

Modernizing U.S. National Standards for the Classification and Mapping of Wetlands

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and John M. Galbraith (Virginia Tech)

Session: (48) Wetlands: Extension/Outreach
June 5, 2012

**9th INTECOL International Wetlands Conference:
Wetlands in a Complex World, June 3-8, 2012, in Orlando, Florida**

Status of the NSDI Wetlands Layer

USFWS Wetlands Geodatabase contains over 35,600 7.5-minute map areas in a seamless ArcSDE geodatabase.



Last updated: 05/08/2012 09:32:51

- 73% of the conterminous U.S.
- 32% of Alaska
- 100% of the windward islands of Hawaii
- 76% of Puerto Rico and the U.S. Virgin Islands
- 100% of Guam and Saipan in the Pacific Trust Territories

<http://www.fws.gov/wetlands/Layer/Status-Information.html>

Wetland Mapping Consortium (WMC)

Enhancing Wetland Conservation through Improved Mapping and Monitoring



Wetland Mapping Consortium (WMC)

- The WMC is an interdisciplinary group of wetland scientists and managers interested in mapping and monitoring wetlands with remotely sensed images and/or using the resultant products to best manage wetland resources.
- Goal is to improve the management of wetland resources through enhanced wetland mapping and monitoring and dissemination of this information.

WMC Collaborative Projects

- ❖ WMC Scholar Site –Online Collaborative Resources
- ❖ WMC Monthly Webinar Series
- ❖ SSURGO Data Package for Wetland Mappers
- ❖ Technical support for Wetlands Mapping and Classification Standards Working Groups
 - Wetlands Classification Image Gallery –Online image collection
(with CNL World-- Larry Handley and Catherine Lockwood will present later in this session)
 - Technical Guidance on developing national conventions for Wetland Names and Stable Unique Identifier Codes

http://cliv.cses.vt.edu/WMC/ Wetland Mapping Consorti...

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Wetland Mapping Consortium (WMC)

Enhancing Wetland Conservation through Improved Mapping and Monitoring

WMC fosters collaborations and disseminates data and findings for the purpose of enhanced wetland mapping and monitoring.

WMC Objectives:

- + Build collaborative teams to enable rapid and thorough response to calls for relevant proposals.
- + Organize a pool of experts who can respond to requests for more information about wetland mapping techniques and technologies.

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WETLAND MAPPING CONSORTIUM

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Click links on the left side of the page have content or expected content.

- Announcements: WMC information messages.
- Calendar: view scheduled WMC events.
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Recent Announcements

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Announcements (viewing announcements from the last 30 days)

UPDATE: WMC Lunch Meeting Tables at INTECOL Tuesday June 5, 2012

(Jane Awi - Jun 4, 2012 7:04 pm)

WMC Webinar: Automation Techniques for Mapping Wetlands

(Jane Awi - May 15, 2012 3:54 pm)

Recent Chat Messages

Training & Collaboration Resources

- * Wetland Mapping Consortium (WMC)
<http://clic.cses.vt.edu/WMC/>
- * Association of State Wetland Managers (ASWM)
<http://aswm.org/>
- * U.S. Fish and Wildlife Service (USFWS) Wetland Mapping Training
http://www.fws.gov/habitatconservation/nwi/wetlands_mapping_training/index.html



U.S. Fish & Wildlife Service

Wetland Mapping Training



[Glossary](#)

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Wetland Mapping Training

[Module 1: What is the National Wetlands Inventory?](#)

[Module 2: National Wetland Classification Standard](#)

[Part 1: Definition of Wetlands](#)

[Part 2: Introduction to the Standard](#)

[Part 3: Systems and Subsystems](#)

Purpose

This online Wetland Mapping Training course was developed by the U.S. Fish and Wildlife Service (Service) to assist our cooperators and data contributors in successfully submitting standards-compliant wetlands geospatial data to the National Wetlands Inventory Program (NWI). These data become part of the NWI-managed Wetlands Layer of the National Spatial Data Infrastructure (NSDI). Only standards-compliant data can be added to the Wetlands Layer.

Who should take this course?

SSURGO Package for Wetland Mappers

Soil Survey Geographic (SSURGO) Database NRCS Soils

<http://soils.usda.gov/survey/geography/ssurgo/>

- ✓ Hydric Soils conveniently extracted
- ✓ Seamless national coverage
- ✓ Data to be refreshed annually

Requirements Document

Soil Survey Geographic (SSURGO) Package for Wetland Mappers

(with gSSURGO map layer and Potential Wetland Soil Landscapes query)
5/2/2012

1. Business Problem Statement

Wetlands Mappers (Association of State Wetland Managers, the Wetlands Mapping Consortium [WMC], and others) need access to state-wide NCSS Soil Survey Geographic Database (SSURGO) information (Geographic Information Systems [GIS] ready digital maps and attributes) to support effective wetland mapping activities.

2. Current Business Process

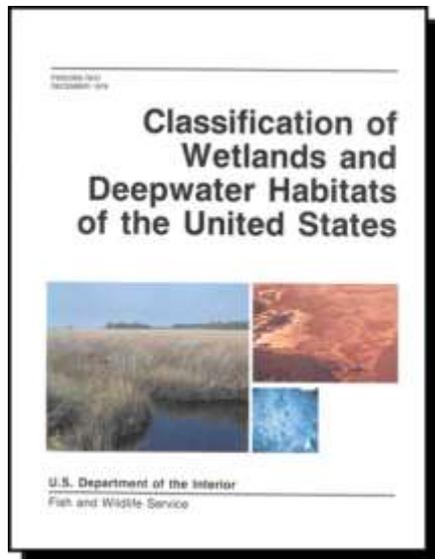
Currently, in order to obtain state-wide SSURGO datasets, users need to download (or order on DVD or HD) either state collections of individual SSURGO datasets or download each traditional soil survey area independently from NRCS web sites for use in desktop GIS environments. This is a staff time consuming process and requires expert knowledge to manipulate each SSURGO dataset into state-wide map layers with combined attribute tables.

Reliable extraction of wetland mapping related attributes (percent of map unit containing a hydric soil component, map unit dominant condition soil drainage class, etc.) also requires expert knowledge. The Soil Data Viewer (SDV) software provided by NRCS for use with ArcGIS® and Microsoft (MS) Access® software works well, but only with datasets that have sizes less than 2 GB. Many state-wide SSURGO vector data sets exceed the 2 GB limit. Without assistance from SDV, attribute table query is prone to human error and incomplete or incorrect identification of wetlands related soil attributes often results.

U.S. National Standards for Mapping Wetlands: Federal Geographic Data Committee (FGDC)

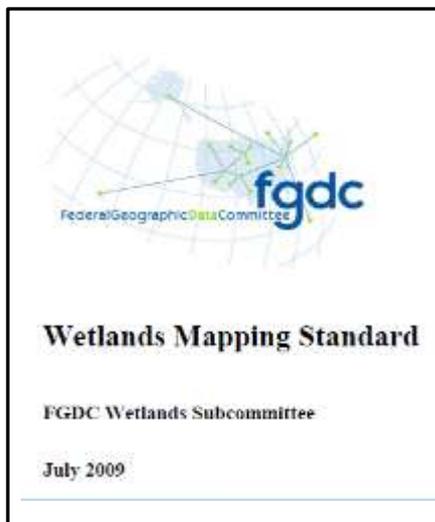
- FGDC is an interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis.
- The nationwide data publishing effort is known as the National Spatial Data Infrastructure (NSDI).
- FGDC standards specify the minimum quality of data necessary to allow inclusion of the data into the National Spatial Data Infrastructure (NSDI) and the National Map (USGS).
- The national standards for wetland mapping must be used in all wetland inventory mapping projects that receive any Federal funding (direct or indirect). Alternatively-funded wetland mapping projects are encouraged to comply with the standard.
- Site-specific and jurisdictional boundary mapping are EXEMPT.

What are the FGDC National Standards for Wetlands?



Wetlands Classification Standard *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al, 1979) endorsed by FGDC in 1996

http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/index_html

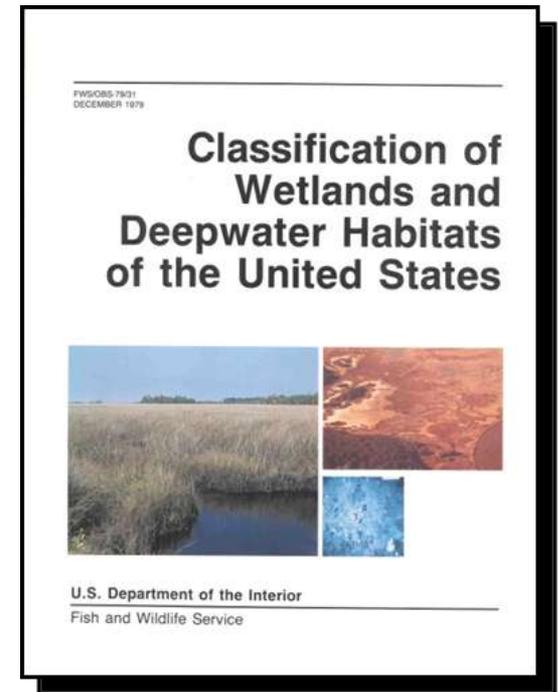


Wetlands Mapping Standard endorsed by FGDC in 2009 (FGDC-STD-015-2009)

http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/2009-08%20FGDC%20Wetlands%20Mapping%20Standard_final.pdf

Maintenance Review of the FGDC National Wetlands Classification Standard (Cowardin et al 1979)

- ❖ FGDC Standards are reviewed and updated on 5 year cycles [FGDC Directive # 9 Maintenance and Support]
- ❖ Development of the Wetlands Mapping Standard lead to specific recommendations for corresponding updates to the Wetlands Classification Standard on which it relies.
- ❖ See more information online at [FGDC.gov](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/maintenance-review-wetlands-classification-std)
<http://www.fgdc.gov/standards/projects/FGDC-standards-projects/maintenance-review-wetlands-classification-std>



Revised Wetlands Classification Standard

- ✓ Newly edited and updated version formatted to be consistent with recently endorsed standards
- ✓ Reflects advances in the science
- ✓ Incorporates recommendations endorsed as part of the mapping standard development and supported by the National Wetlands Inventory's *Data Collection Requirements and Procedures for Mapping Wetland, Deepwater, and Related Habitats of the United States* (http://www.fws.gov/wetlands/_documents/gNSDI/DataCollectionRequirementsProcedures.pdf)
- ✓ **Same hierarchical structure of the classification system at the top three levels (System, Subsystem, and Class).** *Most of the updates in classification are to Modifiers.*

Proposed Update to Reference Images

Wetland Image Gallery

The Wetland Image Gallery is a compilation of wetland images and corresponding information for the FGDC maintenance review of the current Wetland Classification Standard. The gallery provides an image framework for the classification of various possible wetland and deepwater habitats. The intent is to support, update, and add new images as examples to complement the classification scheme within the Classification of Wetlands and Deepwater Habitats of the United States.

<http://www.wetlandgallery.cnlworld.org>

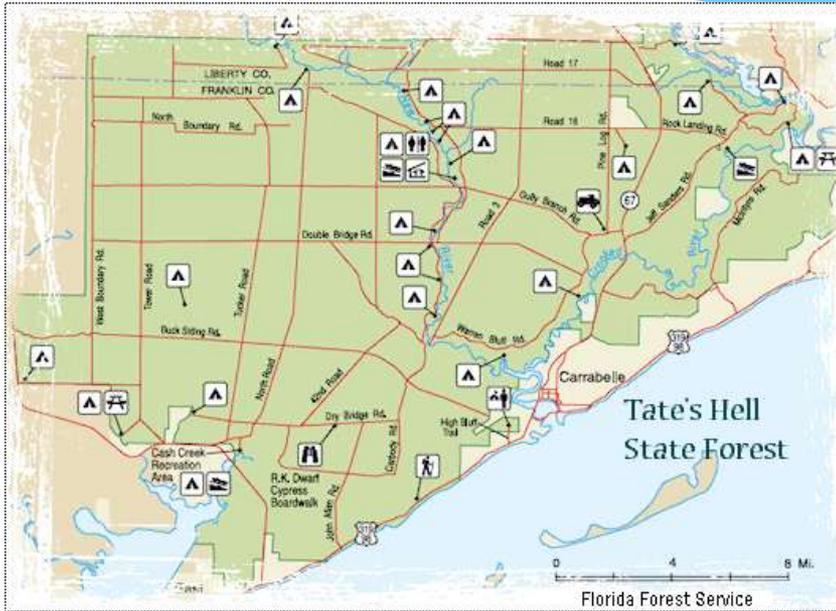
Proposed Update to Deepwater Limit

- As noted in Section 2.2, we have placed the boundary between wetlands and deepwater habitats in the Riverine and Lacustrine Systems at a depth of **2.5 m** (8.2 ft) below low water **because this represents the approximate limit of soil as defined in Soil Taxonomy (Soil Survey Staff 1999)** and the approximate maximum depth to which emergent plants normally grow (Welch 1952, Zhadin and Gerd 1963, Sculthorpe 1967).
- Thus, according to our definitions, inland wetlands may have soil, but inland deepwater habitats do not. All Palustrine waters are less than **2.5-m** deep; therefore, potentially all Palustrine habitats have soil.
- In the Marine and Estuarine Systems, the deep limit of soil lies at a depth of **2.5** m below extreme low water; however, we separate wetlands from deepwater habitats precisely at the extreme low water mark in those Systems.
- So, according to our definitions, Marine and Estuarine wetlands may have soil, and deepwater habitats also may have soil out to the **2.5-m** depth limit.

Wetland Names Working Group (WNWG)

What's in a Name?

Tate's Hell State Forest



Local legend has it that a farmer by the name of Cebe Tate, armed with only a shotgun and accompanied by his hunting dogs, journeyed into the swamp. Although there are several versions of this story, the most common describes Tate as being lost in the swamp for seven days and nights, bitten by a snake, and drinking from the murky waters to curb his thirst. Finally he came to a clearing near Carrabelle, living only long enough to murmur the words, "My name is Cebe Tate, and I just came from Hell!" Cebe Tate's adventure took place in 1875 and ever since, the area has been known as Tate's Hell,

These cypress trees are documented to be over 150 years old but only reach a mature height of approximately 15 feet, hence the name "dwarf cypress".

http://www.floridaforestservice.com/state_forests/tates_hell.html

Traditional Wetland Names

- * Historic

- * Mapper/Surveyor (e.g., Everglades, Great Dismal Swamp)
- * Associated People and Stories (e.g., Tate's Hell, Purgatory Swamp)
- * Native (e.g., Okefenokee from Okefenoka, meaning "Land of the Trembling Earth", Congaree, Cheyenne Bottoms & Quivira)
- * Landowner Names (e.g., Gowing's Swamp) – they change over time.

- * Natural Features

- * Hydrologic Features (e.g., Great Kankakee Swamp for the Kankakee River, Beaver Creek Marsh)
- * Landscape features (e.g., Cheyenne Bottoms, Prairie Potholes)
- * Biologic features (e.g., Cranberry Glades)

- * Landmarks

- * Geo-Political (e.g., Boundary Waters Canoe Area, Arcata Marsh for the City Arcata, CA)

Problems to be Addressed

Currently there are no nationally-accepted standards, conventions, protocols, or tools for creating wetland site names and other stable (not likely to change within a defined set) unique identifiers.

- * Allow individual wetland sites and corresponding geographic features (e.g., points, polygons) to be more effectively tracked, monitored and reported on over time.
- * Associate wetland geographic data with other data sets (such as water quality and monitoring data) to expand analytic capabilities.
- * Enhance system interoperability between federal agencies, states, tribes, and contracted partners.
- * Facilitate data sharing at a national scale.

Unique Identifiers

“With reference to a given (possibly implicit) set of objects, a **unique identifier (UID)** is any identifier which is guaranteed to be unique among all identifiers used for those objects and for a specific purpose” (from Wikipedia 04-20-2011).

- * Identifiers generally include numbers, codes and names.
- * Identifiers in this sense does NOT refer to the 3 parameters for wetland identification. It means names and codes for use in a database.
- * Unique in this sense does NOT refer to “Special” Wetlands. Unique Identifiers means the names and codes are Non-Repeated, Not Redundant within the database.

Coordination with FGDC Standards

The need for stable unique identifier codes for tracking wetlands was identified in the Implementation Plan for the FGDC Wetlands Mapping Standard. <http://www.fws.gov/wetlands/Documents/Implementation-Plan-for-the-FGDC-Wetlands-Mapping-Standard-Version-1.pdf>

This technical challenge is being investigated in coordination with the maintenance review of the Wetlands Classification Standard and prior to the next maintenance review cycle for the Wetlands Mapping Standard (so more information maybe available when the Mapping Standard is updated).

Outcomes

- * The development of nationally-applicable technical guidance on stable unique identifiers for wetlands may enhance capabilities for associating wetland mapping data with other data sets (such as water quality and monitoring data) expanding the possibilities for analysis.
- * Increased availability of such wetland information could better aid in identifying solutions for management, conservation and protection issues for wetlands and other water resources.

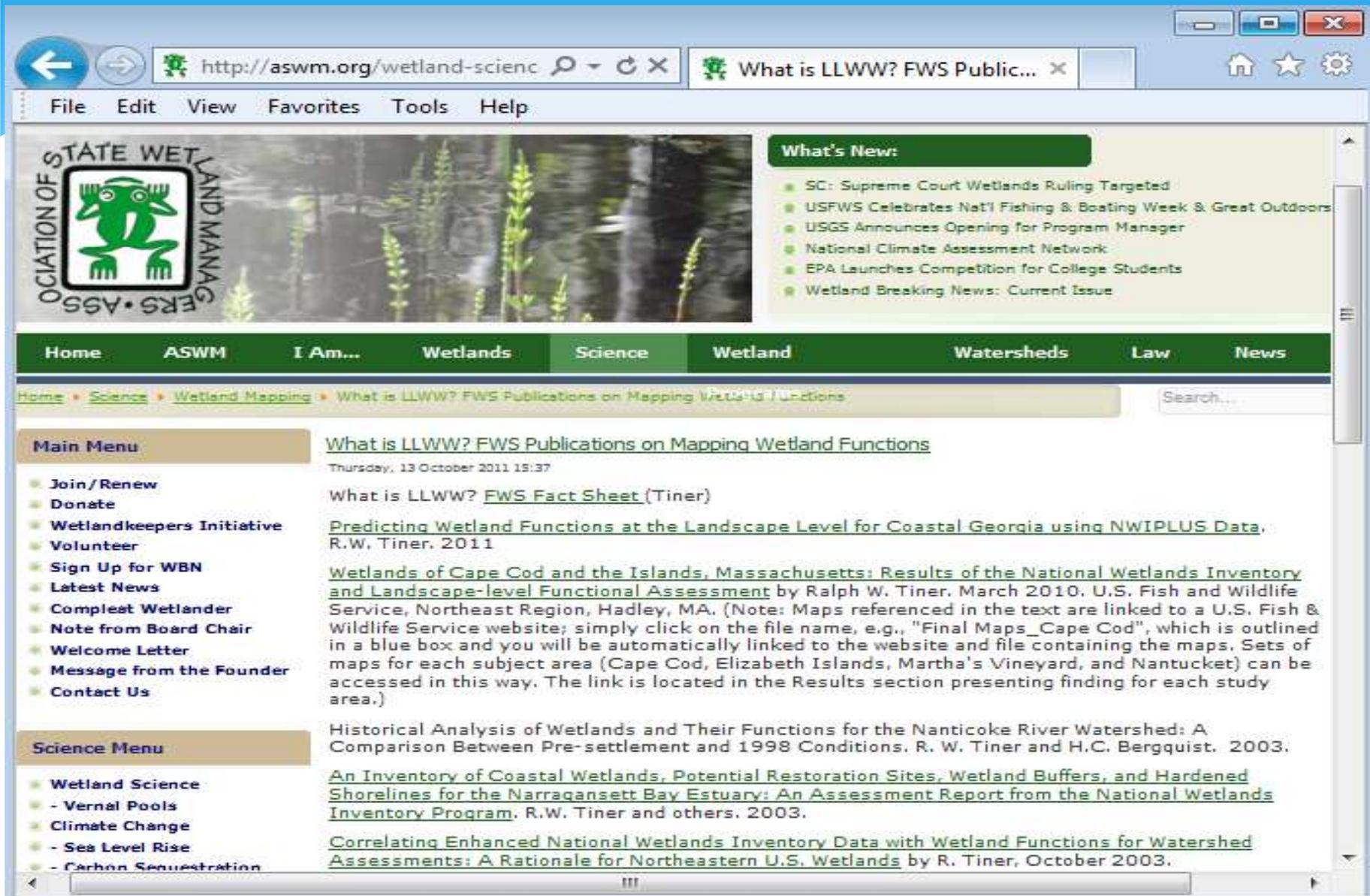
Stable Unique Identifiers: State Projects

- * Numeric Codes for the Identification of Basins in Minnesota
<http://mn.gov/oet/policies-and-standards/geospatial/gis-pages/mn-basin-identification-codes.jsp> --This standard has been developed to improve the sharing and exchange of information about lake and wetland basins.
- * Generation of unique identifiers for complexes of NWI polygons based on the updated New Hampshire Method
<http://nhmethod.org/index.htm>. See “NHWetlands Base Map” at <http://www.granit.unh.edu/data/downloadfreedata/category/databycategory.html>.

Stable Unique Identifiers: Key Issues

- * Codes must function within a **relational database context** to support robust analysis. The national level is the missing puzzle piece to putting state and regional databases together for analysis.
- * Codes need to reflect **wetland dynamism**: expansion/contraction, disappearance/reappearance, and fragmentation over time.
- * What will be the **base polygon** for coding? (Wetland Complex, HGM, LLWW, NWI, other?)
- * Will there be a **target minimum or maximum** wetland size for coding? The wetland Mapping Standard specifies a target mapping unit of 0.5 acres. Some smaller wetlands have significant biological functions which there may be need to monitor.
- * **How will the code be assigned? Can the process be automated?**
- * **What will be the code structure? (Information-rich and scalable or Geographic Coordinate-based “Locator Point”)**
- * **Length of code** may become unwieldy. Multiple fields may be required to store components of code and to aid in scalability and analysis.

LANDSCAPE, LANDFORM, WATER FLOW PATH, AND WATERBODY TYPE (LLWW)



The screenshot shows a web browser window displaying the ASWM website. The address bar shows the URL <http://aswm.org/wetland-scienc>. The page title is "What is LLWW? FWS Public...". The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The website header features the ASWM logo (Association of State Wetland Managers) and a navigation menu with links for Home, ASWM, I Am..., Wetlands, Science, Wetland, Watersheds, Law, and News. The main content area is titled "What is LLWW? FWS Publications on Mapping Wetland Functions" and includes a "What's New:" section with a list of recent news items. A left sidebar contains a "Main Menu" and a "Science Menu" with various links. The main text area contains several articles, including "What is LLWW? FWS Fact Sheet (Tiner)", "Predicting Wetland Functions at the Landscape Level for Coastal Georgia using NWIPLUS Data", "Wetlands of Cape Cod and the Islands, Massachusetts: Results of the National Wetlands Inventory and Landscape-level Functional Assessment", "Historical Analysis of Wetlands and Their Functions for the Nanticoke River Watershed: A Comparison Between Pre-settlement and 1998 Conditions", "An Inventory of Coastal Wetlands, Potential Restoration Sites, Wetland Buffers, and Hardened Shorelines for the Narragansett Bay Estuary: An Assessment Report from the National Wetlands Inventory Program", and "Correlating Enhanced National Wetlands Inventory Data with Wetland Functions for Watershed Assessments: A Rationale for Northeastern U.S. Wetlands".

What's New:

- SC: Supreme Court Wetlands Ruling Targeted
- USFWS Celebrates Nat'l Fishing & Boating Week & Great Outdoors
- USGS Announces Opening for Program Manager
- National Climate Assessment Network
- EPA Launches Competition for College Students
- Wetland Breaking News: Current Issue

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What is LLWW? FWS Publications on Mapping Wetland Functions
Thursday, 13 October 2011 15:37

What is LLWW? [FWS Fact Sheet \(Tiner\)](#)

[Predicting Wetland Functions at the Landscape Level for Coastal Georgia using NWIPLUS Data](#), R.W. Tiner, 2011

[Wetlands of Cape Cod and the Islands, Massachusetts: Results of the National Wetlands Inventory and Landscape-level Functional Assessment](#) by Ralph W. Tiner, March 2010, U.S. Fish and Wildlife Service, Northeast Region, Hadley, MA. (Note: Maps referenced in the text are linked to a U.S. Fish & Wildlife Service website; simply click on the file name, e.g., "Final Maps_Cape Cod", which is outlined in a blue box and you will be automatically linked to the website and file containing the maps. Sets of maps for each subject area (Cape Cod, Elizabeth Islands, Martha's Vineyard, and Nantucket) can be accessed in this way. The link is located in the Results section presenting finding for each study area.)

Historical Analysis of Wetlands and Their Functions for the Nanticoke River Watershed: A Comparison Between Pre-settlement and 1998 Conditions. R. W. Tiner and H.C. Bergquist. 2003.

[An Inventory of Coastal Wetlands, Potential Restoration Sites, Wetland Buffers, and Hardened Shorelines for the Narragansett Bay Estuary: An Assessment Report from the National Wetlands Inventory Program](#). R.W. Tiner and others. 2003.

[Correlating Enhanced National Wetlands Inventory Data with Wetland Functions for Watershed Assessments: A Rationale for Northeastern U.S. Wetlands](#) by R. Tiner, October 2003.

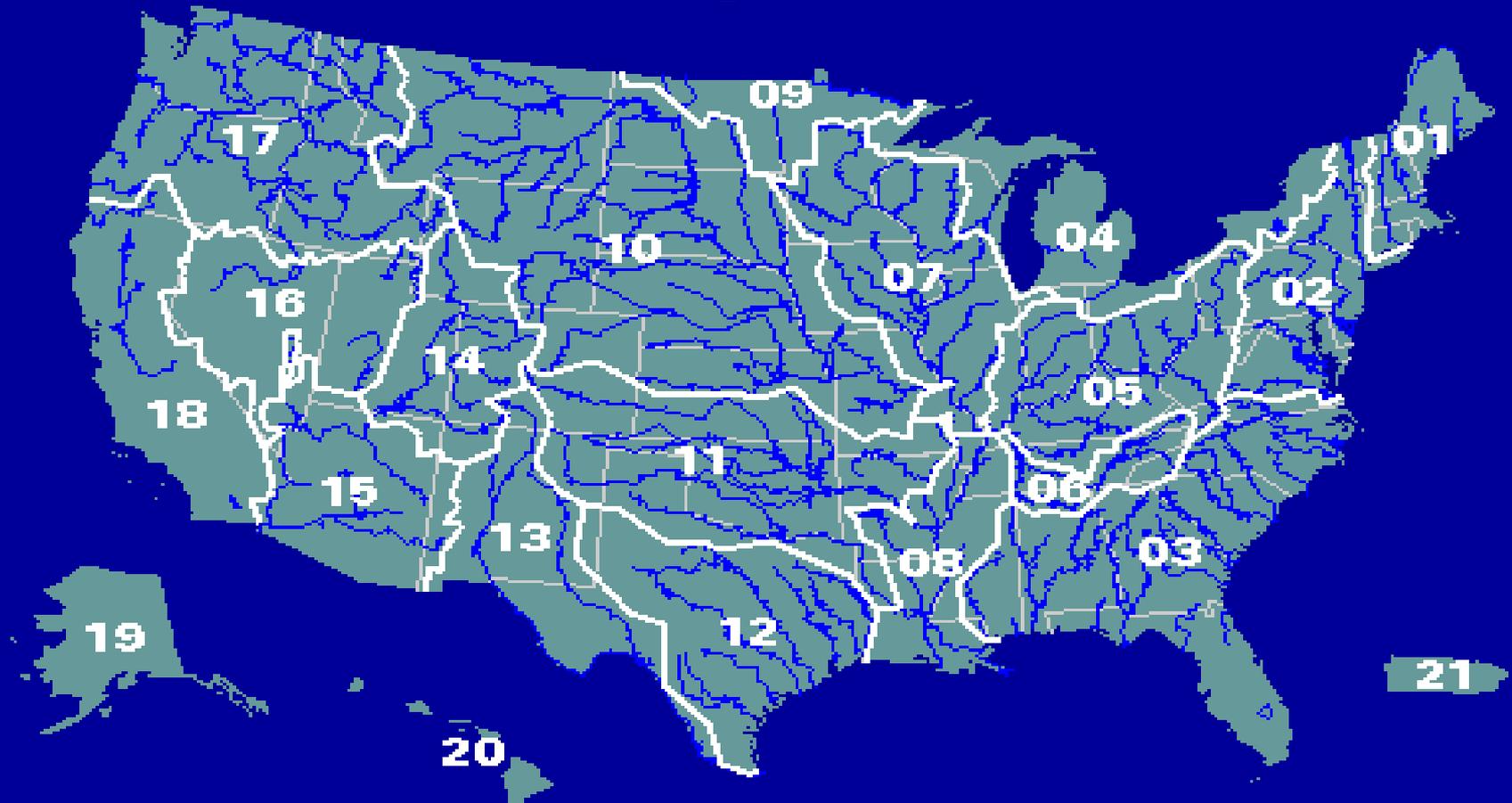
LLWW Advantages for Base Polygons

- ✓ Greater temporal stability of the landscape setting relative to the vegetation.
- ✓ Some level of LLWW could potentially be mapped for sites of interest which are not currently wetlands (including historic, restorable, and riparian sites).

Hydrologic Unit Codes (HUC)

8-digit, 10-digit, and 12-digit Codes

Select a Water Resources Region.



Stable Unique Identifiers: Recommendations:

- * Use of only these codes and names would **NOT be mandated**, states and others would still be free to use their own systems. The intent is to build methods that will solve fundamental problems and be so useful that everybody will want to use it as a complement to their data set.
- * The names and codes should remain **separate from any wetland/upland determination** (even currently drained wetlands or planned/future wetlands could be issued national wetland names and identifier codes).
- * Utilize **multiple approaches** and relational tables for robust usage possibilities.
- * Code(s) should be informationally robust enough to allow for **multiple levels of aggregation and splitting**.
- * Stable Unique Identifier Code assignment by **online web-based tool and database lookup**.
- * **Develop a national pilot project**.
- * Develop a **new FGDC standard and National Coverage** for Wetland Names and Stable Unique Identifier Codes (work towards grants and funding to develop)

NSDI CAP 2011 Project Description

Technical Guidance on Unique Identifiers for Wetland Mapping Standard Implementation, Outreach and Training Materials

<http://www.fgdc.gov/grants/2011CAP/projects/G11AC20060>

The screenshot shows a web browser window with the address bar displaying <http://www.fgdc.gov/grants/2011CAP/projects/G11AC20060>. The browser's address bar also shows a tab titled "Wetland Mapping Standar...". The website header features the FGDC logo (Federal Geographic Data Committee) and navigation links for "Site Map", "Accessibility", and "Contact". A search bar is present with the text "Search Site" and a "Search" button, along with a checkbox for "only in current section". The main navigation menu includes "Home", "Library", "Calendar", and "Contact Us". A left sidebar contains a list of menu items: "Participants", "Data & Services", "Standards", "Metadata", "Framework", "Policy & Planning", "Training", "Grants", "International", and "Geospatial LoB". The main content area displays the breadcrumb trail: "you are here: home → grants → 2011 nsdi cap → 2011 nsdi cap projects → wetland mapping standard implementation, outreach and training materials". The page title is "Wetland Mapping Standard Implementation, Outreach and Training Materials". Below the title, the award number is listed as "Award Number G11AC20060, Category 2: FGDC-endorsed Standards Implementation Training and Outreach". The project description states: "The purpose of this project is to facilitate implementation of an FGDC-endorsed standard in user communities by 1) developing technical guidance for carrying out key recommendations included within the FGDC Wetland Mapping Standard for handling and tracking wetland unique identifiers, and in the Implementation Plan to track polygon lineage and change, and 2) producing implementation recommendations and resulting training materials. Virginia Tech's".

Partner Organizations

- FGDC Wetlands Subcommittee including:
 - U.S. Fish and Wildlife Service
 - U.S. Environmental Protection Agency
 - U.S. Army Corps of Engineers
 - U.S. Geological Survey
- National Wetlands Monitoring and Assessment Working Group (NWMAWG)
- Association of State Wetland Managers (ASWM)
- Wetlands Mapping Consortium (WMC)
- Ducks Unlimited (DU)
- Kentucky Division of Water

Can the WMC help your project move forward?

Wetland professionals, academic researchers, and students who are interested in the mapping and monitoring of wetlands and related resources may join the WMC and utilize our communication tools and resources to foster collaboration.

Resource areas and member lists for project working groups can be set up within the WMC.

Join the WMC

Wetland Mapping Consortium (WMC) membership is FREE. Members have access to email updates, online collaboration tools, as well as the monthly Webinar Series (3rd Wednesdays at 3pm Eastern). For registration information see

http://clic.cses.vt.edu/WMC/WMC_Organizers.htm

If you are interested in joining the Wetland Names Working Group (WNWG) or being notified of our future activities, please send an email to wetlandmappingconsortium@gmail.com with the subject line "Join WNWG".

QUESTIONS or COMMENTS?

- Wetland Mapping Consortium (WMC)
- Wetland Names Working Group (WNWG)
- Stable Unique Identifier Codes for Wetlands
- SSURGO Package for Wetland Mappers
- Wetland Mapping Training

For more information please contact:

Jane Awl

wmc.jane.awl@gmail.com