

**NSDI 2011 Cooperative Agreements Program  
FGDC-Endorsed Standards Implementation Training and Outreach Project  
Final Project Report**

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**Project title:** Wetland Mapping Standard Implementation, Outreach and Training Materials

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**Executive Summary**

The purpose of this project was to facilitate implementation of FGDC-endorsed wetland standards in user communities by developing technical recommendations to address key technical challenges referenced within the FGDC Wetland Mapping Standard (handling and tracking wetland unique identifiers) and in its Implementation Plan (tracking of polygon lineage and change). And in doing so, the goal was to advance the state of the science, as well as add to training resources and opportunities, and provide needed outreach on these issues. There are currently 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 identifier codes. The Conservation Management Institute (CMI), the Wetland Mapping Consortium (WMC), and Jane Awl Consulting (JAC) worked with members of the affected wetlands science community to develop and vet technical recommendations for developing and testing wetland naming and coding methods applicable to national-scale wetland tracking and monitoring needs. This information was presented and discussed at relevant national and regional professional meetings, as well as in national webinars and teleconferences. As an outcome of this project, the Wetland Names Working Group (WNWG) of the Wetland Mapping Consortium (WMC) was formed to pursue the testing, development, and implementation of methodologies and a national standard for wetland names and codes. As of 2012, WNWG has more than 40 members representing federal, state, and nonprofit organizations, as well as universities and other entities engaged in mapping wetlands.

**Project Narrative**

Wetland maps are essential for a variety of purposes, including forecasting 1) sea level rise, 2) the extent of larger natural hazard events that may result from climate change, 3) threats to biodiversity, and 4) changes in water quality and quantity. The issue of wetland names and

coding has been a controversial one since detailed national-scale wetland mapping in the US began more than 30 years ago, with the National Wetlands Inventory (NWI). However, a methodology to uniquely code wetland features is urgently needed by data producers and users. Implementation of national standards for naming and uniquely coding wetlands would:

- allow individual wetland sites and corresponding geographic features (e.g., points, polygons) to be more effectively tracked, monitored, and reported on over time,
- enhance capabilities to associate wetland geographic data with other data sets (such as water quality and monitoring data) to expand the possibilities for analysis,
- assist in improving and modernizing the National Spatial Data Infrastructure (NSDI) Wetlands Layer,
- enhance system interoperability between federal agencies, states, tribes, and contracted partners,
- facilitate data sharing at a national scale,
- aid in data analysis and identifying solutions for management, conservation, and protection issues for wetlands and other water resources, and
- increase the overall availability of and ease of access to wetlands data.

The purpose of this project was to facilitate implementation of FGDC-endorsed wetland standards in user communities by developing technical recommendations for how to move forward on some key technical challenges referenced within the FGDC Wetland Mapping Standard (handling and tracking wetland unique identifiers)<sup>1</sup>, and in its Implementation Plan (tracking of polygon lineage and change)<sup>2</sup>. And in doing so, the goal was to advance the state of the science, as well as adding to training resources and opportunities, and providing needed outreach on these issues. This project was timed to address these key recommendations prior to the next maintenance review cycle for the FGDC Wetlands Mapping Standard (so the results may be considered when updating the Mapping Standard), and in coordination with an ongoing

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<sup>1</sup> The 2009 FGDC Wetlands Mapping Standard in Section 1.6 Standard Development Procedures and Representation states "The development of this Standard generated findings for...additional tools for handling and tracking wetland unique identifiers..." (see [http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/2009-08%20FGDC%20Wetlands%20Mapping%20Standard\\_final.pdf](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/2009-08%20FGDC%20Wetlands%20Mapping%20Standard_final.pdf)). Additional discussion on wetland "unique identifiers" was also provided in the Public Review Draft for the Wetlands Mapping Standard, Appendix A: Workgroup Recommendations to the FGDC, Section 3) Proposed Future Tools for Unique Identifiers and Tracking: "'Unique identifiers' are attributes which uniquely identify each mapped feature. Stable unique identifiers for wetland features would also be helpful for associating wetland data with other data sets (such as water quality and monitoring data), expanding the possibilities for analysis. The proposed National Wetland Mapping Standard endorses the adoption of technical standards for tracking polygons." (See Working Draft Wetland Mapping Standard, Public review draft 2007/08/06, [http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/Public%20review%20draft%20Wetlands%20Mapping%20Standard%2008\\_06\\_07.pdf](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/Public%20review%20draft%20Wetlands%20Mapping%20Standard%2008_06_07.pdf))

<sup>2</sup> The 2010 Implementation Plan for the FGDC Wetlands Mapping Standard Version 1.0 recommends in Appendix B, Technical and Strategic Recommendations for Consideration During the Current Implementation Phase, "4) Work to investigate and enhance system interoperability between federal agencies, states, tribes, and contracted partners, to facilitate data sharing, data verification, and move towards real-time update of the data" and "6) Development of improved database-capabilities to track polygon lineage and polygon change over time." (<http://www.fws.gov/wetlands/Documents/Implementation-Plan-for-the-FGDC-Wetlands-Mapping-Standard-Version-1.pdf>). The Implementation Plan provides a roadmap to support adoption of the standard nationwide, to increase the extent and detail of the NSDI wetlands layer, and to create a forum for addressing additional technical challenges that could not be addressed in the current version of the standard, but need to be resolved in order to improve and modernize the NSDI Wetlands Layer. The Implementation Plan was intentionally designed as a dynamic document to allow incorporation of technical updates, such as the technical guidance and implementation recommendations on wetland site names and other unique identifiers proposed here ([http://www.fws.gov/wetlands/\\_documents/gNSDI/DRAFTImplementationPlanFGDCWetlandsMappingStandard.pdf](http://www.fws.gov/wetlands/_documents/gNSDI/DRAFTImplementationPlanFGDCWetlandsMappingStandard.pdf)).

maintenance review of the FGDC Wetlands Classification Standard. Additionally, national standards for creating wetland site names and unique identifiers<sup>3</sup> for use in database development are urgently needed by state agencies participating in the ongoing National Wetlands Condition Assessment (<http://water.epa.gov/type/wetlands/assessment/survey/index.cfm>).

The Conservation Management Institute (CMI), the Wetland Mapping Consortium (WMC)<sup>4</sup>, and Jane Awl Consulting (JAC) worked with members of the affected wetlands science community to develop and vet technical recommendations for developing and testing wetland naming and coding methods applicable to national-scale wetland tracking and monitoring needs. This information was presented and discussed at relevant national and regional professional meetings, as well as in national webinars and teleconferences. Technical recommendations were developed based on discussions and consensus from webinars, teleconferences, and three national and international scale conferences in 2012:

- State/Tribal/Federal Wetland Coordination Meeting (<http://aswm.org/wetland-programs/-states-and-tribes-login-req/1390-2012-statetribalfederal-coordination-meeting>),
- National Monitoring Conference (<http://acwi.gov/monitoring/conference/2012/>), and
- INTECOL/Society of Wetland Scientists (<http://www.conference.ifas.ufl.edu/INTECOL/>).

Many collaborative relationships were fostered during the course of this project. We wish to thank all the individuals and organizations who assisted in the work toward furthering the development and implementation of national methods for wetland names and stable unique identifier codes. Participant organizations include:

- U.S. Fish and Wildlife Service (USFWS)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- National Oceanic and Atmospheric Administration (NOAA )
- FGDC Wetlands Subcommittee
- National Wetlands Monitoring and Assessment Working Group (NWMAWG)
- Association of State Wetland Managers (ASWM)
- Wetland Mapping Consortium (WMC)
- Ducks Unlimited (DU)
- CNL World (CNL)
- Research Triangle Institute (RTI)
- NatureServe (NS)
- States
- Universities

As a significant outcome of this project, the Wetland Names Working Group (WNWG) of the Wetland Mapping Consortium (WMC) was formed to carry forward efforts to develop and implement a national methodology and standard for wetland names and stable unique identifier codes. As of 2012, WNWG included more than 40 members representing federal, state, and

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<sup>3</sup> What are 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. "Unique" in this sense does NOT refer to "special" wetlands; instead "Unique Identifiers" means they are names and codes that are non-repeated and not redundant within a database.

<sup>4</sup> 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. The WMC actively collaborates with and provides technical support and tools to national and regional working groups such as the National Wetlands Monitoring and Assessment Work Group (NWMAWG) and the Southeast Wetland Workgroup (SEWWG).

nonprofit organizations, as well as universities and other entities engaged in mapping wetlands. The role of WNWG within this 2011 CAP Project was to aid in development, discussion, and review of the project technical recommendations.

***Project Activities:***

- July 13, 2011 -- Jane Awl presented an introductory webinar on the CAP project. The webinar was hosted by ASWM & WMC. More than 15 participants included representatives from Federal Agencies (USDA, FWS, and EPA), States (DE, GA, FL, MD, and MT), NGOs, consultants and academia.
- October 18, 2011 -- John Galbraith presented CAP project information to the Soil Science Society of America, San Antonio, TX.  
<http://scisoc.confex.com/scisoc/2011am/webprogram/start.html>.
- January 18, 2012 -- Jane Awl and Bill Wilen, with Robb Macleod and Denise Clearwater, presented CAP project information in a webinar hosted by ASWM & WMC. The presentation included follow-up information on the CAP project, highlighting ongoing project research and facilitating group discussion of interim project findings. More than 50 participants included representatives from Federal Agencies (EPA, FWS, NOAA, USDA, and USGS), States (CO, DE, FL, KY, MD, MN, MT, NM, OR, and VA), NGOs, consultants and academia.
- March 7, 2012 -- Jane Awl led a WNWG teleconference.
- March 13 to 15, 2012 -- Jane Awl and John Galbraith presented CAP project information at the State/Tribal/Federal Coordination meeting in Shepherdstown, WV.  
<http://aswm.org/wetland-programs/-states-and-tribes-login-req/1390-2012-statetribalfederal-coordination-meeting>.
- March 28, 2012 -- Jane Awl led a WNWG webinar.
- April 30 to May 4, 2012 -- Jane Awl presented CAP project information during a panel discussion of the National Wetlands Monitoring and Assessment Work Group (NWMAWG) of the EPA at the 2012 National Water Quality Monitoring Council meeting in (8th National Monitoring Conference, in Portland, OR).  
<http://acwi.gov/monitoring/conference/2012/>.
- May 9, 2012 -- Jane Awl led a WNWG webinar.
- May 23, 2012 -- Jane Awl and Ralph Tiner presented a WNWG webinar: discussion of using the LLWW descriptor system as component of wetland coding (Landscape position, Landform, Water flow path and Waterbody type, see <http://aswm.org/wetland-science/wetland-mapping/1623-what-is-llww-fws-publications-on-mapping-wetland-functions>) and to begin discussion of applied study recommendations.
- May 30, 2012 -- Jane Awl led a WNWG webinar: subgroup to discuss applied study recommendations.
- June 5, 2012 -- Jane Awl, Bill Wilen, Larry Handley, and John Galbraith presented CAP Project information at the INTECOL/Society of Wetland Scientists (SWS) International Meeting in Orlando, FL. <http://www.conference.ifas.ufl.edu/INTECOL/>.
- June 5, 2012 -- Jane Awl organized a WMC/WWNWG discussion table at INTECOL/SWS. More than 15 participants included representatives from Federal Agencies (USDA, FWS, and EPA), States, NGOs, consultants and academia.
- June 5, 2012 -- Jane Awl led a WNWG subgroup meeting to discuss applied study recommendations.

- June 11, 2012 -- Jane Awl, Ralph Tiner and Andy Robertson presented a WNWG discussion webinar: continued discussion of using LLWW system and applied study recommendations.
- June 15, 2012 -- Jane Awl led a WNWG teleconference: subgroup to discuss applied study recommendations.
- June 18 to 21, 2012 -- John Galbraith presented CAP project information in the Northeast Regional Cooperative Soil Survey Conference at The University of Maine – Orono. <http://soils.usda.gov/partnerships/ncss/conferences/2012/northeast/index.html>.
- June 19, 2012 -- Jane Awl, led a WNWG teleconference with discussion by Larry Handley, Ralph Tiner, and Robb Macleod: subgroup to discuss coding issues.
- July 11, 2012 -- Jane Awl led a WNWG teleconference: subgroup to discuss applied study recommendations.

### ***Project Challenges and Changes***

The primary challenge encountered during this project was the cancelation and rescheduling of some planned conferences and opportunities for outreach in 2011, due to a lack of funding across all levels of private and government organizations. These changes were outside of our control. Alternate conferences and opportunities for outreach were scheduled in 2012. These changes in planned conferences and outreach caused us to amend our project schedule. A no-cost extension of the project was provided to accommodate the changes. To maintain the momentum of the project during intervening periods, we continued collaborating with individual experts, held additional webinars, and provided updates to interested organizations such as the Wetlands Mapping Consortium (WMS), National Wetlands Monitoring and Assessment Working Group (NWMAWG), and the Southeast Wetlands Working Group (SEWWG).

### ***Public Access***

The public can access project information at no cost through the CAP project web page, as well as the Wetland Mapping Consortium (WMC) and Association of State Wetland Managers (ASWM) websites with links from the state wetlands mapping and wetlands mapping standard web pages. This is important because a large portion of new wetlands mapping and monitoring efforts are funded by states through coalitions organized by state wetland managers who participate in WMC and ASWM. ASWM has a proven track record in wetlands mapping education and outreach, and continues to support these activities. ASWM will be committed to providing information, training, and outreach to support the development of wetland maps for the foreseeable future, as part of its long-term commitment to developing an accurate national wetland map.

- Wetland Mapping Consortium (WMC) (<http://clic.cses.vt.edu/WMC/>)
- Association of State Wetland Managers (ASWM) (<http://aswm.org>)

The technical recommendations are provided in Appendices A and B attached to this report:

- Appendix A. Technical Recommendations, Wetland Site Names and Codes 2012; and
- Appendix B. Applied Study Phase, Summary of Proposed Activities (Program Development, Coordination, Applied Studies, Outreach, Training, and Technical Support).

Information on the project research, collaborations, outreach, working group activities, and subgroup discussions, leading up to the technical recommendations, is provided in the series of presentations attached to the CAP Project web page.

The technical recommendations resulting from this project may eventually be used to update the Implementation Plan for the FGDC Wetlands Mapping Standard ([http://www.fws.gov/wetlands/\\_documents/gNSDI/DRAFTImplementationPlanFGDCWetlandsMappingStandard.pdf](http://www.fws.gov/wetlands/_documents/gNSDI/DRAFTImplementationPlanFGDCWetlandsMappingStandard.pdf)), as well as wetland mapping and classification training and outreach materials ([http://www.fws.gov/habitatconservation/nwi/wetlands\\_mapping\\_training/index.html](http://www.fws.gov/habitatconservation/nwi/wetlands_mapping_training/index.html), <http://aswm.org/wetland-science/wetland-mapping>).

## **Next Steps**

***Will this project's activities continue after the performance period? How will knowledge acquired through this project be transferred to user communities beyond the performance period? What formal or informal organizational relationships have been established to sustain activities beyond the performance period?***

Multiple Federal and state agencies, nonprofits, academic institutions, and other wetland mapping entities have a vested interest in sharing the knowledge acquired through this project and continuing the process begun by this project. In particular, ASWM and WMC have already posted some of the project information on their websites. Given their missions, and assuming they continue to have adequate funding, they will likely continue to post information on wetland naming and coding issues. The Wetland Names Work Group (WNWG) of the Wetland Mapping Consortium (WMC) was formed to continue working toward the development and implementation of national methods for wetland names and stable unique identifier codes after the performance period of this project ends. As of 2012, WNWG has more than 40 members representing interested Federal, State, and nonprofit organizations, and universities. Many collaborative relationships have developed during the course of the project. All parties have shown an interest to continue working toward the development and implementation of national methods for wetland names and stable unique identifier codes. These groups include, but are not limited to:

- U.S. Fish and Wildlife Service (USFWS)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- National Oceanic and Atmospheric Administration (NOAA )
- FGDC Wetlands Subcommittee
- National Wetlands Monitoring and Assessment Working Group (NWMAWG)
- Association of State Wetland Managers (ASWM)
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***What is the next phase in this project? What is needed to continue this project?***

The next phase of this project would be to coordinate, design, and implement an Applied Study Phase to test, compare, and refine potential designs for the stable unique identifier code format, methods, and database structure. Such an Applied Study Phase would require coordination and comparison of results from study areas in at least three or four different regions of the U.S. The results and recommendations from the Applied Study Phase would be needed prior to developing a proposal for a new FGDC standard on wetland unique identifier codes. Potential funding opportunities to develop this next phase of the project are being explored by WNWG members. We anticipate that interested parties will implement, study, and further refine the technical recommendations through small projects and applied studies.

***What do you anticipate for future FGDC-endorsed standards training and outreach after the project performance period ends?***

We anticipate that following pilot studies and recommendation of a national methodology, the WMC/WNWG, the FGDC Wetlands Subcommittee, and/or other interested parties might develop a proposal for a new FGDC standard for wetland site names and/or unique identifier codes. Implementation, and development of training materials and outreach for such a new standard, would be dependent on available funding opportunities. Such training materials might be added to existing wetland mapping and classification training materials developed in collaboration between ASWM and USFWS, or they might be provided through other Federal or State agencies, regional wetlands working groups, academic institutions, or other organizations with experience and interest in this issue, such as DU, RTI or CNL World.

**Feedback on Cooperative Agreements Program**

***What are the CAP Program strengths and weaknesses?***

The CAP Program is currently one of the few sources of funding available for supporting much-needed training and outreach in relation to FGDC mapping standards. Without the opportunities for training and outreach created by the CAP program, there would be significantly less awareness, acceptance, and utilization of wetlands mapping standards. The CAP Program plays a vital role in disseminating requisite information to the wetlands mapping standards user community. Especially valuable are the services the CAP Program provides by tracking and maintaining an online history of these training and outreach projects; by providing reference information, documents, and external links on its website; and by actively providing coordination between related CAP projects so new information is relayed quickly to people who can use it. The main weakness might be that the need for training and outreach in the standards user community outstrips the available funding. Additionally, the level of matching funding that must be provided is challenging to achieve given the increasing documentation, auditing, and approval requirements of collaborating organizations. Potential collaborating organizations are often already stretched too thin by requirements to contribute matching funds on their other grant proposals. Needed projects may not be getting fair consideration due to the challenges of achieving and documenting matching funds.

***Where did it make a difference?***

The currently available training on wetlands mapping standards might not be publically available or as easily accessible without previous CAP Program activities.

***Was the assistance you received sufficient or effective?***

The assistance received was both sufficient and effective. CAP Program staff members were helpful and timely in providing information and responding to project needs.

***What would you recommend that the FGDC do differently?***

***Are there factors that are missing or are there additional needs that should be considered?***

Continuation of our project requires an Applied Study Phase that would involve coordination of multiple entities, with mapping study areas in several different states and regions. A CAP grant category to support coordination and participation in the Applied Study Phase by mapping entities, would fill a gap between this project and developing a proposal for a new FGDC standard. Such a category would be very helpful in speeding progress toward development of a proposal for a new standard.

***Are there program management concerns that need to be addressed, such as the time frame?***

No. CAP Program staff members were flexible and helpful in responding to our scheduling needs and extending the project time frame to accommodate conference and outreach schedule changes that were outside of our control. So for this project there were no concerns. (However, the time frame needed to develop applied study projects as described above has been projected to be at least two years given that study designs would need to be developed and coordinated, some ground-truthing may be needed during the summer field seasons, and data and results would likely need to be published externally.)

***If you were to do the project again, what would you do differently?***

The issue of wetland names and coding has been a controversial one since detailed national-scale wetland mapping in the US began more than 30 years ago with the National Wetlands Inventory (NWI). This long-standing controversy is a prime reason national-scale methods have not yet been implemented. During this project we uncovered some previously unidentified issues, constraints, and differing opinions among experts in the wetlands mapping community. A lot of very informative and productive discussions were sparked by this project, and some consensus on how to proceed has been reached. There was not much that could have been done differently given the project timing--these project discussions needed to unfold as they did.