



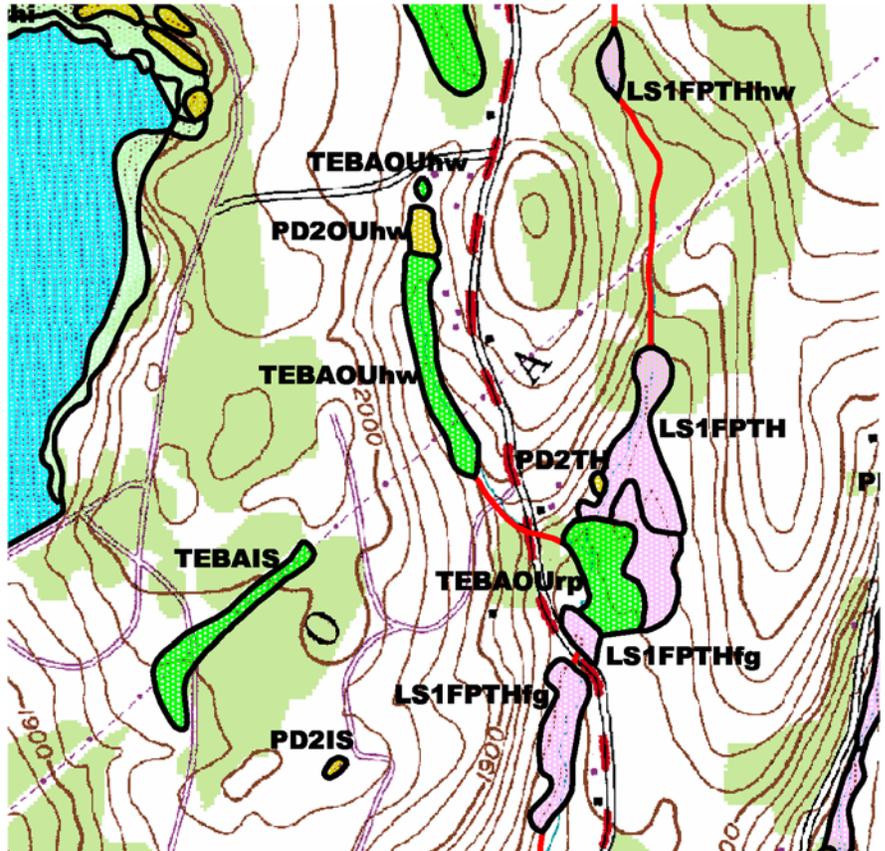
U.S. Fish & Wildlife Service

What is LLWW (Tiner)?

National Wetlands Inventory

The U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) program has developed a hydrogeomorphic (HGM)-type coding system complementary to the national wetlands classification system (Cowardin et al. 1979). Using the habitat classification system, the program has produced wetland maps for over 90 percent of the conterminous United States and 35 percent of Alaska. Digital data are available for 60 percent of the former area and for 25 percent of the latter. These data are valuable for a wide variety of applications, which can be expanded with hydrogeomorphic and other characteristics needed to perform assessments of wetland functions over broad geographic areas.

Wetland functions for a large watershed, as a fundamental natural resource planning unit, can be predicted with added HGM-type characteristics, using geospatial databases and geographic information system (GIS) technology. Potential functions analyzed include water detention, stream flow maintenance, storm surge protection, and wildlife habitat. As one example of application, these codes would allow separation of dammed rivers from dammed lacustrine waters to allow identification of the extent of dammed rivers and streams in large areas of the nation, not currently possible with the national classification system alone.



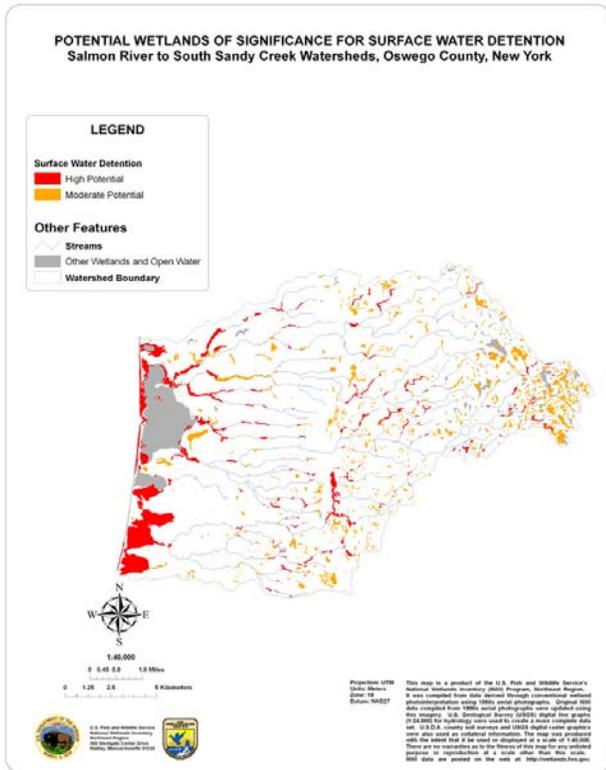
Example of the use of LLWW (landscape position, landform, water flow path, and waterbody). For full keys to the code descriptors, visit <http://www.fws.gov/nwi/publications>.

Thus, watershed managers will be able to make better use of NWI data when additional descriptors (e.g., abiotic and landscape features) are 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 Wetland Subcommittee of the Federal Geographic Data Committee (FGDC) has recommended adding these types of attributes to future wetland mapping projects to make the data more useful to a wider variety of applications.

Recognizing the need to better describe wetlands from the abiotic standpoint, the

Service developed a set of hydrogeomorphic-type descriptors as dichotomous keys (Tiner 1997b) that would be more compatible with its system. The keys bridge the gap between the habitat classification and the HGM system by providing descriptors for landscape position, landform, water flow path and waterbody type (LLWW) important for producing enhanced 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, while designed chiefly as descriptors for the Cowardin et al. system, can be used independently to describe a wetland or deepwater habitat.



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. Later, the keys were modified for use in predicting wetland functions for watersheds nationwide (Tiner 1997a, b, 2000, 2002).

Two sets of dichotomous keys (composed of pairs of contrasting statements) have been developed - one for wetlands and one for waterbodies. Vegetated wetlands (e.g., marshes, swamps, bogs,

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. For example, shallow ponds less than 20 acres in size meet the Service's definition of wetland, but they are also waterbodies. Although such areas can be classified as both wetland and waterbody, if desirable, we recommend that they be classified using the waterbody keys. Another example would be permanently flooded aquatic beds in the shallow water zone of a lake. We have classified them using wetland hydrogeomorphic descriptors, yet they also clearly represent a section of the lake (waterbody). This approach has worked well for us in producing watershed-based wetland characterizations and preliminary assessments of wetland functions.

The latest simplified key for landscape position of wetlands is given below. The more detailed keys for landscape position, landform, water flow path, and waterbody may be accessed online at: <http://www.fws.gov/nwi/publications>.

Consequently, there is some overlap with Cowardin since some users may wish to use these descriptors independently. The first set of dichotomous keys was

flatwoods, and wet meadows) and periodically exposed nonvegetated wetlands (e.g., mudflats, beaches, and other exposed shorelines) should be

Simplified Keys for Classifying Tidal and Nontidal Wetlands by Landscape Position (Adapted from Tiner 2003)

- 1. Wetland borders a river, stream, lake, reservoir, in-stream pond, estuary, or ocean.....2
- 1. Wetland does not border one of these waterbodies; it is surrounded by upland or borders a pond that is surrounded by upland.....Terrene
- 2. Wetland lies along an ocean shore and is subject to tidal flooding.....Marine
- 2. Wetland does not lie along an ocean shore or if oceanside, it is not subject to tidal flooding.....3
- 3. Wetland lies along an estuary (salt-brackish waters) and is subject to tidal flooding.....Estuarine
- 3. Wetland does not lie along an estuary or if along the estuary, it is not subject to tidal flooding.....4
- 4. Wetland lies along a lake or reservoir or within its basin (i.e., the relatively flat plain contiguous to the lake or reservoir).....Lentic
- 4. Wetland lies along a river or stream, or in-stream pond, or borders a marine or estuarine wetland or associated waters but is not flooded by tides (except episodically).....5
- 5. Wetland is associated with a river or stream.....6
- 5. Wetland is not associated with a river or stream; it is a freshwater nontidal wetland bordering a marine or estuarine wetland or associated waters.....Terrene
- 6. Wetland is the source of a river or stream and this watercourse does not flow through the wetland.....Terrene
- 6. A river or stream flows through or alongside the wetland.....7
- 7. Wetland is periodically flooded by river or stream.....Lotic
- 7. Wetland is not periodically flooded by the river or stream.....Terrene

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31.
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