COMMON QUESTIONS:

WETLAND DEFINITION, DELINEATION, AND MAPPING

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PREFACE

The following guide pertaining to frequently asked questions concerning wetland definition, delineation, and mapping is designed for local and state government officials, the staffs of land trusts and other environmental organizations, consultants, and others working with wetland protection and restoration.

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Map on page 3 by USDA Natural Resources Conservation Service, Planning http://www.mt.nrcs.usda.gov/technical/ecs/plants/xeriscp/plan.html

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What is a "wetland"?

A. Scientists agree that wetlands are transition areas between aquatic ecosystems and uplands. See National Research Council. 1995. Wetlands: Characteristics and Boundaries**.** National Academy Press. They also agree that wetlands are lands subject to periodic inundation or saturated soil conditions. They agree that wetlands are often characterized by not only inundation or saturation but by plants able to grow in saturated conditions, and soils reflecting periodic inundation. Finally, scientists agree that wetlands are characterized by a variety of functions and values which result from conditions such as high primary productivity (in many instances), fish habitat, amphibian and reptile habitat, bird habitat, flood storage and conveyance, erosion control, and pollution control.

However, scientists disagree somewhat with regard to how wet a system must be to qualify as a wetland, the precise mixtures of vegetation needed to characterize a wetland, and the full range of soils characteristic of wetlands. These differences of opinion have given rise to dozens of slightly different wetland definition criteria used by scientists, states, local governments, federal agencies and others.

Differences of opinion reflect, in part, the dependency of wetlands characteristics and resulting functions and values upon climate. Climate, of course, varies from one region to another. Rainfall varies in the U.S. from over 120 inches a year in some areas of the Northwest to less than 7 inches per year in New Mexico. Total rainfall is not always indicative of functions. For example, infrequently inundated or saturated areas along rivers and streams in the Southwest serve similar ecological functions to much wetter areas in the Northwest.

How are wetland definition, mapping and delineation related in regulatory programs?

A. Legislators and agencies have included wetland definitions in statutes, administrative regulations, and ordinances at all levels of government. These wetland definitions typically contain broad criteria for identification of wetlands on the ground (e.g., saturation, soils, and plants). Federal, state, and local government agencies administering these regulations have often adopted more specific criteria utilizing more specific combinations of hydrology, vegetation, and soils. These criteria are then applied through air photo interpretation and other sources of information to prepare wetland maps. The criteria are also applied in onsite field investigations ("delineation") to determine precise wetland boundaries.

Areas often dry may, nonetheless, be wetlands

Wetland mapping involves the use of a photographic, topographic, or other map base. Wetland maps usually indicate wetland type (and in some instances other characteristics) as well as wetland boundaries. Maps are often prepared by simultaneous use of air photos or satellite imagery, soils information, topographic maps, flood and surface water maps and other types of information.

The term wetland "delineation" is usually used to refer to determination of precise boundaries on the ground through field surveys. A wetland delineator uses the wetland regulatory definition and any supplementary criteria. A delineator uses wetland maps (if they are available), other available maps and field observations of hydrology, vegetation, and soils to draw this line on the ground.

What "parameters" are considered by wetland scientists in defining, mapping, and delineating wetlands?

A. Wetland scientists and regulators use three principal types of wetland characteristics or "parameters" in defining, mapping, and delineating wetlands:

- Vegetation. The types of plants that can live in wetlands are determined by the depth and duration of flooding and saturation. Vegetation is the most common paremeter used in defining, mapping, and delineating wetlands. There are over 7,000 plants which grow in wetlands in the U.S. A much smaller number, about 26%, are "obligate". Obligate species grow only in wetlands and are strong indicators of wetland boundaries. "Facultative" plants grow in both wetlands and uplands and are a less good indicator but are useful when combined with soils and hydrologic information.

- Evidence of hydrology. Hydrology (water depth, extent of inundation, period of inundation) determines all other wetland characteristics. However, hydrology is often not easily assessed. Often water can be observed at the surface only part of the year for many wetlands. Other evidence of hydrology (other than surface observation) may include flood records and flood maps, debris lines and evidence of flooding in trees and other vegetation, evidence of scour, and soils. Where there are uncertainties and disputes, field measurements of vegetation and soils may be taken over a growing season. Piezometers measuring water levels and hydrologic models may be used (although rare) to calculate the depth and frequency of inundation and saturation and ground water levels.

"...term wetland "delineation" is usually used to refer to determination of precise boundaries on the ground through field surveys."

- Soils. Wetland soils often contain large amounts of organic matter because saturation prevents oxidation of plant materials. Soils reflect long term hydrology and are, therefore, useful in identifying wetlands even where hydrology and plants have been disturbed or during periods of drought.

What wetland definitions are in most common use?

A. Two wetlands definitions are in most common use:

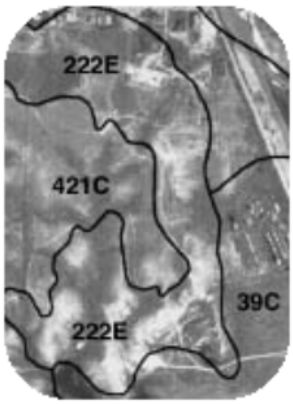
(1) The U.S. Fish and Wildlife Service (FWS) wetland definition. This scientific definition was developed by Lewis Cowardin et al for FWS in 1979. The USDA Natural Resources Conservation Service (NRCS) also uses the Cowardin definition in its National Resources Inventory and the 1987 National Food Security Act manual in administering the Swampbuster program. The FWS definition provides:

> "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

(2) The second commonly used definition was developed by the U.S. Army Corps of Engineers (Corps) in 1977 for the Section 404 permit program. This definition provides:

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

The major different between the FWS definition used for the purposes of the National Wetland Inventory (NWI) and the Corps definition used for Section 404 regulatory purposes is that the FWS definition requires only one major parameter while the Corps definition requires hydrology and vegetation.



Many states and local governments have adopted their own wetland definitions. However, these definitions are usually similar to the FWS or Corps definition although there are exceptions. For example, Connecticut uses soil maps to define wetlands and Massachusetts uses the 100 floodplain for certain definition purposes.

Do the differences in definitions make much difference in what is considered a wetland "on the ground?"

A. In many instances, no. There is little difference in Corps, FWS, NRCS, and state and local boundaries for most coastal, estuarine, river fringe, and lake fringe wetlands which are saturated or inundated much of the year. However, the deep water boundary of wetlands extends to two meters with the FWS definition while the Corps definition stops with rooted vegetation.

There is also little difference in what definition of wetland is used for many depressional, organic or mineral flats, or slope wetlands which are inundated or saturated much or all of the time.

More differences occur for infrequently flooded or saturated wetlands such as flats, plays, riparian zones, and some depressions which lack wetland vegetation some of the time. Characteristic soils may also be lacking. This is particularly true for wetlands subject to significant long term surface water or ground water fluctuations. More difference also occur for other types of wetlands in low gradient areas.

Do courts favor one definition over another?

A. No court has held that one definition is "better" than another. However, courts require agencies to use the definition set forth in their agency statutes and regulations.

Are "riparian" zones" in the West considered wetlands?

A. Many floodplain/riparian areas in the West serve functions similar to those for wetter systems in the East such as erosion control, flood storage, flood conveyance, pollution control, and bird, mammal, amphibian, and fish and reptile habitat. These systems are "wetter" than the surrounding landscape but less wet than Eastern wetlands. These systems are subject to less frequent flooding and are not typically characterized by high ground water levels much of the year. Plants and animals found in such areas do not reflect saturated conditions. For these reasons, such riparian zones are not generally considered wetlands.

However, such areas are often considered "waters of the U.S." in some regulatory and planning programs because they serve similar functions and needs and are, in a relative sense, wetter lands. A broad range of efforts are underway to protect and restore such areas because of their functions and values. See National Research Council. 2002. Riparian Areas: Functions and Strategies for Management. National Academy Press. Washington, D.C.

What wetland definitions are used for wetland mapping?

A. The FWS National Wetland Classification System definition has been used in the preparation of National Wetland Inventory (NWI) maps. Most other federal agencies have also used this definition for wetland mapping. NRCS uses this definition for its Natural Resources Inventory.

The Corps has not mapped wetlands for the Section 404 program but have adopted procedures and criteria for more specific delineation of wetlands on the ground. See 1987 Manual for the Delineation of Wetlands.

States and local governments have traditionally used their own wetland definitions for preparing wetland maps. However, States and local governments are increasingly using the NWI definition and NWI maps in their wetland delineation efforts to save money and for the purposes of consistency.

Are wetland maps available for the Nation?

A. National Wetland Inventory maps at the scale of l/24,000 are available for about 90% of the lower 48 states including the most populated areas. These maps are not designed for use with the Section 404 regulatory program and utilize a slightly different wetland definition than the Section 404 program as indicated above.

Some wetland maps have also been prepared by NOAA and other agencies.

A number of states have prepared their own wetland maps for wetland regulatory and management purposes such as New York, Massachusetts, and Wisconsin. However, other states are using NWI maps or a state version of these maps.

Some local governments have also prepared their own wetland maps or have incorporated a variation on the NWI maps into their GIS systems.

Is wetland map information available in digital form?

A. Yes, for about 40% of the nation. The FWS is making available on line a less technical version of their NWI maps for much of the nation.

Some states such as New York are also digitizing their wetland maps. A number of states have established state geoinformation systems with wetland maps from state or federal sources as one component. Examples include Wisconsin, Minnesota, New York, Texas, and California.

What sources of information are typically used in preparing wetland maps?

A. Most wetland maps including the NWI maps and state and local wetland maps are based primarily upon air photo interpretation of black and white, color, and in some instances, color infra red air photos. U.S. Geological Survey (USGS) topographic maps and NRCS soil maps may be used to aid these photo interpretation efforts. Wetland boundaries are drawn based upon vegetation and observed hydrology (e.g., standing water). Color infrared photography is particularly useful in distinguishing moisture gradients. Satellite imagery has also been used in some instances although imagery has been, until recently, often at too small a scale to permit detailed mapping. This is changing as the resolution and accuracy of remote sensing sources improve.

On the ground field surveys may also be used to check air photos and other information sources in federal, state, and local mapping efforts such as the wetland mapping efforts of the Virginia Institute for Marine Science. Some detailed local wetland mapping efforts have been based primarily upon field surveys of vegetation, soils, and hydrology.

Are wetland maps sufficiently accurate and detailed to resolve on the ground boundary disputes?

A. Often, no. Wetland maps are useful in suggesting whether a property is, overall, located in a wetland, the type of wetland, and the overall wetland boundary. However, maps are often insufficiently accurate and detailed to locate precise wetland boundaries on the ground (10s of feet) or to resolve boundary disputes. Field surveys (delineations) utilizing applicable wetland definitions are used to refine boundaries and resolve disputes. Surveys involve detailed examination of vegetation, soil borings, and

a search for hydrologic indicators (e.g. water marks on trees). In rare instances more detailed hydrologic studies over time (e.g. piezometers) may be required.

Typically boundaries are "red flagged" on the ground once boundaries are more precisely identified.

Can wetland regulatory maps be successfully challenged in court if they contain some inaccuracies?

A. In general, no. No court has apparently invalidated wetland regulations because of uncertainties in maps. Courts have upheld wetland maps even if they contain some inaccuracies, particularly if the regulations provide procedures for correcting maps errors through field surveys as permit applications are submitted to a regulatory agency.

Are the wetland boundaries identified more easily for some types of wetlands than others?

A. Yes, it is often quite easy to identify the landward boundaries of coastal and estuarine wetlands because daily inundation by the tides can often be observed and the number of salt tolerant plants species is relatively small. The landward boundaries of many riverine and lake fringe wetlands and some depressional, "flats" and slope wetlands are also easily identified where there is frequent saturation or there are sharp breaks in topography such as a bluff or rim.

Wetland boundaries are more difficult to identify where slopes are gradual and where inundation or saturation occurs only a portion of the year. These conditions are common for flats and some low gradient depressional wetlands as well as the landward portions of infrequently flooded coastal, estuarine, lake fringe, and riverine wetlands. Wetland boundaries are also often difficult to delineate for highly altered systems which have been partially drained or filled (particularly where there are some subsurface drainage but the condition of this drainage is not known). Here a combination of vegetation, soils, and hydrologic indicators must be used to delineate boundaries.

Does a landowner or developer need to hire a consultant to delineate wetland boundaries?

A. Wetland boundaries may be identified in some instances by a landowner for frequently flood or saturated wetlands and for wetlands with relatively steep slopes such as incised floodplains as suggested above. However, landowners often need expert assistance for infrequently flooded or saturated areas, low gradient areas, and highly altered systems.

Some state and local regulatory programs carry out delineations for landowners. Corps staff for the Section 404 program also carry out some delineations at the request of landowners. However, due to back load of requests and long waits, many landowners find it desirable to hire a consultant to delineate wetland

boundaries rather than wait for the Corps. This delineation is then submitted to the Corps which may field check the boundary.

Are wetland delineation guidance documents available?

A. Yes, the Corps in 1987 prepared a Wetland Delineation Manual, which is used for Section 404 permitting and is available both on the web and in hard copy form. NRCS has also published delineation guidance. Several states such as New York and Michigan have published their own wetland delineation manuals. Finally, a variety of books and reports are available to help a consultant or landowner carry out wetland delineation. See "Suggested Readings and Web Sites below.

SUGGESTED READINGS

Atkinson, R., J. Perry, E. Smith, and J. Cairns, Jr. 1993. Use of Created Wetland Delineation and Weighted Averages as a Component of Assessment. In Wetlands, Vol. 13, No. 3, September. The Society of Wetland Scientists.

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SUGGESTED WEB SITES

http://www.saj.usace.army.mil/permit/documents/87manual.pdf
U.S. Army Corps of Engineers 1987 Wetland Delineation Manual.

http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/delineations.html
U.S. Army Corps of Engineers. Wetland Delineation; Suggestions for Applicants and Consultants.

http://www.nae.usace.army.mil/reg/datasht.pdf
New England District Corps of Engineers Delineation Datasheet and Supplemental Information.

http://www.dep.state.fl.us/water/wetlands/delineation/manual.htm
Florida Wetlands Delineation Manual. Florida Department of Environmental Protection

http://www.pwrc.usgs.gov/wli/techdel.htm
Wetland Science Institute. Wetland Delineation Technical Articles.

http://www.state.ma.us/dep/brp/ww/files/bvw.htm
Massachusetts Department of Environmental Protection.
Bordering Vegetated Wetland Delineation Criteria and Methodology.

http://www.ecy.wa.gov/programs/sea/pubs/96-94.html
Washington State Wetlands Identification and Delineation Manual. March 1997.

http://www.wetlanddelineators.org/
The Wetland Delineators Association.

http://www.dec.state.ny.us/website/dfwmr/marine/material.htm
New York State Department of Environmental Conservation. Tidal Wetland Information Materials. A guide to New York State Tidal Wetland Maps (maps not available on this site).

http://www.metrokc.gov/gis/mapportal/iMAP_main.htm
King County. GIS Center. Wetland maps.

www.esri.com/hazards
Federal Emergency Management Agency flood maps.

http://wetlands.fws.gov/
U.S. Fish and Wildlife Service. National Wetlands Inventory

www.nwrc.gov
U.S. Geological Survey National Wetlands Research Center.

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www.epa.gov/owow/wetlands
U.S. Environmental Protection Agency. Wetlands. Section 404 regulations.

www.wes.army.mil/el/wetlands/wetlands.html
U.S. Army Corps of Engineers. Environmental Laboratory Wetlands. Access to many reports including the 1987 Corp's Wetland Delineation manual.

http://plants.usda.gov/
USDA Natural Resources Conservation Service. National Plant Database.

http://www.soils.usda.gov/use/hydric/
USDA Natural Resource Conservation Service. Hydric Soils. Access to hydric soils list.

http://www.nwrc.usgs.gov/
U.S. Geological Survey. National Wetlands Research Center online publications.

http://www.kenaiwetlands.net/
Wetland Mapping and Classification of the Kenai Lowland, Alaska

http://www.dec.state.ny.us/website/dfwmr/marine/twhome.htm
New York State Department of Environmental Conservation. Tidal Wetland Mapping.

http://www.dnr.state.oh.us/wetlands/mapping.htm
Ohio Department of Natural Resources. Wetland Maps for Ohio. Satellite imagery based wetland maps for Ohio.

http://www.state.ma.us/dep/brp/ww/files/wcpdist.htm
Massachusetts Department of Environmental Protection. Wetlands mapping using color photos and place on an orthophoto base in Massachusetts.

http://www.govtech.net/magazine/gt/1995/aug/dept/giswwet.phtml
New Jersey mapping of wetlands.

http://www.freep.com/news/mich/wet30_20021130.htm
Mapping Michigan Wetlands.

http://www.csc.noaa.gov/crs/apps/issues/spot_merlin.htm
Using satellite data to map coastal and freshwater wetlands in Maryland.

http://wisclinc.state.wi.us/
Dane County, Wisconsin (WI) NRCS Wetland Inventory.

http://feature.geography.wisc.edu/sco/maps/m_wetlnd.html
Wisconsin wetland mapping effort.

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An electronic version of this brochure is available in PDF at:
http://aswm.org/pdf_lib/14_mapping_6_26_06.pdf