rush
Juncus effusus L.
Spatterdock
Nuphar luteum (L.) Sibthorp & Smith
Speckled alder
Alnus incana (L.) Moench ssp. *rugosa* (Du Roi) Clausen
Sphagnum moss
Sphagnum spp.
Spikesedge
Eleocharis spp.
Summer cypress
Kochia scoparia (L.) Schrad.
Swamp milkweed
Asclepias incarnata L.
Swamp rose
Rosa palustris Marsh.
Sweetflag
Acorus americanus (Raf.) Raf.
Sweet gale
Myrica gale L.
Tearthumb
Polygonum spp.
Tufted rush
Juncus coriaceus Mackenz.
Tussock sedge
Carex stricta Lam.
Twig-rush
Cladium mariscoides (Muhl.) Torr.
Umbrella sedge
Cyperus spp.
Virginia chain-fern
Woodwardia virginia (L.) Sm.
Walter's millet
Echinochloa walteri (Pursh) Heller

Water-celery
Vallisneria americana Michx.
Water hemp
Amaranthus cannabinus (L.) J. D. Sauer
Water lily
Nymphaea odorata Ait.
Water milfoil
Myriophyllum spp.
White spruce
Picea glauca (Moench) Voss.
Widgeon grass
Ruppia maritima L.
Wild rice
Zizania aquatica L.
Winterberry
Ilex verticillata (L.) Gray
Willow
Salix spp.
Woody glasswort
Salicornia virginica L.

Scientific/Common Names

Acer rubrum L.
Red maple
Acorus americanus (Raf.) Raf.
Sweetflag
Agalinus maritima (Raf.) Raf.
Seaside gerardia
Alnus incana (L.) Moench ssp. *rugosa* (Du Roi) Clausen
Speckled alder
Alnus serrulata (Air.) Willd.
Smooth alder
Althaea officinalis L.
Marsh-mallow
Amaranthus cannabinus (L.) J. D. Sauer
Water hemp
Asclepias incarnata L.
Swamp milkweed
Aster subulatus Michx.
Saltmarsh aster
Aster spp.
Aster
Boehmeria cylindrica (L.) Sw.
False nettle
Calamagrostis canadensis (Michx.) Beauv.
Bluejoint reedgrass
Carex stricta Lam.
Tussock sedge

Carex vulpinoidea Michx.
Sedge
Carex spp.
Sedge
Cephalanthus occidentalis L.
Buttonbush
Chamaecyparis thyoides (L.) B.S.P.
Atlantic white cedar
Chamaedaphne calyculata (L.) Moench
Leatherleaf
Chenopodium rubrum L.
Goosefoot
Cladium mariscoides (Muhl.) Torr.
Twig-rush
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Pepper-bush
Cornus amomum Mill.
Silky dogwood
Cyperus spp.
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Cyperus strigosus L.
Redroot cyperus
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Saltgrass
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Barnyard grass
Echinochloa walteri (Pursh) Heller
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Eleocharis palustris (L.) R. & S.
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Green algae
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Green ash
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Brown algae, Rockweed
Glyceria spp.
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Rose mallow
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Inkberry
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Isoetes spp.
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Rice cutgrass
Lemna minor L.
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Osmunda regalis L. var. *spectabilis* (Willd.) Gray
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Olney threesquare
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Giant bulrush
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Virginia chain-fern
Xanthium strumarium L.
Cocklebur
Zannichellia palustris L.
Horned pondweed
Zizania aquatica L.
Wild rice
Zostera marina L.
Eelgrass

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