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**Project Title:** Enhancing Wetland Classification for the FGDC Wetland Mapping Standard in Montana

**Final Report**

**Organization:** The University of Montana-Montana Natural Heritage Program, P.O. Box 201800, 1515 East Sixth Avenue, Helena, MT 59620-1800; [mtnhp.org](http://mtnhp.org)

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**Collaborating Organizations:**

- Montana Department of Environmental Quality's (DEQ) Wetland Program, 1520 East Sixth Avenue, Helena, MT 59620, [deq.mt.gov/wqinfo/wetlands/](http://deq.mt.gov/wqinfo/wetlands/)
- Colorado Natural Heritage Program, Colorado State University, 1475 Campus Delivery, Fort Collins, CO 80523, [cnhp.colostate.edu/](http://cnhp.colostate.edu/)
- CNL World, 343 Morehead, Chadron, NE 69337, [cnlworld.org/](http://cnlworld.org/)

**Executive Summary:** This project advanced a key recommendation to enhance the current FGDC-endorsed Wetland Mapping Standard. Specifically, the U.S. Fish and Wildlife Service (USFWS), the maintenance authority for the standard, developed a list of hydrogeomorphic descriptors to describe wetland characteristics not currently addressed under the existing wetland classification standard. These descriptors are added to existing digital wetland data to enhance the information associated with each wetland polygon by describing the landscape position, landform, water flow path, and waterbody type (LLWW). Enhancing wetland data with LLWW descriptors can provide a more comprehensive picture of wetland type and potential wetland function. With input from project partners, the Montana Natural Heritage Program (MTNHP) has developed semi-automated procedures to assign LLWW descriptors to existing digital wetland data. The MTNHP also developed training materials and other technical guidance on the LLWW approach. As a result, creators of digital wetland data in Montana have the tools necessary to add LLWW descriptors to wetland data. Additionally, users of wetland data have the information necessary to understand how these descriptors enhance the information that digital wetland data can provide. This project has been presented at both state and regional natural resource conferences, and a webinar is scheduled through the Wetland Mapping Consortium <http://www.aswm.org/wetland-science/wetlands-one-stop-mapping/3436-past-wetland-mapping-consortium>. All but one task was completed as proposed.

**Project Narrative:**

Since the early 2000s, the USFWS has been enhancing wetland data in its Wetlands Geodatabase, also referred to as the National Wetlands Inventory (NWI), by adding LLWW descriptors that enhance the information in the existing wetland classification standard by providing information on potential wetland function. LLWW descriptors describe the landscape position (relation of a wetland to an adjacent waterbody); landform (the physical shape of the wetland); water flow path (the direction water flows into and out of the wetland); and waterbody type (lake, river, stream, or pond). These enhanced wetland data can then be used to conduct landscape analyses of wetland function, assist in the development of conservation strategies, and increase public awareness of wetland functions. The use of these descriptors has been applied widely to NWI data across the eastern U.S. with the recent introduction of NWI Plus ([http://www.aswm.org/wetlandsonestop/nwiplus\\_nwn.pdf](http://www.aswm.org/wetlandsonestop/nwiplus_nwn.pdf)). Additionally, descriptive materials

such as keys, mapping codes, and a glossary of terms have been developed for use with LLWW descriptors in the east. Although these descriptors are applicable to wetlands in the eastern U.S., they may not fully address situations in the western U.S. without some modification. The MTNHP has been mapping wetlands in Montana and submitting digital wetland data into the USFWS Wetlands Geodatabase since 2007. During that time, we have been adapting the procedures used to create NWI Plus for Montana and have produced some training materials for internal use. Originally, LLWW descriptors were added manually to an individual wetland polygon, which was a time-consuming task, particularly when applied over large geographic areas. This labor-intensive approach prompted the MTNHP to develop a semi-automated procedure to assign these descriptors to wetland data through the creation of geoprocessing tools in a GIS so creators of wetland data can efficiently assign LLWW descriptors to digital wetland mapping.

The project had seven tasks:

*Task 1: Refine geoprocessing tools for semi-automation of LLWW attribution.*

We examined our existing methods of assigning LLWW descriptors and looked for opportunities to improve the efficiency of our geoprocessing methods through the use of other existing digital data sets. These layers included a statewide 10-m Digital Elevation Model (DEM), a slope raster created from the DEM, and the high resolution National Hydrography Dataset (NHD).

*Task 2: Circulate geoprocessing tools and associated methods to our project partners for input.*

Project partners reviewed geoprocessing procedures on multiple occasions and provided helpful insights. We ran these procedures on several test areas and produced map packages, which allowed partners to run the tools on wetland data and to observe actual results.

*Task 3: Develop training materials for both creators and users of wetland data.*

We developed a flow chart of geoprocessing procedures, a fact sheet about LLWW, a dichotomous key for assigning LLWW descriptors, and a glossary of terms used in the LLWW approach. Project partners reviewed these materials and provided input, which was incorporated into the final versions. We are also holding a webinar through the Wetland Mapping Consortium in December 2013 <http://www.aswm.org/wetland-science/wetlands-one-stop-mapping/3436-past-wetland-mapping-consortium>.

*Task 4: Determine the accuracy of the LLWW classification through the use of field-based wetland assessment data collected in Montana.*

We were unable to complete this task using existing field-based wetland assessment data. We had assumed we could use information about hydrogeomorphic (HGM) class gathered during field-based wetland assessments to inform the accuracy assessment. However, this was not feasible for some wetlands. For instance, some wetlands may have more than one HGM class, such as streamside wetlands that are influenced by both overbank flow and groundwater inputs. The assignment of LLWW descriptors to a single wetland polygon necessitates that the descriptors apply to the conditions present for the majority of the wetland polygon. During field assessments, we typically assess only a portion of a mapped wetland polygon, and our field protocol requires that the area assessed incorporate a single HGM class. The difficulty of completing this task was discussed during calls with project partners.

*Task 5: Present the details of the project at state or regional meetings of GIS and natural resource professionals.* The details of the project were presented at the spring meeting of the Montana Association of Geographic Information Professionals (MAGIP) held in Miles City, Montana in May 2013. Participation by federal personnel was limited due to travel restrictions as a result of federal budget sequestration. Attendees were composed largely of local organizations such as county governments. The project was presented a second time at the EPA Region 8 Wetland Capacity Building Workshop held in Salt Lake City, Utah in September 2013. Attendees included State agency personnel from environmental quality departments, transportation departments, and state wildlife agencies from Montana, Wyoming, and Utah; federal agency personnel from the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the Army Corps of Engineers; Tribal representatives; and non-profit organizations and universities.

*Task 6: Submit interim and final reports to FGDC and project partners.* The interim report was submitted November 29, 2012. The final report was submitted November 27, 2013.

*Task 7: Produce an online article or professional paper detailing the project and the results of the accuracy assessment.*

An article is in preparation. Additionally, we will contribute to a publication written by Ralph Tiner, the Regional NWI Coordinator from the U.S. Fish and Wildlife Service.

Geoprocessing tools and training materials created from this project will be posted on the MTNHP website [mtnhp.org](http://mtnhp.org). Additionally, wetland mapping that incorporates LLWW descriptors will be available for download <ftp://ftp.gis.mt.gov/WetlandsFramework/>.

#### **Next Steps:**

*How will this project's activities continue beyond the performance period?*

The MTNHP, along with Montana DEQ, is the theme steward for the wetlands theme in the Montana Spatial Data Infrastructure. Procedures developed through this project will be incorporated into all digital wetland mapping in Montana, as funding permits. As stewards of the Wetlands theme, the MTNHP is responsible for continued maintenance and stewardship of digital wetland data. These data will ultimately be submitted to the USFWS Wetlands Geodatabase.

The training materials produced will be available through the FGDC NSDI website as well as the MTNHP website. Additionally, we anticipate further outreach opportunities as additional partners discover these products.

*How will the knowledge acquired through this project be transferred to user communities beyond the performance period?*

The geoprocessing procedures and training materials created through this project will allow other creators of digital wetland data to enhance these data with LLWW descriptors. The enhanced information provided will allow data users such as natural resource professionals, local and

county planning offices, and watershed councils to more effectively prioritize conservation strategies, improve public understanding of wetland functions, and allow for cumulative assessment of loss and gains in wetland function across a given area.

*Identify the relationships that have been established with other organizations to sustain activities beyond the performance period.*

We worked closely with the Colorado Natural Heritage Program and other creators of wetland data in the Rocky Mountain Region to incorporate these methods into their mapping projects. We have also worked closely with the Montana DEQ to ensure that users of these data have an improved understanding of the data products produced. This project also allowed us to build a relationship with Ralph Tiner, the Regional NWI Coordinator that created the LLWW approach, which will improve the products resulting from this project. Additionally, wetland data that incorporates LLWW descriptors will be linked to the NWI Plus on the Association of Wetland Managers Wetlands One-Stop Mapping website <http://aswm.org/wetland-science/wetlands-one-stop-mapping>.

*Describe the next phase in your project.*

The next phase of the project will 1) seek funding to conduct an accuracy assessment of the LLWW classification assigned to wetland mapping in Montana; 2) develop a tool to assign LLWW descriptors based on geoprocessing procedures created during this project; 3) develop a work plan to incorporate LLWW descriptors into existing wetland mapping; 4) develop a functional correlation matrix to link LLWW descriptors with potential wetland function; and 5) continue education and outreach efforts.

*Identify project needs (more technical assistance, software, other?) How can the FGDC help?*

It would be helpful to obtain another NSDI CAP grant to support some of the actions identified for the next phase of the project, above.

### **Feedback on Cooperative Agreements Program:**

*What are the CAP strengths and weaknesses?*

The CAP staff was very attentive during the project and responded to requests in a timely manner. It also allowed us to receive valuable input from wetland professionals and creators of wetland data in other Rocky Mountain states.

*Where did it make a difference?*

CAP funding allowed us to focus on developing procedures to assign LLWW descriptors; a project that we have attempted to complete for several years but have been unable to due to lack of dedicated funding.

*Was the assistance you received sufficient or effective?*

Yes, the financial assistance we received was sufficient and effective. Additionally, having the input of the Regional Wetland Coordinator from the U. S. Fish and Wildlife Service who created the LLWW approach benefitted the project greatly. It would also have been helpful if someone with technical knowledge of GIS had been assigned to the project.

*What would you recommend the FGDC do differently?*

Nothing.

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

No.

*Are there program management concerns that need to be addressed?*

No.

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

I would have sought input from additional GIS professionals that are familiar with scripting languages to create tools to automate the geoprocessing procedures.