U.S. Fish & Wildlife Service

Dichotomous Keys and Mapping Codes for Wetland Landscape Position, Landform, Water Flow Path, and Waterbody Type Descriptors: Version 2.0

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Cover photo by R.W. Tiner.

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Section 1. Introduction

A wide variety of wetlands have formed across the United States. To describe this diversity and to inventory wetland resources, government agencies and scientists have devised various wetland classification systems (Tiner 1999). Features used to classify wetlands include vegetation, hydrology, water chemistry, origin of water, soil types, landscape position, landform (geomorphology), wetland origin, wetland size, and ecosystem form/energy sources.

The U.S. Fish and Wildlife Service's wetland and deepwater habitat classification (Cowardin et al. 1979) is the national standard for wetland classification. This classification system emphasizes vegetation, substrate, hydrology, water chemistry, and certain impacts (e.g., partly drained, excavated, impounded, and farmed). These properties are important for describing wetlands and separating them into groups for inventory and mapping purposes and for natural resource management. They do not, however, include some abiotic properties important for evaluating wetland functions (Brinson 1993). Moreover, the classification of deepwater habitats is limited mainly to general aquatic ecosystem (marine, estuarine, lacustrine, and riverine) and bottom substrate type, with a few subsystems noted for riverine deepwater habitats. The Service's classification system would benefit from the application of additional descriptors that more fully encompass the range of characteristics associated with wetlands and deepwater habitats.

In the early 1990s, Mark Brinson created a hydrogeomorphic (HGM) classification system to serve as a foundation for wetland evaluation (Brinson 1993). He described the HGM system as "a generic approach to classification and not a specific one to be used in practice" (Brinson 1993, p. 2). This system emphasized the location of a wetland in a watershed (its geomorphic setting), its sources of water, and its hydrodynamics. The system was designed for evaluating similar wetlands in a given geographic area and for developing a set of quantifiable characteristics for "reference wetlands" rather than for inventorying wetland resources (Smith et al. 1995). A series of geographically focused models or "function profiles" for various wetland types have been created and are in development for use in functional assessment (e.g., Brinson et al. 1995, Ainslie et al. 1999, Smith and Klimas 2002).

Need for New Descriptors

The Service's National Wetlands Inventory (NWI) Program has produced wetland maps for 91 percent of the coterminous United States and 35 percent of Alaska. Digital data are available for 46 percent of the former area and for 18 percent of the latter. Although these data represent a wealth of information about U.S. wetlands, they lack hydrogeomorphic and other characteristics needed to perform assessments of wetland functions over broad geographic areas. Using geographic information system (GIS) technology and geospatial databases, it is now possible to predict wetland functions for watersheds - a major natural resource planning unit. Watershed managers could make better use of NWI data if additional descriptors (e.g., hydrogeomorphic-type attributes) were added to the current NWI database. Watershed-based preliminary

assessments of wetland functions could be performed. This new information would also permit more detailed characterizations of wetlands for reports and for developing scientific studies and lists of potential reference wetland sites. The Wetlands Subcommittee of the Federal Geographic Data Committee (FGDC) in drafting wetland mapping standards recommended use of these indicators (FGDC Wetlands Subcommittee 2009). They recognized the value of adding these attributes to the existing NWI data thereby making the database a more powerful analytical tool.

Background on Development of Keys

Since the Cowardin et al. wetland classification system (1979) is the national standard and forms the basis of the most extensive wetland database for the country, it would be desirable to develop additional modifiers to enhance the current data. This would greatly increase the value of NWI digital data for natural resource planning, management, and conservation. Unfortunately, Brinson's "A Hydrogeomorphic Classification of Wetlands" (1993) was not designed for use with the Service's wetland classification. He used some terms from the Cowardin et al. system but defined them differently (e.g., Lacustrine and Riverine). Consequently, the Service needed to develop a set of hydrogeomorphic-type descriptors that would be more compatible with its system. Such descriptors would bridge the gap between these two systems, so that NWI data could be used to produce preliminary assessments of wetland functions based on characteristics identified in the NWI digital database. In addition, more descriptive information on deepwater habitats would also be beneficial. For example, identification of the extent of dammed rivers and streams in the United States is a valuable statistic, yet according to the Service's classification dammed rivers are classified as Lacustrine deepwater habitats with no provision for separating dammed rivers from dammed lacustrine waters. Differentiation of estuaries by various properties would also be useful for national or regional inventories.

Recognizing the need to better describe wetlands from the abiotic standpoint in the spirit of the HGM approach, the Service developed a set of dichotomous keys for use with NWI data (Tiner 1997b). The keys bridge the gap between the Service's wetland classification and the HGM system by providing descriptors for landscape position, landform, water flow path and waterbody type (LLWW descriptors) important for producing better characterizations of wetlands and deepwater habitats. The LLWW descriptors for wetlands can be easily correlated with the HGM types to make use of HGM profiles when they become available. The LLWW attributes were designed chiefly as descriptors for the Service's existing classification system (Cowardin et al. 1979) and to be applied to NWI digital data, but they can be used independently to describe a wetland or deepwater habitat. Consequently, there is some overlap with Cowardin et al. since some users may wish to use these descriptors without reference to Cowardin et al.

The first set of dichotomous keys was created to improve descriptions of wetlands in the northeastern United States (Tiner 1995a, b). They were initially used to enhance NWI data for predicting functions of potential wetland restoration sites in Massachusetts (Tiner 1995a, 1997a). Later, the keys were modified for use in predicting wetland functions for watersheds nationwide (Tiner 1997b, 2000). A set of keys for waterbodies was added to improve the Service's ability to characterize wetland and aquatic resources for watersheds.

The keys are periodically updated based on application in various physiographic regions. Since 2003, numerous applications of the descriptors have been performed. While the basic framework of the descriptors has not changed, new water flow path descriptors and modifiers have been added to provide more options for improving the characterization of wetlands. This version is an update of an earlier set of keys published from 1997 to 2003 (Tiner 1997b, 2000. 2003).

Use of the Keys

Two sets of dichotomous keys (composed of pairs of contrasting statements) are provided - one for wetlands and one for waterbodies. Vegetated wetlands (e.g., marshes, swamps, bogs, flatwoods, and wet meadows) and periodically exposed nonvegetated wetlands (e.g., mudflats, beaches, and other exposed shorelines) should be classified using the wetland keys, while the waterbody keys should be used for permanent deep open water habitats (subtidal or >6.6 feet deep for nontidal waters). Some sites may qualify as both wetlands and waterbodies. A good example is a pond. Shallow ponds less than 20 acres in size meet the Service's definition of wetland, but they are also waterbodies. Such areas can be classified as both wetland and waterbody, if desirable. Ponds should be first classified to a landscape position and then to a particular type using the waterbody keys. Another example would be permanently flooded aquatic beds in the shallow water zone of a lake. They are classified using wetland hydrogeomorphic descriptors, yet they also clearly represent a section of the lake (waterbody). This approach has worked well in producing watershed-based wetland characterizations and preliminary assessments of wetland functions. When applying the attributes to existing NWI data, the NWI polygons may actually encompass more than one landscape type. This situation is frequently encountered in headwater locations where streamside wetlands and neighboring groundwater-driven wetlands have been classified as the same NWI type (e.g., PFO1E or PFO1C). Since splitting the polygon into two different sections is not usually done, the LLWW descriptors added should apply to the conditions reflective of most of the wetland polygon.

Uses of Enhanced Digital Database

Once they are added to existing NWI digital data, the LLWW characteristics (e.g., landscape position, landform, water flow path, and waterbody type) may be used to produce a more complete description of wetland and deepwater habitat characteristics for watersheds. The enhanced NWI digital data may then be used to predict the likely functions of individual wetlands or to estimate the capacity of an entire suite of wetlands to perform certain functions in a watershed. Such work has been done for several watersheds including Maine's Casco Bay watershed and the Nanticoke River and Coastal Bays watersheds in Maryland, the Delaware portion of the Nanticoke River, and numerous small watersheds in New York (see Tiner et al. 1999, 2000, 2001; Machung and Forgione 2002; Tiner 2002; see sample reports on the NWI website:http://wetlands.fws.gov for application of the LLWW descriptors). These characterizations are based on our current knowledge of wetland functions for specific types (Tiner 2003) and may be refined in the future, as needed, based on the applicable HGM profiles and other information. The new terms can also be used to describe wetlands for reports of various kinds including wetland permit reviews, wetland trend reports, and other reports

requiring more comprehensive descriptions of individual wetlands.

Organization of this Report

The report is organized into seven sections: 1) Introduction, 2) Wetland Keys, 3) Waterbody Keys, 4) Coding System for LLWW Descriptors (codes used for classifying and mapping wetlands), 5) Acknowledgments, 6) References, and 7) Glossary.

Section 2. Wetland Keys

Three keys are provided to identify wetland landscape position and landform for individual wetlands: Key A for classifying the former and Keys B and C for the latter (for inland wetlands and coastal wetlands, respectively). A fourth key - Key D - addresses the flow of water associated with wetlands. Table 1 lists the LLWW descriptors. It gives readers a good idea of what the various combinations may be.

Users should first identify the landscape position associated with the subject wetland following Key A-1. Afterwards, using Key B-1 for inland wetlands and Key C-1 for salt and brackish wetlands, users will determine the associated landform. The landform keys include provisions for identifying specific regional wetland types such as Carolina bays, pocosins, flatwoods, cypress domes, prairie potholes, playas, woodland vernal pools, West Coast vernal pools, interdunal swales, and salt flats. Key D-1 addresses water flow path descriptors. Various other modifiers may also be applied to better describe wetlands, such as headwater areas; these are included in the four main keys.

Besides the keys provided, there are numerous other attributes that can be used to describe the condition of wetlands. Some examples are other descriptors that address resource condition could be ones that emphasize human modification, (e.g., natural vs. altered, with further subdivisions of the latter descriptor possible), the condition of wetland buffers, or levels of pollution (e.g., no pollution [pristine], low pollution, moderate pollution, and high pollution). Addressing wetland condition, however, was beyond the main goal of describing wetlands from a hydrogeomorphic standpoint.

Special Note: If interested in classifying the landscape position of lakes and ponds to identify their location in a watershed, Key A-1 should provide necessary direction. Pond and lake codes could begin with landscape position followed by the waterbody type and the water flow path with other modifiers added as appropriate (e.g., TEPD_IS or LSLK_TH). This is an option for database construction. In most cases, however, this should not be necessary as information on their position in the landscape should be interpretable from their water flow path designation.

Table 1. List of landscape position, landform, water flow path, and waterbody type (LLWW) descriptors. Note that more detailed categorization of landforms, water flow path, and pond types are possible, but they have not been shown here. * - Lakes and ponds are assigned as a landform so that their landscape position can be identified.

Landscape	Landform	Water Flow Path	Waterbody Type
Marine	Fringe	Bidirectional-tidal	Open Ocean
	Island		Reef-protected Waters
			Atoll Lagoon
			Fjord
			Semi-protected Oceanic Bay
Estuarine	Fringe	Bidirectional-tidal	Fjord
	Basin		Island Protected Rocky Headland Bay
	Basin (tidally restricted)		Rocky Headland Bay
	Island		Tectonic Estuary
	Delta		River-dominated Estuary
			Bar-built Estuary
			Bar-built Estuary (Coastal Pond)
			Bar-built Estuary (Hypersaline Lagoon)
			Island-protected Estuary
			Shoreline Bay Estuary
Lotic	Floodplain	Throughflow	River (Gradients: Tidal, Dammed, High,
	Basin	Throughflow-intermittent	Middle, Low, and Intermittent)
	Flat	Throughflow-entrenched	Stream (Gradients: Tidal, Dammed, High,
	Fringe	Bidirectional-tidal	Middle, Low, and Intermittent)
	Island	Bidirectional-nontidal	
	Pond*		
	Lake*		

Lentic	Fringe Basin Flat Island Pond*	Bidirectional-nontidal Bidirectional-tidal Throughflow	Natural Lake (Main Body, Open Embayment, Semi-enclosed Embayment, Barrier Beach Lagoon) Dammed River Valley Lake (Reservoir) Dammed River Valley Lake (Hydropower) Dammed River Valley Lake (Other) Other Dammed Lake (Former Natural Lake) Other Dammed Lake (Artificial)
Terrene	Fringe (pond) Basin Basin (former floodplain) Flat Flat (former floodplain) Slope Floodplain Pond* Lake*	Outflow Outflow-artificial Inflow Throughflow Throughflow-artificial Throughflow-entrenched Isolated Paludified Bidirectional-tidal	Pond (Natural, Dammed/Impounded, Excavated, Beaver, Other Artificial; many other types)

Key A-1: Key to Landscape Position

This key allows characterization of wetlands based on their location in or along a waterbody, in a drainageway, or in isolation ("geographically isolated" - surrounded by upland). *Attention: Lakes and ponds should also be classified by landscape position as Lotic River, Lotic Stream, or Terrene (and Lentic for ponds only).* See Figure 1 for schematic of landscape positions.

1. Wetland is completely surrounded by upland (non-hydric soils or filled lands that are now upland development) or in a pond completely surrounded by upland or wetland is a pond completely surrounded by upland (dryland)…… .....**Terrene**
Go to Key B-1 for inland landform

1. Wetland is not surrounded by upland or in an isolated pond but is connected to a waterbody of some kind or to another wetland…….…….....2

2. Wetland is located in or along tidal salt or brackish waters (i.e., an estuary or ocean) including its frequently inundated shoreline (excluding areas formerly under tidal influence) and if vegetated, is colonized by salt-tolerant plants (halophytes).....3
2. Wetland (including pond or shallow lake) is not frequently inundated by salt or brackish tides.....4

3. Wetland is located in or along the ocean.....**Marine**
Go to Key C-1 for coastal landform

3. Wetland is located in or along an estuary (typically a semi-enclosed basin or tidal river where fresh water mixes with sea water).....**Estuarine**
Go to Key E-2 for Estuary Type, then to Key C-1 for coastal landform

> Note: An estuary is represented by salt and brackish tidal waters and contiguous wetlands where marine waters are mixed with fresh water from rivers, streams, and/or upland runoff; tidal freshwater wetlands are not considered part of the estuary for this classification. If an area was formerly connected to an estuary but now is completely cut-off from tidal flow, it is should be classified as one of the other landscape positions - Terrene, Lentic, or Lotic, depending on current site characteristics. Such areas should be designated with a modifier to identify such wetlands as "former estuarine wetland." Lands overflowed infrequently by tides such as overwash areas on barrier islands are considered Terrene, while those frequently flooded as evidenced by salt and brackish marsh plants are classified as Estuarine. Tidal freshwater wetlands (e.g., PEMR, PFO1R, PSS1S) contiguous to salt/brackish/oligohaline tidal marshes are classified as Lotic (if a stream or river extends completely through it) or Terrene (if lacking a stream or if stream does not flow completely through the wetland). Freshwater wetland islands (e.g., PFO_R or PSS_R) imbedded within estuarine wetlands and freshwater wetlands on levees along rivers in the upper estuary (oligohaline zone) should also be classified as estuarine given their location in the estuary. This situation should be a minor occurrence.

4. Wetland is located in or along a lake or reservoir (permanent waterbody where standing water is typically much deeper than 6.6 feet at low water but including large shallow lakes ≥20 acres), including streamside wetlands in a lake basin (the depression containing the lake), and wetlands behind barrier islands and beaches with open access to a lake (e.g., Great Lakes).....**Lentic**
Go to Key C-2 for Lake Type
Then *Go to Key B-1 for inland landform*

Note: Lentic wetlands consist of all wetlands in a lake basin (i.e., the depression forming the lake), including lakeside wetlands intersected by streams emptying into the lake. The upstream limit of lentic wetlands is defined by the upstream influence of the lake which is usually approximated by the limits of the basin within which the lake occurs. If the lake is imbedded in a wetland landscape as in the arctic and subarctic or in the Mississippi delta, for example, the limits of the lentic wetland should be those shoreline wetlands subject to periodic inundation during high lake levels and not the entire wetland landscape in which the lake is found. Wetlands contiguous to the lake but at higher elevations and not in the lake basin should NOT be classified as lentic; these wetlands should be treated as terrene outflow types in most cases. This is especially common where lakes are artificially created by diking and/or excavation. The streamside lentic wetlands are designated as "Throughflow," thereby emphasizing the stream flow through these wetlands. Other lentic wetlands are typically classified as "Bidirectional-nontidal" since water tables rise and fall with lake levels during the year. Tidally-influenced freshwater lakes have "Bidirectional-tidal" flow.

Modifiers: Natural, Dammed River Valley, Other Dammed - see Key C-2 for others.

4. Wetland does not occur along a lake or reservoir….....5

5. Wetland is located in a river or stream (including in-stream ponds and shallow lakes), within its banks, or on its *active* floodplain and is periodically flooded by the river or stream.....6

Note: Included in this grouping are wetlands in sloughs that are along small streams or braided streams that may not be visible on mid-altitude aerial photography or on standard 1:24K topographic maps (apply “sl” slough descriptor. Also included are wetlands along flowing water courses that may be impounded but subject only to periodic flooding due to flood protection or other purposes.

5. Wetland is not located in a river or stream or on its *active* floodplain, but may be located along the river yet not subject to frequent overflow (e.g., upper terrace) and mostly maintained by groundwater seepage (latter would be “riparian”) or precipitation.....**Terrene**
Go to Key B-1 for inland landform

Note: These terrene wetlands may occur: (1) on a slope or flat, or in a depression (including ponds, potholes, and playas) lacking a stream but may be contiguous to a river or stream, (2) on a historic (inactive) floodplain, (3) in a landscape position crossed by a stream (e.g., an entrenched stream), but where the stream does not periodically inundate

the wetland, or (4) adjacent to an estuarine wetland but at an elevation that is only infrequently flooded by storm tides and thereby is a freshwater wetland.

6. Wetland is the source of a river or stream but this watercourse does not extend through the wetland.....**Terrene**

Modifiers: Should include Headwater modifier for wetlands that are sources of streams and Estuarine Discharge or Marine Discharge for wetlands whose outflow goes directly to an estuary or the ocean, respectively.

6. Wetland is located in a river or stream, within its banks, or on its *active* floodplain.....7

7. Wetland is associated with a river (a broad channel mapped as a polygon or 2-lined watercourse on a 1:24,000 U.S. Geological Survey topographic map) or its *active* floodplain.....**Lotic River**

Go to Couplet "a" below

(*Also see note under first couplet #4 - Lentic re: streamside wetlands in lake basins*)

Note: If wetland is a freshwater tidal wetland directly behind an estuarine wetland add "ed" (estuarine discharge) to the wetland classification; "ed" should NOT be applied to freshwater tidal wetlands along the river in the fresh tidal reach.

7. Wetland is associated with a stream (*a.linear or single-line watercourse on a 1:24,000 U.S. Geological Survey topographic map*) or its *active* floodplain.....**Lotic Stream**

Go to Couplet "a" below

(*Also see note under first couplet #4 - Lentic re: streamside wetlands in lake basins*)

Note: Artificial drainageways (i.e., ditches) are not considered part of the Lotic classification, whereas channelized streams are part of the Lotic landscape position.

Modifiers: Headwater (wetlands along first- and second-order perennial streams in hilly terrain and along first-order streams only on the coastal plain including all intermittent streams above these perennial streams) and Channelized (excavated stream course).

a. Water flow is under tidal influence (freshwater tidal wetlands).....**Tidal Gradient**

Go to Key B-1 for inland landform

a. Water flow is not under tidal influence (nontidal).....b

b. Water flow is dammed, yet still flowing downstream, at least seasonally.....**Dammed Reach**

Go to Key B-1 for inland landform

Modifiers: Lock and Dammed, Run-of-River Dam, Beaver Dam, and Other Dam (see Waterbody Key B-2 for further information).

b. Water flow is unrestricted.....c

c. Water flow is intermittent during the year.....**Intermittent Gradient**
Go to Key B-1 for inland landform
c. Water flow is perennial (year-round).....d

d. Water flow is generally rapid due to steep gradient; typically little or no floodplain development; watercourse is generally shallow with rock, cobbles, or gravel bottoms; first- and second-order "streams" in hilly to mountainous terrain; part of Cowardin's Upper Perennial Subsystem.....**High Gradient**
Go to Key B-1 for inland landform
d. Watercourse characteristics are not so; "stream" order greater than 2 in hilly to mountainous terrain.....e

e. Water flow is generally slow; typically with extensive floodplain; water course shallow or deep with mud or sand bottoms; typically fifth and higher order "streams", but includes lower order streams in nearly level landscapes such as the Great Lakes Plain (former glacial lakebed) and the Coastal Plain, and ditches; the lower order streams may lack significant floodplain development); Cowardin's Lower Perennial subsystem.....**Low Gradient**
Go to Key B-1 for inland landform
e. Water flow is fast to moderate; with little to some floodplain; usually third-, fourth- and higher order "streams" associated with hilly to mountainous terrain; part of Cowardin's Upper Perennial Subsystem.....**Middle Gradient**
Go to Key B-1 for inland landform

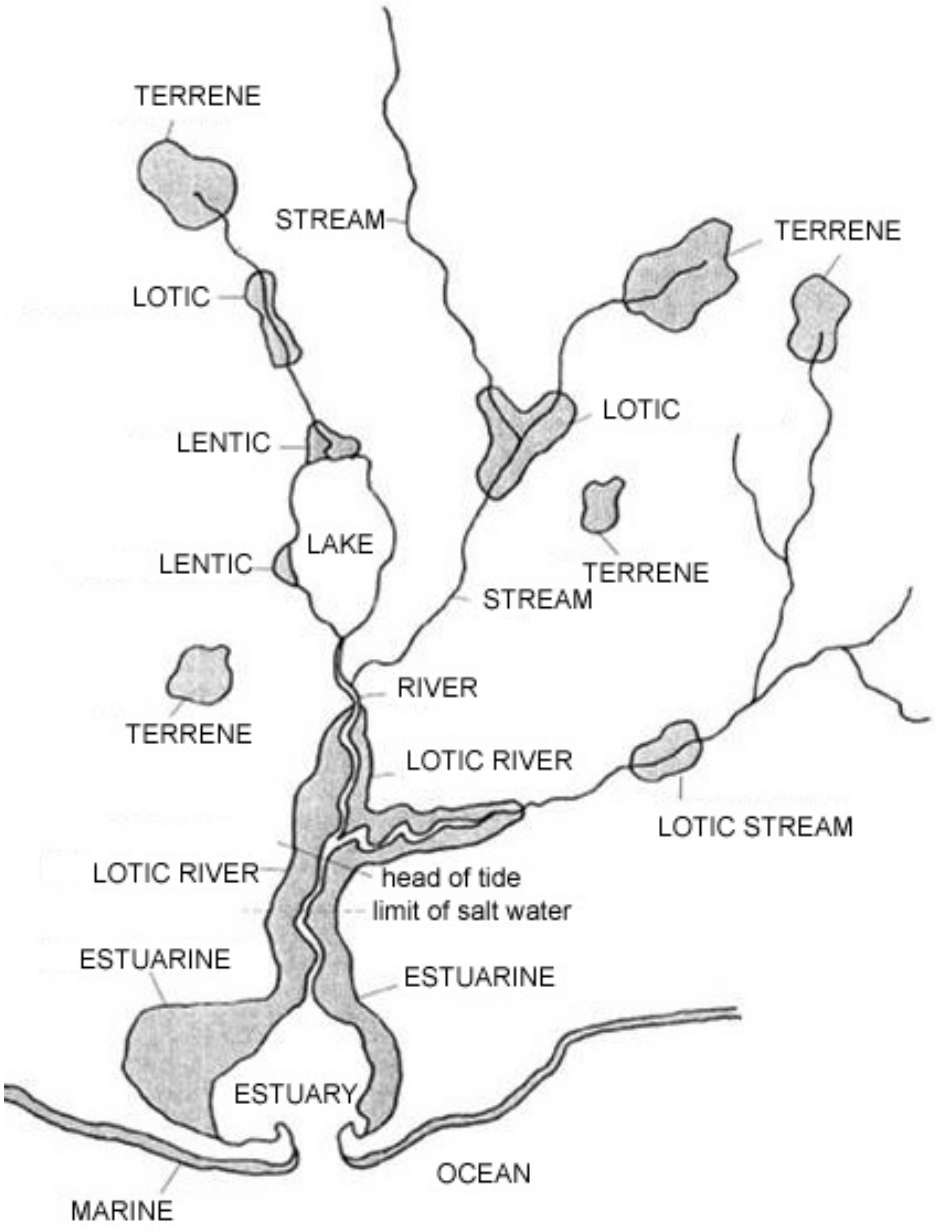

Figure 1. General landscape positions for wetlands, with a few waterbodies shown (ocean, estuary, lake, river, and stream)..

Key B-1: Key to Inland Landforms

1. Wetland occurs on a noticeable slope (e.g., greater than a 2 percent slope).....**Slope Wetland**
Go to Key D-1 for water flow path

Modifiers can be applied to Slope Wetlands to designate the type of inflow or outflow as Channelized Inflow or Outflow (intermittent or perennial, stream or river), Nonchannelized Inflow or Outflow (wetland lacking stream, but connected by observable surface seepage flow), or Nonchannelized-Subsurface Inflow or Outflow (suspected subsurface flow from or to a neighboring wetland upslope or downslope, respectively).

1. Wetland does not occur on a distinct slope.....2

2. Wetland forms an island.....**Island Wetland**
(Go to Key D-1 for water flow path)

Note: Can designate an island formed in a delta at the mouth of a river or stream as a Delta Island Wetland; other islands are associated with landscape positions (e.g., lotic river island wetland, lotic stream island wetland, lentic island wetland, or terrene island pond wetland). For deltaic wetland formations at the mouths of large rivers (e.g., Mississippi), the term "**Delta Wetland**" may be applied. These types can be further classified based on the predominant forces working to shape the delta: river-dominated delta, tide-dominated delta, or wave-dominated delta. Vegetation class and subclass from Cowardin et al. 1979 should be applied to characterize the vegetation of these wetland islands if not previously classified; vegetation is assumed to be rooted unless designated by a *modifier* - "Floating Mat" to indicate a floating island.

2. Wetland does not form an island.....3

3. Wetland occurs within the banks of a river or stream or along the shores of a pond, lake, or island, or behind a barrier beach or island, and is either: (1) vegetated *and* typically permanently inundated, semipermanently flooded (including their tidal freshwater equivalents plus seasonally flooded-tidal palustrine emergent wetlands which tend to be flooded frequently by the tides) or otherwise flooded for most of the growing season, or permanently saturated due to this location or (2) a nonvegetated bank or shore that is temporarily or seasonally flooded .....**Fringe Wetland**
Go to Couplet "a" below for Types of Fringe Wetlands
Then *Go to Key D-1 for water flow path*
Attention: *Seasonally to temporarily flooded vegetated wetlands along rivers and streams (including tidal freshwater reaches) are classified as either Floodplain, Basin, or Flat landforms - see applicable categories.*

a. Wetland forms along the shores of an upland island within a lake, pond, river, or stream.....b
a. Wetland does not form along the shores of an island.....d

b. Wetland forms behind a barrier island or beach spit along a lake.....Lentic Barrier Island Fringe Wetland or Lentic Barrier Beach Fringe Wetland

Modifier: Drowned River-mouth

b. Wetland forms along another type of island.....c

c. Wetland forms along an upland island in a river or stream.....Lotic River Island Fringe Wetland or Lotic Stream Island Fringe Wetland

c. Wetland forms along an upland island in a lake or pond.....Lentic Island Fringe Wetland or Terrene Pond Island Fringe Wetland

d. Wetland forms in or along a river or stream.....Lotic River FringeWetland or Lotic Stream Fringe Wetland

d. Wetland forms in or along a pond or lake.....e

e. Wetland forms along a pond shore.....f

e. Wetland forms along a lake shore.....Lentic Fringe Wetland

Modifier: Drowned River-mouth, Outlet, Inlet

f. Wetland occurs along an in-stream pond.....Lotic River or Stream Fringe Pond Wetland Throughflow

f. Wetland occurs in another type of pond.....Terrene Fringe Pond Wetland

Note: Vegetation is assumed to be rooted unless designated by a *modifier* to indicate a floating mat (Floating Mat).

3. Wetland does not exist along these shores.....4

4. Wetland occurs on an active floodplain (alluvial processes in effect).....**Floodplain Wetland*** (could specify the river system, if desirable). *Go to Key D-1 for water flow path*
Sub-landforms are listed below.

a. Wetland forms along the shores of a river island.....Floodplain Island Wetland

a. Wetland is not along an island.....b

b. Wetland forms in a depressional feature on a floodplain.....Floodplain Basin Wetland or Floodplain Oxbow Wetland (a special type of depression)

b. Wetland forms on a broad nearly level terrace.....Floodplain Flat Wetland

*Note: Questionable floodplain areas may be verified by consulting soil surveys and locating the presence of alluvial soils, e.g., Fluvaquents or Fluvents, or soils with Fluvaquentic subgroups. While most Floodplain wetlands will have a Throughflow water flow path; others may be designated, e.g., Inflow, Outflow, or Isolated if located on the floodplain terrace where they are not inundated every other year on average. Former floodplain wetlands restricted by levees or other features that restrict alluvial processes are classified as Basins or Flats and may be further designated as former floodplain.

Modifiers: Partly Drained; Confluence wetland - wetland at the intersection of two or more streams; River-mouth or stream-mouth wetland - wetland at point where a river and stream empties into lake; Meander scar wetland - floodplain basin wetland, the remnant of a former river meander.

4. Wetland does not occur on an active floodplain.....5

5. Wetland exists in a distinct depression in various positions on the landscape (i.e., surrounded by upland, along smaller rivers and streams, along in-stream ponds, along lake shores, or on former floodplains)..... **Basin Wetland** or **Basin Wetland Former Floodplain** (including *Basin Oxbow Wetland Former Floodplain*) or **Basin Wetland Former Estuarine Fringe**. Can specify regional types: *Carolina Bay Basin Wetland* and *Pocosin Basin Wetland* (Atlantic Coastal Plain), *Cypress Dome Basin Wetland* (Florida), *Prairie Pothole Basin Wetland* (Upper Midwest), *"Salt Flat" Basin Wetland* (arid West), *Playa Basin Wetland* (Southwest), *West Coast Vernal Pool Basin Wetland* (California and Pacific Northwest), *Interdunal Basin Wetland* (sand dunes), *Woodland Vernal Pool Basin Wetland* (forests throughout the country), *Polygonal Basin Wetland* (Alaska), *Sinkhole Basin Wetland* (karst/limestone regions), *Pond Wetland Basin* (throughout country), or some type of *Island Basin Wetland* for basin wetlands on islands.

Go to Key D-1 for water flow path

Modifiers may be applied to indicate artificially created basins due to beaver activity or human actions or artificially drained basins including: Beaver (beaver-created); wetlands created for various purposes or unintentionally formed due to human activities - may want to specify purpose like Aquaculture (e.g., fish and crayfish), Wildlife management (e.g., waterfowl impoundments), and Former floodplain, or to designate former salt marsh that is now nontidal (Former estuarine wetland). Other *modifiers* may be applied to designate the type of inflow or outflow as Channelized (intermittent or perennial, stream or river), Nonchannelized-wetland (contiguous wetland lacking stream), or Nonchannelized-subsurface flow (suspected subsurface flow to neighboring wetland), or to identify a headwater basin (Headwater) or a drainage divide wetland that discharges into two or more watershed (Drainage divide), or to denote a spring-fed wetland (Spring-fed), a wetland bordering a pond (Pond basin wetland) and a wetland bordering an upland island in a pond (Pond island border). For lotic basin wetlands, consider additional modifiers such as Confluence wetland - wetland at the intersection of two or more streams; River-mouth or Stream-mouth wetland - wetland at point where a river and a stream empties into a lake. For lentic basins associated with the Great Lakes, possibly identify Drowned River-mouth wetlands where mouth extends into the lake basin. Outlet or Inlet can be applied to identify the location of the basin wetland within the lake if desirable (e.g., larger lakes). Partly drained may be used for ditched/drained wetlands.

5. Wetland exists in a relatively level area.....**Flat Wetland** or specify *regional types* of flat wetlands, for example: **Salt Flat Wetland** (in the Great Basin) or flats that are fragments of once-larger former floodplains: **Flat Wetland, Former Floodplain**.

Go to Key D-1 for water flow path

Note: If desirable, a *modifier* for drained flats can be applied (Partly drained). Other modifiers can be applied to designate the type of inflow or outflow as Channelized (intermittent or perennial, stream or river), Nonchannelized-wetland (contiguous wetland lacking stream), or Nonchannelized-subsurface flow (suspected subsurface flow to neighboring wetland). For lotic flat wetlands, consider additional modifiers such as confluence wetland - wetland at the intersection of two or more streams; river-mouth or stream-mouth wetland - wetland at point where a river and a stream empties into a lake.

Key C-1: Key to Coastal Landforms

1. Wetland forms a distinct island in an inlet, river, or embayment.....**Island Wetland**
Go to Key D-1 for water flow path

a. Occurs in a delta at the mouth of a river.....Delta Island Wetland
(Could identify flood delta and ebb delta islands for tidal inlets if desirable.)
a. Occurs either in a river or an embayment …….....b

b. Occurs in a river.....River Island Wetland
b. Occurs in a coastal embayment.....c

c. Embayment is open…….. Open Bay Island Wetland

c. Embayment is sheltered or only periodically open to tidal influence…….d

d. Embayment is sheltered and naturally open to tides…….Sheltered Bay Island Wetland

d. Embayment under natural circumstances may be open or closed due to coastal processes; includes bays now permanently open via jetties and similar structures……...
…….……Coastal Pond Island Wetland

Note: The "island" landform should not be applied to sections of marshes fragmented by ditches. It is intended for islands surrounded by significant amounts of open water. It is realized that application of this landform may vary among users but for specific projects, such usage should be consistent.

1. Wetland does not form such an island, but occurs behind barrier islands and beaches, or along the shores embayments, rivers, streams, and islands.....2

2. Wetland occurs along the shore, contiguous with the estuarine waterbody.....**Fringe Wetland**
Go to Key D-1 for water flow path

a. Occurs behind a barrier island or barrier beach spit.....Barrier Island Fringe Wetland or Barrier Spit Fringe Wetland [*Modifier* for overwash areas: Overwash]

a. Occurs elsewhere.....b

b. Occurs along a coastal embayment or along an island in a bay.....c
b. Occurs along a tidal river (including an island in the river), an oceanic island, or along a rocky coastline.....e

c. Embayment is open……. Open Bay Fringe Wetland or Open Bay Island Fringe Wetland (along island)
c. Embayment is sheltered or only periodically open to tidal influence…….d

d. Embayment is sheltered and naturally open to tides…….Sheltered Bay Fringe Wetland or Sheltered Bay Island Fringe Wetland (along island)
d. Embayment under natural circumstances may be open or closed due to coastal processes; includes bays now permanently open via jetties and similar structures……... …..…Coastal Pond Fringe Wetland or Coastal Pond Island Fringe Wetland (along island)

e. Occurs along a coastal river or along an island in a river.....River Fringe Wetland or River Island Fringe Wetland
e. Occurs elsewhere.....f

f. Occurs along an oceanic island.....Ocean Island Fringe Wetland
f. Occurs along the shores of exposed rocky mainland.....g

g. Occurs at toe of cliff……Toe-of-Bluff Fringe Wetland
g. Occurs elsewhere along rocky shore……Headland Fringe Wetland

2. Wetland is separated from main body of marsh by natural or artificial means; the former may be connected by a tidal stream extending through the upland or by washover channels (e.g., estuarine intertidal swales), whereas the latter occurs in an artificial impoundment or behind a road or railroad embankment where tidal flow is at least somewhat restricted.....**Basin Wetland**
Go to Key D-1 for water flow path

Modifiers may be applied to separate natural from created basins (managed fish and wildlife areas; aquaculture impoundments; salt hay diked lands; tidally restricted-road, and tidally restricted-railroad), and for other situations, as needed.

Key D-1: Key to Water Flow Paths

See Figure 2 for general depiction of major water flow paths across the landscape.

1. Wetland is periodically flooded by tides.....**Bidirectional-tidal**
   See Key F-2 for additional descriptors based on tidal ranges (i.e., macrotidal, mesotidal, and microtidal).

   Modifier: Wind tides for areas with low tidal ranges where the more prominent tides are wind-driven such as in North Carolina's Albemarle and Pamlico Sounds.

   Note: If tidal flow is regulated by water control structures, water flow path should be designated as **Bidirectional-tidal Artificial**.

1. Wetland is not flooded by tides.....2

2. Water levels fluctuate due to lake influences or to river flood stages, but water does not flow through this wetland.....**Bidirectional-nontidal, Bidirectional-nontidal/isolated, Bidirectional-nontidal/throughflow, Bidirectional-nontidal/outflow, Bidirectional-nontidal/inflow, and Bidirectional-nontidal Artificial.**

   Note: Lentic wetlands with streams running through them are classified as Throughflow to emphasize this additional water source, while lentic wetlands located in coves or fringing the high ground would typically be classified as Bidirectional-Nontidal. Further classification of water flow path is recommended to link the flow to the lake itself; the bidirectional-nontidal flow path should also include that of the lake. To accomplish that the following subcategories are established: **Bidirectional-nontidal/isolated**, **Bidirectional-nontidal/throughflow**, **Bidirectional-nontidal/outflow**, and **Bidirectional-nontidal/inflow**. **Many floodplain wetlands are throughflow types, yet some are connected to the river through a single channel in which water rises and falls with changing river levels. The water flow path of the latter types is best classified as bidirectional-nontidal**. If flow is regulated by water-control structures, **Bidirectional-nontidal Artificial** should be used.

2. Wetland is not subject to lake influences.....3

3. Wetland is formed by paludification processes where in areas of low evapotranspiration and high rainfall, peat moss moves uphill creating wetlands on hillslopes (i.e., wetland develops upslope of primary water source).....**Paludified**
3. Wetland is not formed by paludification processes.....4

4. Wetland receives surface or ground water from a stream, other waterbody or wetland (i.e., at a higher elevation) and surface or ground water passes through the subject wetland to a stream, another wetland, or other waterbody at a lower elevation; a flow-through system....**Throughflow**, **Throughflow-intermittent***, **Throughflow-entrenched***, or

Throughflow-artificial*

Modifiers: Groundwater-dominated throughflow wetlands can be separated from Surface water-dominated throughflow wetlands.

*Note: **Throughflow-intermittent** is to be used with throughflow wetlands along intermittent streams; **Throughflow-entrenched** indicates that stream flow is through a wetland but the stream is deeply cut and does not overflow into the wetland (therefore the stream is, for practical purposes, separate from the wetland) - this water flow path is intended to be used with Terrene wetlands in this situation; **Throughflow-artificial** is used to designate wetlands where throughflow is human-caused - usually to indicate connection of Terrene wetlands to other Terrene wetlands and waters by ditches and not by streams either natural or channelized.

4. Water does not pass through this wetland to other wetlands or waters.....5

5. There is no surface or groundwater inflow from a stream, other waterbody, or wetland (i.e., no documented surface or ground water inflow from a wetland or other waterbody at a higher elevation) and no observable or known outflow of surface or ground water to other wetlands or waters.....**Isolated**

Attention: *In most applications, isolation is interpreted as "geographically isolated" since groundwater connections are typically unknown for specific wetlands. For practical purposes then," isolated" means no obvious surface water connection to other wetlands and waters. If hydrologic data exist for a locale that documents groundwater linkages, such wetlands should be identified as either outflow. inflow, or throughflow with a "Groundwater-dominated" modifier and not be identified as isolated unless the whole network of wetlands is not connected to a stream or river. In the latter case, the network is a collection of interconnected isolated wetlands.*

Note: Some isolated wetlands are part of a small group of isolated wetlands that may be interconnected in some fashion. For these cases, isolated can be combined with other water flow paths to designate the direction of the internal flow where naturally connected: **Isolated-throughflow**, **Isolated-outflow**, and **Isolated-inflow**, or where connected by ditches: **Isolated-throughflow Artificial**, **Isolated-outflow Artificial**, and **Isolated-inflow Artificial**.

5. Wetland is not hydrologically or geographically isolated.....6

6. Wetland receives surface or ground water inflow from a wetland or other waterbody (perennial or intermittent) at a higher elevation and there is no observable or known significant outflow of surface or ground water to a stream, wetland or waterbody at a lower elevation .....**Inflow**

Modifiers: Groundwater-dominated inflow wetlands can be separated from Surface

water-dominated inflow wetlands; Human-caused (usually to indicate connection of Terrene wetlands to other Terrene wetlands and waters [e.g., Inflow human-caused] by ditches and not by streams either natural or channelized).

6. Wetland receives no surface or ground water inflow from a wetland or permanent waterbody at a higher elevation (may receive flow from intermittent streams only or direct ground water discharge, e.g., during wet season in dry climates) and surface or ground water is discharged from this wetland to a stream, wetland, or other waterbody at a lower elevation…….. .....**Outflow** or **Outflow-artificial***

Modifiers: Groundwater-dominated outflow wetlands can be separated from Surface water-dominated outflow wetlands. Might consider separating perennial outflow (**Outflow-perennial**) from intermitttent outflow (**Outflow-intermittent**), if interested.

*Note: Outflow-artificial is usually used to indicate outflow from formerly isolated wetlands resulting by ditches.

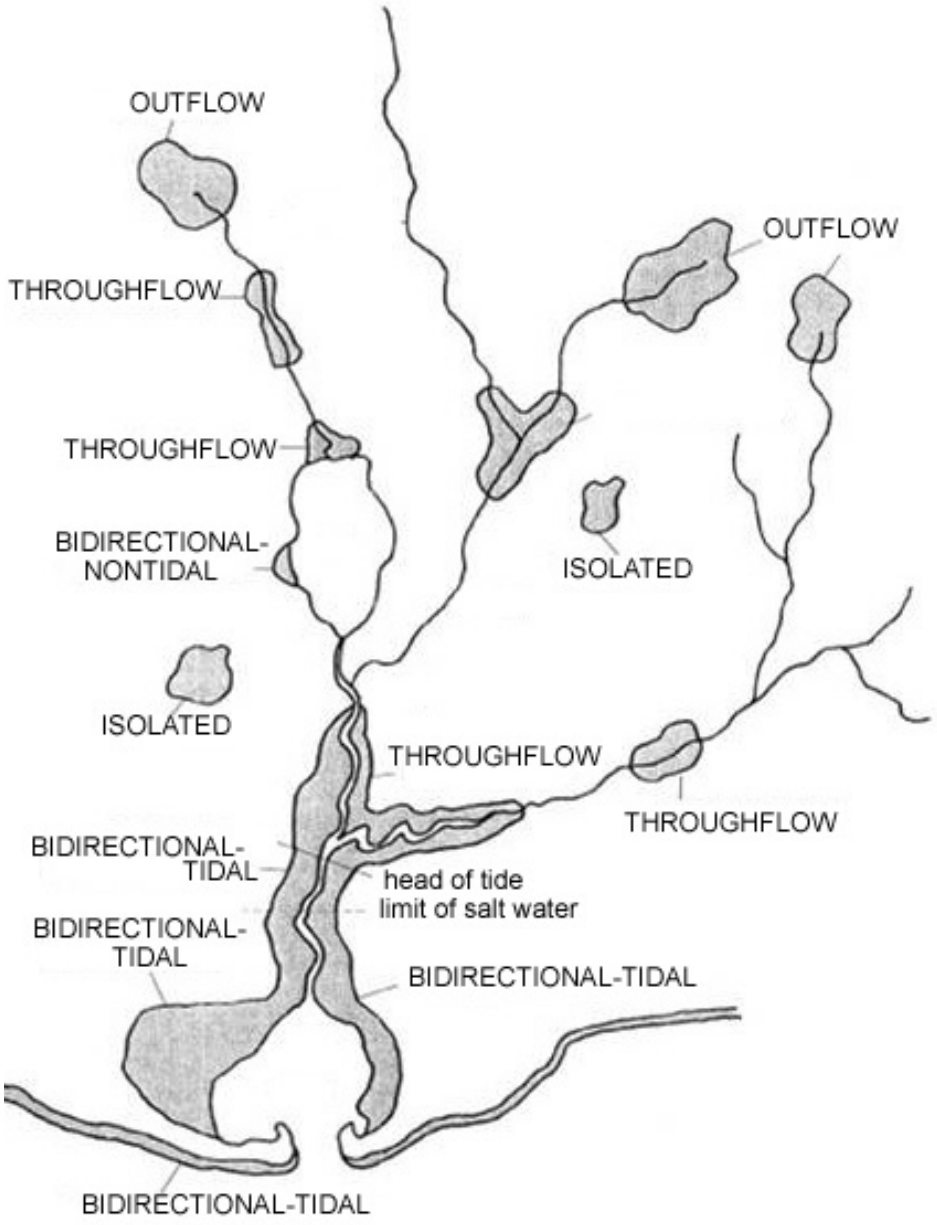

Figure 2. General depiction of common water flow paths across the landscape. Note: Flow for nontidal areas is from top of page downward.

Section 3. Waterbody Keys

These keys are designed to expand the classification of waterbodies beyond the system and subsystem levels in the Service's wetland classification system (Cowardin et al. 1979). Users are advised first to classify the waterbody in one of the five ecosystems: 1) marine (open ocean and associated coastline), 2) estuarine (mixing zone of fresh and ocean-derived salt water), 3) lacustrine (lakes, reservoirs, large impoundments, and dammed rivers), 4) riverine (undammed rivers and tributaries), and 5) palustrine (e.g., nontidal ponds) and then apply the waterbody type descriptors below. *All lakes and ponds should be assigned a landscape position (e.g., Lotic River, Lotic Stream, or Terrene, or Lentic, for ponds only) to indicate their position in a watershed (e.g., LS_LK_ or TEPD_) – see Key A-1 in Section 2 if questions.*

Five sets of keys are given. Key A-2 helps describe the major waterbody type. Key B-2 identifies different stream gradients for rivers and streams. It is similar to the subsystems of Cowardin's Riverine system, but includes provisions for dammed rivers to be identified as well as a middle gradient reach similar to that of Brinson's hydrogeomorphic classification system. The third key, Key C-2, addresses lake types, while Keys D-2 and E-2 further define ocean and estuary types, respectively. Key F-2 is a key to water flow paths of waterbodies. Key G-2 is for describing general circulation patterns in estuaries. The coastal terminology applies concepts of coastal hydrogeomorphology.

Besides the keys provided, there are numerous other attributes that can be used to describe the condition of waterbodies. Some examples are other descriptors that address resource condition could be ones that emphasize human modification, (e.g., natural vs. altered, with further subdivisions of the latter descriptor possible), the condition of waterbody buffers (e.g., stream corridors), or levels of pollution (e.g., no pollution [pristine], low pollution, moderate pollution, and high pollution).

Key A-2. Key to Major Waterbody Type

1. Waterbody is predominantly flowing water.....2
1. Waterbody is predominantly standing water.....7

> Note: Fresh waterbodies may be tidal; if so, waterbody is classified as a Tidal Lake or Tidal Pond using criteria below to separate lakes from ponds.

2. Flow is unidirectional and waterbody is a river, stream, or similar channel.....3
2. Flow is tidal (bidirectional) at least seasonally; waterbody is an ocean, embayment, river, stream, or lake.....4

3. Waterbody is a polygonal feature on a U.S. Geological Survey map or a National Wetlands Inventory Map (1:24,000/1:25,000).....**River**
3. Waterbody is a linear feature on such maps or was originally a linear feature but is now a polygonal feature due to channelization (channelized stream).....**Stream**
Go to River/Stream Gradient Key - Key B-2 - for other modifiers

> Caution: For drier regions, mapped streams on DRG and/or NHD may actually be more of a drainageway; need to examine aerial photos/imagery to be verify the existence of a defined channel.

4. Waterbody is freshwater.....5
4. Waterbody is salt or brackish.....6

5. Waterbody is a polygonal feature on a U.S. Geological Survey map or a National Wetlands Inventory Map (1:24,000/1:25,000).....**River**
5. Waterbody is a linear feature on such maps.....**Stream**
Go to River/Stream Gradient Key - Key B-2 - for other modifiers

6. Part of a major ocean or its associated embayment (Marine system of Cowardin et al. 1979) .....**Ocean**
Go to Ocean Key - Key D-2
6. Part of an estuary where fresh water mixes with salt water (Estuarine system of Cowardin et al. 1979).....**Estuary**
Go to Estuary Key - Key E-2

7. Waterbody is freshwater.....8
7. Waterbody is salt or brackish and tidal.....10

8. Waterbody is permanently flooded and deep (>than 6.6 ft at low water), excluding small "kettle or bog ponds" (i.e., usually less than 5 acres in size and surrounded by bog vegetation).....**Lake**
Go to Lake Key - Key C-2

8. Waterbody is shallow (< 6.6 ft at low water) or a small "kettle or bog pond" (with deeper water).....9

9. Waterbody is small (< 20 acres).....**Pond**

Go to Wetland Landscape Position Key - Key A-1

Separate natural from artificial ponds, then add other modifiers like the following. Some *examples* of modifiers for ponds: beaver, alligator, marsh, swamp, vernal, Prairie Pothole, Sandhill, sinkhole/karst, Grady, interdunal, farm-cropland, farm-livestock, golf, industrial, sewage/wastewater treatment, stormwater, aquaculture-catfish, aquaculture-shrimp, aquaculture-crayfish, cranberry, irrigation, aesthetic-business, acid-mine, arctic polygonal, kettle, bog, woodland, borrow pit, Carolina bay, tundra, coastal plain, tidal, and in-stream.

Note: As mentioned earlier, ponds should be given a landscape position - Lotic River, Lotic Stream, or Terrene and the pond descriptor will be the "landform" descriptor to separate the waterbody from any fringing vegetated wetlands (LR_PD__; LS_PD__; TEPD__). Some ponds may actually be imbedded in lentic wetlands and therefore should be attributed with that landscape position (LE_PD_). Wetlands associated with isolated ponds are typically either Terrene basin wetlands, such as a cypress dome or cypress-gum pond, or Terrene pond fringe wetlands, such as semipermanently flooded wetlands along margins of pond. In-stream ponds are in the Lotic landscape position.

9. Waterbody is large (≥20 acres)..... **Lake**

Go to Wetland Landscape Position Key - Key A-1

Note: As mentioned earlier, all lakes should be given a landscape position - Lotic River, Lotic Stream, or Terrene and the lake descriptor will be the "landform" descriptor to separate the waterbody from any fringing vegetated wetlands (LR_LK__; LS_LK__; TELK__). The shallow water zone of deeper lakes will, of course, be treated as a lentic wetland (e.g., LE___). According to Cowardin et al. (1979) a depth of 6.6 feet (2 m) at mean low water is the main separation point between wetland and deepwater habitat, but many permafrost lakes may be just slightly deeper, so for this classification they will be treated as shallow lakes and not deepwater habitat.

10. Part of a major ocean or its associated embayment (Marine system of Cowardin et al. 1979) .....**Ocean**

Go to Ocean Key - Key D-2

10. Part of an estuary where fresh water mixes with salt water (Estuarine system of Cowardin et al. 1979).....**Estuary**

Go to Estuary Key - Key E-2

Key B-2. River/Stream Gradient and Other Modifiers Key

Please note that the river/stream gradient extends from the freshwater tidal zone through the intermittent reach. The limits of the latter are typically defined by drainageways with well-defined channels that discharge water seasonally. From a practical standpoint, the limits of the lotic system are displayed on 1:24,000 U.S. Geological Survey topographic maps or similar digital data. Intermittent streams, certain dammed portions of rivers plus lock and dammed canal systems may be classified as rivers using the descriptors presented in these keys. In the Cowardin et al. system, they may be classified as Riverine Intermittent Streambed or Lacustrine Unconsolidated Bottom, respectively.

1. Water flow is under tidal influence.....**Tidal Gradient**

> *Type of tidal river or stream*: 1) natural river, 2) natural stream, 3) channelized river, 4) channelized stream, 5) canal (artificial polygonal lotic feature), 6) ditch (artificial linear lotic feature), 7) restored river segment (part of river where restoration was performed), and 8) restored stream segment (part of stream where restoration was performed).

1. Water flow is not under tidal influence (nontidal).....2

2. Water flow is dammed, yet still flowing downstream at least seasonally.....**Dammed Reach**

> *Type of dammed river*: 1) lock and dammed (canalized river, a series of locks and dams are present to aid navigation), 2) run-of-river dammed (low dam allowing flow during high water periods; often used for low-head hydropower generation), and 3) other dammed (unspecified, but not major western hydropower dam as such waterbodies are considered lakes, e.g., Lake Mead and Lake Powell).

2. Water flow is unrestricted.....3

3. Water flow is perennial (year-round); perennial rivers and streams.....4
3. Water flow is seasonal or aperiodic (intermittent); Cowardin's Intermittent Subsystem .....
.....**Intermittent Gradient***

4. Water flow is generally rapid due to steep gradient; typically little or no floodplain development; watercourse is generally shallow with rock, cobbles, or gravel bottoms; first and second order "streams"; part of Cowardin's Upper Perennial subsystem.....**High Gradient***
4. Water flow is not so; some to much floodplain development.....5

5. Water flow is generally slow; typically with extensive floodplain; water course shallow or deep with mud or sand bottoms; typically fifth and higher order "streams", but includes lower order streams in nearly level landscapes such as the Great Lakes Plain (former glacial lakebed) and the Coastal Plain (the latter streams may lack significant floodplain development); Cowardin's Lower Perennial subsystem .....**Low Gradient***
5. Water flow is fast to moderate; with little to some floodplain; usually third and fourth order "streams"; part of Cowardin's Upper Perennial subsystem.....**Middle Gradient***

**Type of river or stream* - additional modifiers that may be applied as desired: 1) natural river-single thread (one channel), 2) natural river-multiple thread (braided) (multiple, wide, shallow channels), 3) natural river-multiple thread (anastomosed) (multiple, deep narrow channels), 4) natural stream-single thread, 5) channelized river (dredged/excavated), 6) channelized stream, 7) canal (artificial polygonal lotic feature), 8) ditch (artificial linear lotic feature), 9) restored river segment (part of river where restoration was performed), 10) restored stream segment (part of stream where restoration was performed), and 11) connecting channel (joins two lakes). Other possible descriptors: 1) for perennial rivers and streams - riffles (shallow, rippling water areas), pools (deeper, quiet water areas), and waterfalls (cascades), 2) for water depth of perennial rivers - deep rivers (≥6.6 ft at low water) from shallow rivers (<6.6 ft at low water), 3) nontidal river or stream segment emptying into an estuary, ocean, or lake (estuary-discharge, marine-discharge, or lake-discharge), 4) classification by stream order (1^{st}, 2^{nd}, 3^{rd}, etc. for perennial segments), and 5) channels patterns (straight, slight meandering, moderate meandering, and high meandering).

Key C-2. Key to Lakes.

The lake designation is for permanently flooded deep waters (>6.6 feet). Some classification systems include shallow waterbodies or periodically exposed areas as "lakes." The Cowardin et al. system considers standing waterbodies larger than 20 acres to be part of the lacustrine system (regardless of water depth; shallow = wetlands; >6.6 feet = deepwater habitat), while smaller ones are typically part of the palustrine wetlands. For our purposes, "shallow lakes" and "seasonal or intermittent lakes" are considered some type of terrene or lotic wetland depending on the presence and location of a stream. Lentic wetlands are associated with permanently flooded standing waterbodies deeper than 6.6 feet at low water, but also include large shallow lakes greater than 20 acres in size.

1. Waterbody is not dammed or impounded.....**Natural Lake**

> *Modifiers*: While most lakes are situated in a basin surrounded by upland or nearly so, some lakes occur within a large wetland landscape. Examples of the latter include lakes in the arctic and subarctic, boreal region of northern Minnesota, and the lower Mississippi delta. These lakes should be further classified as imbedded wetland lake (e.g., bog lake, floodplain lake, or polygonal wetland lake). The wetlands in the lake's waters can be classified as lentic with the imbedded matrix modifier but the contiguous wetlands surrounding the lake should be assigned to the Lotic or Terrene landscape position. Main body, Open embayment, Semi-enclosed embayment, Barrier beach lagoon, Seiche-influenced, River-fed and Stream-fed descriptors. Can also use applicable modifiers listed under Pond (see Key A-2).
>
> *Can use additional modifiers listed under Pond (see Key A-2) and others (e.g., crater, lava flow, aeolian, fjord, oxbow, other floodplain, glacial, alkali, and manmade), as appropriate.

1. Waterbody is dammed, impounded, or excavated 2

2. Waterbody is dammed or impounded.....3
2. Waterbody is excavated.....4

3. Dammed river valley.....**Dammed River Valley Lake**

Modifiers: Reservoir, Hydropower, and Seiche-influenced; also River-fed and Stream-fed descriptors.

Note: When the dam inundates former floodplains and other low-lying areas, the waterbody is considered a Dammed River Valley Lake. If the dam crosses a higher gradient river and increase water depth in the channel without significant flooding of much neighboring "land," the waterbody is considered the dammed reach of a river.

3. Dammed natural lake or stream.....**Other Dammed Lake**

4. Deepwater excavated lake (e.g., quarry lake)…….…….……**Deep**.**Excavated Lake**

4. Shallow-water impoundment (e.g., large settling pond) – treat and classify as wetland …..…… …… **Shallow Excavated Lake**

Modifiers: Former natural lake, Artificial lake, River-fed and Stream-fed descriptors. Can apply various subcategories of impounded ponds to Shallow Excavated Lake.

Key D-2. Key to Oceans and Marine Embayments.

1. Waterbody is completely open, not protected by any feature.....**Open Ocean**
(Can further identify open bays if desirable.)
1. Waterbody is somewhat protected.....2

2. Associated with coral reef or island 3

2. Not associated with coral reef or island.....4

3. Open but protected by coral reef…….....**Reef-protected Waters**
3. Completely or nearly completely surrounded by a coral reef or coral islands.....**Atoll Lagoon**

4. Deep embayment cut by glaciers, with an underwater sill at front end, restricting circulation; associated with rocky headlands.....**Fjord**
4. Other semi-protected embayment.....**Semi-protected Oceanic Bay**

Modifiers for all types above: Submerged vegetation (e.g., eelgrass or turtle-grass) or Floating vegetation (e.g., macroalgae such as kelp beds).

Key E-2. Key to Estuaries.

The following types should encompass most of the estuaries located in the United States. There may be estuaries that do not fit within this classification. Such types should be brought to the attention of the author.

1. Estuary is surrounded by rocky headlands and shores.....2
1. Estuary is not surrounded by rocky headlands and shores.....4

2. Deep embayment cut by glaciers, with an underwater sill at front end, restricting circulation (e.g., Puget Sound).....**Fjord Estuary**
2. Not so, either open or semi-enclosed.....3

3. Protected by islands.....**Island Protected Rocky Headland Bay Estuary**
3. Not protected by islands.....**Rocky Headland Bay Estuary**

Modifiers: Open or Semi-enclosed

4. Estuary is tectonically formed (e.g., San Franciso Bay), including volcanic activity..... .....**Tectonic Estuary**

Modifiers: Fault-formed and Volcanic-formed

4. Estuary is not tectonically formed …….....5

5. Estuary is river-dominated with a delta formed at the mouth of the river where it enters the sea (e.g., Mississippi River Delta).....**River-dominated Estuary**
5. Estuary is not river-dominated.....6

6. Estuary is a drowned river valley (e.g., Chesapeake Bay).....**Drowned River Valley Estuary**

Modifiers: Open Bay, River Channel, Semi-enclosed Bay, Bar-built Embayment, and Lake (large open waterbody surrounded by marsh with a relatively narrow channel connecting it with an estuarine embayment or the sea). (Note: Where bar-built features have formed at their mouths, use the "bar-built embayment" modifier).

6. Estuary is not a drowned river valley.....7

7. Estuary formed behind and is protected by sandy barrier islands or barrier beaches (spits).....**Bar-built Estuary**

Modifiers: Coastal Pond (oligohaline to saline) and Hypersaline Lagoon (hypersaline)

7. Estuary is not behind sandy barrier islands or beaches.....8

8. Estuary is protected by reefs or other islands.....**Island Protected Estuary**
8. Estuary is an open or semi-enclosed embayment.....**Shoreline Bay Estuary**

Modifiers for all estuarine waterbodies: Inlet (includes any ebb- or flood- deltas that are completed submerged), Stabilized Inlet, Shoal (shallow water area), Submerged Vascular Plants (e.g., eelgrass or turtle-grass) or Submerged or Floating-leaved Macroalgae (e.g., kelp beds).

Key F-2. Key to Water Flow Paths

1. Water flow is tidally influenced and flooding is frequent (more than just storm tides) and not regulated by water-control structures…….....2
1. Water flow is not under the influence of the tides, or tidal flooding is infrequent (only by the highest storm tides) or regulated by water-control structures…….....4

2. Tide range is greater than 4m (approx. >12 feet) .....**Macrotidal**
2. Tidal range is less than 4m 3

3. Tidal range is 2-4m (approx. 6-12 feet) .....**Mesotidal**
3. Tidal range is less than 2m (approx. < 6 feet) .....**Microtidal**

Modifier: Wind tides for areas with low tidal ranges where the more prominent tides are wind-driven such as in North Carolina's Albemarle and Pamlico Sounds.

4. Water flows out of the waterbody via a river, stream, or ditch, with little or no inflow (inflow could be from intermittent streams or ground water only) .....**Outflow**

Modifier: Human-caused for inflow via a ditch network. If interested, separate perennial outflow (**Outflow-perennial**) from intermitttent outflow (**Outflow-intermittent**) and artifical outflow via water-control structures and other means (**Outflow-artificial**).

4. Water flow is not so.....5

5. Water enters waterbody from river, stream, or ditch, flows through it, and continues to flow downstream.....**Throughflow, Throughflow-intermittent**, or **Throughflow-artificial**

Modifier: Human-caused for throughflow via a ditch network

Note: **Throughflow-intermittent** is applied to intermittent streams; **Throughflow-artificial** is used to indicate regulated flows by water-control structures or other means.

5. Water flow is not throughflow.....6

6. Water flows in and/or out of the waterbody through water-control structures….....7

6. Water flow is not bidirectional.....8

7. Water flow of adjacent waterbody is tidal and flow to waterbody is regulated by water-control structures……**Bidirectional-tidal Artificial**
7. Water flow of adjacent waterbody is not tidal and flow is regulated by water-control structures....…… ……..... **Bidirectional-nontidal Artificial**

8. Water flow enters via a river, stream, or ditch, but does not exit pond, lake or reservoir; waterbody serves as a sink for water.....**Inflow**

Modifier: Human-caused for inflow via a ditch network.

8. No apparent channelized inflow, source of water either by precipitation or by underground sources.....**Isolated**

Attention: *In most applications, isolation is interpreted as "geographically isolated" since groundwater connections are typically unknown for specific waterbodies. For practical purposes then," isolated" means no obvious surface water connection to other wetlands and waters. If hydrologic data exist for a locale that document groundwater linkages, such waterbodies should be identified as either outflow. inflow, or throughflow with a "Groundwater-dominated" modifier added and not be identified as isolated unless the whole network of waterbodies is not connected to a stream or river. In the latter case, the network is a collection of interconnected isolated waterbodies.*

Note: Some isolated wetlands are part of a small group of isolated wetlands that may be interconnected in some fashion. For these cases, isolated can be combined with other water flow paths to designate the direction of the internal flow where naturally connected: **Isolated-throughflow**, **Isolated-outflow**, and **Isolated-inflow**, or where connected by ditches: **Isolated-throughflow Artificial**, **Isolated-outflow Artificial**, and **Isolated-inflow Artificial**. .

Key G-2. Key to Estuarine Hydrologic Circulation Types

1. Estuary is river-dominated with distinct salt wedge moving seasonally up and down the river; fresh water at surface with most saline waters at bottom; low energy system with silt and clay bottoms .....**Salt-wedge Estuary**
1. Estuary is not river-dominated 2

2. Estuarine water is well-mixed, no significant salinity stratification, salinity more or less the same from top to bottom of water column; high-energy system with sand bottom.....
.....**Homogeneous Estuary**
2. Estuarine water is partially mixed, salinities different from top to bottom, but not strongly stratified; low energy system .....**Partially Mixed Estuary**

Section 4. Coding System for LLWW Descriptors

The following is the coding scheme for expanding classification of wetlands and waterbodies beyond typical NWI classifications. When enhancing NWI maps/digits, codes should be applied to all mapped wetlands and deepwater habitats (including linears). At a minimum, landscape position (including lotic gradient), landform, and water flow path should be applied to wetlands, and waterbody type and water flow path to water to waterbodies. Wetland and deepwater habitat data for specific estuaries, lakes, and river systems could be added to existing digital data through use of geographic information system (GIS) technology.

Codes for Wetlands

Wetlands are typically classified by landscape position, landform, and water flow path. Landforms are grouped according to Inland types and Coastal types with the latter referring to tidal wetlands associated with marine and estuarine waters. Use of other descriptors tends to be optional. They would be used for more detailed investigations and characterizations.

Landscape Position

ES	Estuarine
LE	Lentic
LR	Lotic river
LS	Lotic stream
MA	Marine
TE	Terrene

Lotic Gradient

1	Low
2	Middle
3	High
4	Intermittent
5	Tidal
6	Dammed
a	lock and dammed
b	run-of-river dam
c	beaver
d	other dammed
7	Artificial (ditch)

Lentic Type

1 Natural deep lake (see also Pond codes for possible specific types)
- a main body
- b open embayment
- c semi-enclosed embayment
- d barrier beach lagoon
- e wetland landscape matrix
- e1 polygonal
- e2 bog
- e3 deltaic
- e4 floodplain – forest matrix
- e5 floodplain – shrub matrix
- e6 floodplain – herb matrix
- e7 floodplain – mixed matrix

2 Dammed river valley lake
- a reservoir
- b hydropower
- c flood control
- d other

3 Other dammed lake
- a former natural
- b flood control basin

4 Deep excavated lake (e.g., quarry lake)

5 Shallow excavated lake (e.g., settling basin; *use Pond codes for specific types if desirable*)

6 Other artificial lake

Estuary Type

1 Drowned river valley estuary
- a open bay (fully exposed)
- b semi-enclosed bay
- c river channel
- d bar-built embayment
- e lake

2 Bar-built estuary
- a coastal pond-open
- b coastal pond-seasonally closed
- c coastal pond-intermittently open
- d hypersaline lagoon

3 River-dominated estuary

4 Rocky headland bay estuary
- a island protected

5 Island protected estuary

6 Shoreline bay estuary
a open (fully exposed)
b semi-enclosed
7 Tectonic
a fault-formed
b volcanic-formed
8 Fjord
9 Other

Inland Landform

SL Slope
SLpa Slope, paludified

IL Island*
ILde Island, delta
ILrs Island, reservoir
ILpd Island, pond

FR Fringe*
FRil Fringe, island*
FRbl Fringe, barrier island
FRbb Fringe, barrier beach
FRpd Fringe, pond
FRdm Fringe, drowned river mouth
FRot Fringe, outlet
FRit Fringe, inlet
FRsl Fringe, slough (vegetated flowing watercourse lacking defined stream channel and bank)

FP Floodplain
FPba Floodplain, basin
FPox Floodplain, oxbow
FPfl Floodplain, flat
FPil Floodplain, island

BA Basin
BAcb Basin, Carolina bay
BApo Basin, pocosin
BAcd Basin, cypress dome
BApp Basin, prairie pothole
BApl Basin, playa
BAwc Basin, West Coast vernal pool
BAid Basin, interdunal
BAwv Basin, woodland vernal

BApg	Basin, polygonal
BAsh	Basin, sinkhole
BApd	Basin, pond
BAgp	Basin, grady pond
BAsa	Basin, salt flat
BAaq	Basin, aquaculture (created)
BAcr	Basin, cranberry bog (created)
BAwm	Basin, wildlife management (created)
BAip	Basin, impoundment (created)
BAfe	Basin, former estuarine fringe
BAff	Basin, former floodplain
BAfo	Basin, former floodplain oxbow
BAdm	Basin, drowned river-mouth
BAot	Basin, outlet
BAit	Basin, inlet
BAsl	Basin, slough (vegetated flowing watercourse lacking defined stream channel)

FL Flat

FLsa	Flat, salt flat
FLfe	Flat, former estuarine fringe
FLff	Flat, former floodplain
FLsl	Flat, slough (vegetated flowing watercourse lacking defined stream channel)

*Note: Inland slope wetlands and island wetlands associated with rivers, streams, and lakes are designated as such by the landscape position classification (e.g., lotic river, lotic stream, or lentic), therefore no additional terms are needed here to convey this association.

Coastal Landform

IL	Island
ILdt	Island, delta
ILde	Island, ebb-delta
ILdf	Island, flood-delta
ILrv	Island, river
ILst	Island, stream
ILby	Island, open bay
ILsb	Island, sheltered bay
ILcp	Island, coastal pond
DE	Delta
DEr	Delta, river-dominated
DEt	Delta, tide-dominated
DEw	Delta, wave-dominated
FR	Fringe
FRal	Fringe, atoll lagoon
FRbl	Fringe, barrier island
FRbs	Fringe, barrier spit
FRby	Fringe, open bay
FRsb	Fringe, sheltered bay
FRbi	Fringe, open bay island
FRsi	Fringe, sheltered bay island
FRcp	Fringe, coastal pond
FRci	Fringe, coastal pond island
FRhl	Fringe, headland
FRoi	Fringe, oceanic island
FRlg	Fringe, lagoon
FRrv	Fringe, river
FRri	Fringe, river island
FRst	Fringe, stream
FRtb	Fringe, toe-of-bluff
BA	Basin
BAaq	Basin, aquaculture (created)
BAid	Basin, interdunal (swale)
BAst	Basin, stream
BAsh	Basin, salt hay production (created)
BAtd	Basin, tidally restricted/road (not a management area)
BAtr	Basin, tidally restricted/railroad (not a management area)
BAwm	Basin, wildlife management (created)
BAip	Basin, impoundment (created)

Water Flow Path

PA Paludified
IS Isolated
IT Isolated-throughflow (connected to other wetlands in an isolated complex)
IO Isolated-outflow (connected to other wetlands in an isolated complex)
II Isolated-inflow (connected to other wetlands in an isolated complex)
ITA Isolated-artificial throughflow (connected by ditches to other artificially isolated wetlands)
IOA Isolated-artificial outflow (connected by ditches to other artificially isolated wetlands)
IIA Isolated-artificial inflow (connected by ditches to other artificially isolated wetlands)
IN Inflow
OU Outflow
OA Outflow-artificial*
OP Outflow-perennial
OI Outflow-intermittent
TH Throughflow
TA Throughflow-artificial*
TN Throughflow-entrenched
TI Throughflow-intermittent
BI Bidirectional-nontidal
BIA Bidirectional-nontidal Artificial (e.g., diked wetland)
BO Bidirectional-nontidal/outflow (lake)
TB Bidirectioinal-nontidal/throughflow (lake)
IB Bidirectional-nontidal/isolated (lake)
NB Bidirectional-nontidal/inflow (lake)
BT Bidirectional-tidal
BTA Bidirectional-tidal Artificial (e.g., diked wetland)

*Note: To be used with wetlands connected to streams by ditches.

Other Modifiers (apply at the end of the code as appropriate)

aa abandoned agriculture (former farmed wetland now regenerating)
ae animal eat-out (barren patches due to animals, e.g., snow geese, nutria)
bl barrier island (apply to nontidal wetlands on barrier islands)
br barren
bv beaver-influenced wetland
ch channelized flow
cl coastal island (wetland on an island in an estuary or ocean excluding barrier islands)
cr cranberry bog
da disposal area (typically dredged spoil)

dd	drainage divide
dg	partly drained-groundwater extraction
dr	partly drained
ds	discharge to stream (via seepage from Terrene saturated wetland)
ed	freshwater wetland discharging directly into an estuary (formerly “ef”)
fe	former estuarine wetland
fg	fragmented
fm	floating mat
gd	groundwater-dominated (apply to Water Flow Path only)
gz	grazed
hi	severely human-induced
hw	headwater
li	lake island (wetland associated with a lake island)
md	freshwater wetland discharging directly into marine waters
mk	muskrat-influenced wetland
ow	overwash
pi	pond island border
ri	river island (wetland associated with a river island)
rs	ridge-and-swale complex (wetland part of this type complex)
sd	surface water-dominated (apply to Water Flow Path only)
sf	spring-fed
ss	subsurface flow
td	tidally restricted/road
tr	tidally restricted/railroad
wt	wind tides

(Note: "ho" was formerly used to indicate human-induced outflow brought about by ditch construction; now this is addressed by the water flow path "OA" Outflow-artificial.)

Codes for Waterbodies (Deepwater Habitats and Ponds)

Besides Waterbody Type, waterbodies can be classified by water flow path (for lakes and ponds), estuary hydrologic type (for estuaries), and tidal range types (for estuaries and oceans).

Waterbody Type

RV River
- 1 low gradient
  - a connecting channel
  - b canal
- 2 middle gradient
  - a connecting channel
- 3 high gradient
  - a waterfall
  - b riffle
  - c pool
- 4 intermittent gradient
- 5 tidal gradient
- 6 dammed gradient
  - a lock and dammed
  - b run-of-river dammed
  - c other dammed

ST Stream
- 1 low gradient
  - a connecting channel
  - b channelized
- 2 middle gradient
  - a connecting channel
  - b channelized
- 3 high gradient
  - a waterfall
  - b riffle
  - c pool
- 4 intermittent gradient
- 5 tidal gradient
- 6 dammed
  - a lock and dammed
  - b run-of-river dammed
  - c beaver dammed
  - d other dammed
- 7 artificial
  - a connecting channel
  - b ditch

LK Lake

1 natural lake (*see also Pond codes for possible specific types*)
- a main body
- b open embayment
- c semi-enclosed embayment
- d barrier beach lagoon
- e wetland landscape matrix (lake embedded in wetland)
- e1 polygonal (for Alaska)
- e2 bog
- e3 deltaic
- e4 floodplain – forest matrix*
- e5 floodplain – shrub matrix*
- e6 floodplain – herb matrix*
- e7 floodplain – mixed matrix*

*Add "ox" to end of code after Water Flow Path to indicate oxbow lake.

2 dammed river valley lake
- a reservoir
- b hydropower
- c other

3 other dammed lake
- a former natural
- b artificial

4 Deep excavated lake (e.g., quarry lake)

5 Shallow excavated lake (e.g., settling basin; *use Pond codes for specific types if desirable*)

6 Other artificial lake

(Consider using a modifier to highlight specific lakes as needed, especially the Great Lakes, e.g., LK1E for Lake Erie or LK2O for Lake Ontario, and Lake Champlain, LK1C)

EY Estuary

1 drowned river valley estuary
- a open bay (fully exposed)
- b semi-enclosed bay
- c river channel
- d bar-built embayment
- e lake

2 bar-built estuary
- a coastal pond-open
- b coastal pond-seasonally closed
- c coastal pond-intermittently open
- d hypersaline lagoon

3 river-dominated estuary
4 rocky headland bay estuary
a island protected
5 island protected estuary
6 shoreline bay estuary
a open (fully exposed)
b semi-enclosed
7 tectonic
a fault-formed
b volcanic-formed
8 fjord
9 other

Note: If desired, you can also designate river channel (rc), stream channel (sc),and inlet channel (ic) by modifiers. *Examples*: EY1rc = Drowned River Valley Estuary river channel; EY2ic= Bar-built estuary inlet channel. If not, simply classify all estuarine water as a single type, e.g., EY1 for Drowned River Valley or EY2 for Bar-built Estuary.

OB Ocean or Bay
1 open (fully exposed)
2 semi-protected oceanic bay
3 atoll lagoon
4 other reef-protected waters
5 fjord

PD Pond
1 natural
a bog
b woodland-wetland
c woodland-dryland
d prairie-wetland (pothole)
e prairie-dryland (pothole)
f playa
g polygonal
h sinkhole-woodland
i sinkhole-prairie
j Carolina bay
k pocosin
l cypress dome
m vernal-woodland
n vernal-West Coast
o interdunal
p grady
q floodplain
q1 floodplain – forest matrix

q2 floodplain – shrub matrix
q3 floodplain – herb matrix
q4 floodplain – mixed matrix
r other

2 dammed/impounded
a agriculture
a1 cropland
a2 livestock
a3 cranberry
b aquaculture
b1 catfish
b2 crayfish
c commercial
c1 commercial-stormwater
d industrial
d1 industrial-stormwater
d2 industrial-wastewater
e residential
e1 residential-stormwater
f sewage treatment
g golf
h wildlife management
i other recreational
j mining
j1 sand/gravel
j2 coal
k playa (altered)
o other
3 excavated
a agriculture
a1 cropland
a2 livestock
a3 cranberry
b aquaculture
b1 catfish
b2 crayfish
c commercial
c1 commercial-stormwater
d industrial
d1 industrial-stormwater
d2 industrial-wastewater
e residential
e1 residential-stormwater
f sewage treatment

g	golf
h	wildlife management
i	other recreational
j	mining
j1	sand/gravel
j2	coal
k	playa (altered)
o	other
4	beaver
5	other artificial

Water Flow Path

IN	Inflow
OU	Outflow
OA	Outflow-artificial*
OP	Outflow-perennial
OI	Outflow-intermittent
TH	Throughflow
TA	Throughflow-artificial*
TI	Throughflow-intermittent*
TN	Throughflow-entrenched
BIA	Bidirectional-nontidal Artificial (e.g., diked waterbody)
BTA	Bidirectional-tidal Artificial (e.g., diked waterbody)
IS	Isolated
IT	Isolated-throughflow
IO	Isolated-outflow
II	Isolated-inflow
ITA	Isolated-artificial throughflow (connected by ditches to other artificially isolated wetlands)
IOA	Isolated-artificial outflow (connected by ditches to other artificially isolated wetlands)
IIA	Isolated-artificial inflow (connected by ditches to other artificially isolated wetlands)
MI	Microtidal
ME	Mesotidal
MC	Macrotidal

*Note: OA and TA are human-caused by ditches; TI is to be used with throughflow ponds along intermittent streams. Ideally BT should not used for tidal waterbodies; use MI, ME, and MC instead; BTA is for tidal waters (impoundments) where tidal flow is regulated by water-control structures.

Estuarine Hydrologic Circulation Type

SW	Salt-wedge/river-dominated type
PM	Partially mixed type
HO	Homogeneous/high energy type

Other Modifiers (apply at end of code for given waterbody)

ch	channelized or dredged
dv	diverted
ef	freshwater stream flowing directly into an estuary (formerly “ed”)
fv	floating vegetation (on the surface)
lv	leveed
md	freshwater stream flowing directly into marine waters
ox	oxbow (lake)
sv	submerged vegetation
wt	wind tides

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Section 7. Glossary

Barrier Beach -- a coastal peninsular landform extending from the mainland into the ocean or large embayment or large lake (e.g., Great Lakes), typically providing protection to waters on the backside and allowing the establishment of salt marshes; similar to the barrier island, except connected to the mainland

Barrier Island -- a coastal insular landform, an island typically between the ocean (or possibly the Great Lakes) and the mainland; its presence usually promotes the formation of salt marshes on the backside

Basin -- a depressional (concave) landform; various types are further defined by the absence of a stream (isolated), by the presence of a stream and its position relative to a wetland (throughflow, outflow, inflow), or by its occurrence on a floodplain (floodplain basins include ox-bows and sloughs, for example)

Bay -- a coastal embayment of variable size and shape that is always opens to the sea through an inlet or other features

Carolina Bay -- a wetland formed in a semicircular or egg-shaped basin with a northwest to southeast orientation, found along the Atlantic Coastal Plain from southern New Jersey to Florida, and perhaps most common in Horry County, South Carolina

Channelization -- the act or result of excavating a stream or river channel to increase downstream flow of water or to increase depth for navigational purposes

Channelized -- water flow through a conspicuous drainageway, a stream or a river

Coastal Island -- an island in marine and estuarine areas

Coastal Pond -- pond and its associated wetlands that form behind a barrier beach and are subjected to varying tidal influence (intermittent to daily); the tidal connection for many coastal ponds has been stabilized by jetties; the ones that are only intermittently connected have low salinities

Connecting Channel -- a river or stream that connects two adjacent lakes; lakes are typically close together considering their relative size; it is not any stream that occurs between two lakes in a drainage basin; perhaps the best examples are rivers connecting the Great Lakes, such as the St. Marys River connecting Lake Superior to Lake Huron, Detroit River connecting Lake St. Clair to Lake Erie, and the Niagara River connecting Lake Erie with Lake Ontario

Cypress Dome -- a wetland dominated by bald cypress growing in a basin that may be formed by the collapse of underlying limestone, forest canopy takes on a domed appearance with tallest trees in center and becoming progressively shorter as move toward margins of basin

Delta -- a typically lobed-shaped or fan-shaped landform formed by sedimentation processes at the mouth of a river carrying heavy sediment loads

Ditch -- a linear, often shallow, artificial channel created by excavation with intent to improve drainage of or to irrigate adjacent lands

Drained, Partly -- condition where a wetland has been ditched or tiled to lower the ground water table, but the area is still wet long enough and often enough to fall within the range of conditions associated with wetland hydrology

Entrenched -- condition where a stream cuts through a wetland and does not periodically overflow into the wetland; the affected wetland may be a terrene wetland cut by a stream or it could be a lotic wetland along an entrenched stream (the latter would usually have to be identified in the field)

Estuarine -- the landscape of estuaries (salt and brackish tidal waterbodies, such as bays and coastal rivers) including associated wetlands, typically occurring in sheltered or protected areas, not exposed to oceanic currents

Flat -- a relatively level landform; may be a component of a floodplain

Flatwood -- forest of pines, hardwoods or mixed stands growing on interfluves on the Gulf-Atlantic Coastal Plain, typically with imperfectly drained soils; some flatwoods are wetlands, while others are dryland

Floodplain -- a broad, generally flat landform occurring in a landscape shaped by fluvial or riverine processes; for purposes of this classification limited to the broad plain associated with large river systems subject to periodic flooding (once every 100 years) and typically having alluvial soils; further subdivided into several subcategories: flat (broad, nearly level to gently sloping areas) and basin (depressional features such as ox-bows and sloughs)

Floodplain, active -- floodplain that is typically inundated once every 100 years by natural events

Floodplain, inactive -- floodplain that is no longer flooded once in 100 years due to human-alterations such as leveeing, diking, or altered river flow regimes or to natural processes such as changing river courses

Fringe -- a wetland occurring along a standing or flowing waterbody, i.e., a lake, pond, river, stream, estuary, or ocean, including tidal wetlands that are inundated frequently by tides, nontidal vegetated wetlands that are flooded for most of the growing season, and nonvegetated wetlands that form the banks of these waterbodies (such as cobble-gravel bars along river bends)

Ground Water -- water below ground, held in the soil or underground aquifers

Headland -- the seaward edge of the major continental land mass (North America), commonly called the mainland; not an island

High Gradient -- the fast-flowing segment of a drainage system, typically with no floodplain development; equivalent to the Upper Perennial and Intermittent Subsystems of the Riverine System in Cowardin et al. 1979

Inflow -- water enters; an inflow wetland is one that receives surface water from a stream or other waterbody or from significant surface or ground water from a wetland or waterbody at a higher elevation and has no significant discharge

Interdunal -- occurring between sand dunes, as in interdunal swale wetlands found in dunefields behind ocean and estuarine beaches and in sand plains like the Nebraska Sandhills

Island -- a landform completely surrounded by water and not a delta; some islands are entirely wetland, while others are uplands with or without a fringe wetland

Isolated -- lacking an apparent surface water connection to other wetlands and waterbodies; typically "geographically isolated" (surrounded by upland - nonhydric soils); may be connected to other wetlands and water via groundwater, but this is not known or has not been established for the subject area; a collection of “isolated” wetlands may be connected via surface water but the group does not have a surface water outlet.

Karst -- a limestone region characterized by sinkholes and underground caverns

Kettle -- a glacially formed depression typically created by a block of glacial ice left on the land by a retreating glacier; melting of the ice formed a kettle pond that may be quite deep, with bog vegetation frequently established along its perimeter

Lake Island -- an island in a lake

Lentic -- the landscape position associated with large, deep standing waterbodies (such as lakes and reservoirs) and contiguous wetlands formed in the lake basin (excludes seasonal and shallow lakes which are included in the *Terrene* landscape position)

Lotic -- the landscape position associated with flowing water systems (such as rivers, creeks, perennial streams, intermittent streams, and similar waterbodies) and contiguous wetlands

Low Gradient -- the slow-flowing segment of a drainage system, typically with considerable floodplain development; equivalent to the Lower Perennial Subsystem of the Riverine System in Cowardin et al. 1979 plus contiguous wetlands

Marine -- the landscape position (or seascape) associated with the ocean's shoreline

Middle Gradient -- the segment of a drainage system with characteristic intermediate between the high and low gradient reaches, typically with limited floodplain development; equivalent to areas mapped as Riverine Unknown (R5) in the Northeast Region plus contiguous wetlands

Nonchannelized -- water exits through seepage, not through a river or stream channel or ditch

Outflow -- water exits naturally or through artificial means (e.g., ditches); an outflow wetland has water leaving via a stream, seepage, or ditch (artificial) to a wetland or waterbody at a lower elevation; it lacks an inflowing surface water source like an intermittent or perennial stream

Oxbow -- a former mainstem river bend now partly or completely cut off from mainstem

Paludified -- subjected to paludification, the process by which peat moss engulfs terrains of varying elevations due to an excess of water, typically associated with cold, humid climates of northern areas (boreal/arctic regions and fog-shrouded coasts)

Playa -- a type of basin wetland in the Southwest characterized by drastic fluctuations in water levels over the normal wet-dry cycle

Pocosin -- a shrub and/or forested wetland forming on organic soils in interstream divides (interfluves) on the Atlantic Coast Plain from Virginia to Florida, mostly in North Carolina

Pond -- a natural or human-made shallow open waterbody that may be subjected to periodic drawdowns

Prairie Pothole -- a glacially formed basin wetland found in the Upper Midwest especially in the Dakotas, western Minnesota, and Iowa

Reservoir -- a large, deep waterbody formed by a dike or dam created for a water supply for drinking water or agricultural purposes or for flood control, or similar purposes

River Island -- an island within a river

Salt Pond -- a coastal embayment of variable size and shape that is periodically and temporarily cut off from the sea by natural accretion processes; some may be kept permanently open by jetties and periodic maintenance dredging

Salt Flat -- a broad expanse of alkaline wetlands associated with arid regions, especially the Great Basin in the western United States

Sinkhole -- a depression formed by the collapse of underlying limestone deposits; may be wetland or nonwetland depending on drainage characteristics

Slope -- a wetland occurring on a slope; various types include those along a sloping stream (fringe), those (paludified) formed by paludification -- the process of bogging or swamping of

uplands by peat moss in northern climes (humid and cold), and those not designated as one of the above and typically called seeps

Slough -- a vegetated wetland in a natural drainageway without a detectable stream on the aerial imagery where water flows through the system in a more or less unconfined manner; may have narrow, shallow channels or braided channels when observed on-the-ground; the term “slough” has various definitions in other contexts

Stream -- a natural drainageway that contains flowing water at least seasonally; different stream types: *perennial* where water flows continously in all years except drought or extremely dry years; intermittent where water flows only seasonally in most years; channelized where stream bed has been excavated or dredged

Subsurface Flow -- water leaves via ground water

Surface Water -- water occurring above the ground as in flooded or ponded conditions

Tectonic -- changes in the earth's surface caused by landslides, faulting, and volcanic activity

Terrene -- wetlands surrounded or nearly so by uplands and lacking a channelized outlet stream; a stream may enter or exit this type of wetland but it does not flow through it as a channel; includes a variety of wetlands and natural and human-made ponds

Throughflow -- water entering and exiting, passing through; a throughflow wetland receives significant surface or ground water which passes through the wetland and is discharged to a stream, wetland or other waterbody at a lower elevation; throughflow may be perennial, intermittent, or associated with an entrenched stream

Tidal Gradient -- the segment of a drainage basin that is subjected to tidal influence; essentially the freshwater tidal reach of coastal rivers; equivalent to the Tidal Subsystem of the Riverine System in Cowardin et al. 1979 plus contiguous wetlands

Vernal Pool -- a temporarily flooded basin; woodland vernal pools are found in humid temperature regions dominated by trees, these pools are surrounded by upland forests, are usually flooded from winter through mid-summer, and serve as critical breeding grounds for salamanders and woodland frogs; West Coast vernal pools occur in California, Oregon, and Washington on clayey soils, they are important habitats for many rare plants and animals.