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NATIONAL WETLAND INVENTORY AT RISK

By Marla Stelk, Policy Analyst, ASWM

I am old enough to remember the days before digital geographic information system (GIS) mapping services – the world before TomTom, Garmin, or ESRI's ArcGIS. My father was a big fan of AAA and would always prepare for our summer family vacations by making sure he had all the maps of each state we would be driving through from the local AAA office. Our car was littered with maps for each state we had ever visited or ever hoped to. TripTik maps signified a huge advance in having your whole trip in one handy map booklet – an advantage to slugging around the half dozen other individual state maps. Now you could view your whole trip as a somewhat cohesive whole. And who could forget the good ol' enormous Rand McNally atlas...

- Marla Stelk

Maps have, and continue to be, useful tools for navigation, planning, and spacial awareness. They assist us in understanding our physical world beyond our immediate senses, in planning how we choose to interact with it, and in developing a deeper understanding of how the world as a whole interacts within an interconnected ecosystem. The National Wetlands Inventory (NWI) program, established by the U.S. Fish and Wildlife Service (FWS) in 1974, is one of the oldest and most frequently used government mapping resources. It was established with the mission to create a nationwide inventory of U.S. wetlands to provide biologists and other stakeholders with data and visual displays of the physical distribution of wetlands in an effort to assist in wetland protection and conservation. Throughout its history, the NWI program has diligently worked to support the FWS mission “to protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit for the American people.”

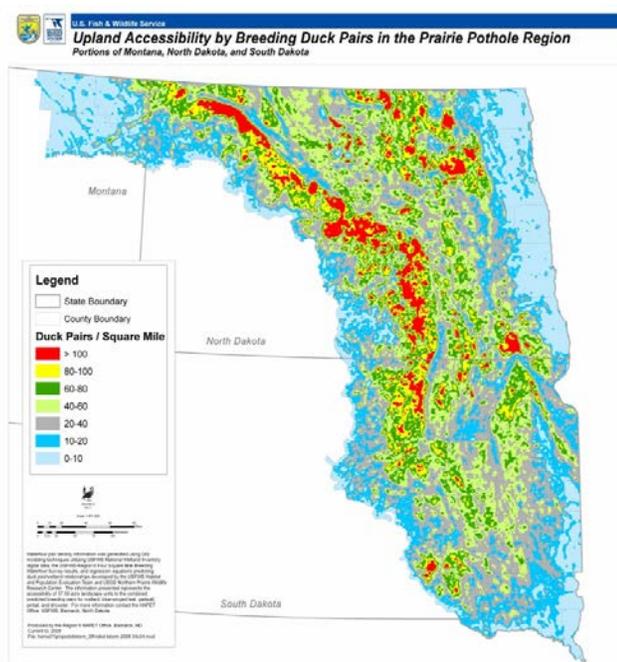
For several years, the maps produced by the NWI were paper maps created through a mylar layering technique made wildly popular by Ian McHarg's book, *Design with Nature*, in 1979. This was a very time and labor intensive process and one which was never fully completed by the NWI before the introduction of modern computerized desktop geospatial technology in the 1980's. One of the most significant contributions of the mapping efforts by NWI was the creation of a classification system for

wetland types (generally referred to as the *Cowardian et al. system*) that is now the official FWS wetland classification system and the Federal standard for wetland classification.



Jeanne Christie photos

Exponential advances in technology and software programming over the last 30 years have resulted in the transition of those layering techniques and data into a virtual platform through GIS software. However, most of the new GIS software programs that we commonly use today have been built up from or built around the ability to utilize the digitized wetland data provided by the NWI as well as other geospatial data providers. NWI was the foundation for the development of popular mapping applications like Habitat Priority Planner, SLAMM (Sea-Level Affecting Marsh Model), and Thunderstorm Maps and users continue to use NWI data within those applications to delineate watersheds, locate habitat, and plan for both development and conservation.



As Bill Wilen, Senior Biologist at the FWS explains, “The EPA-developed SLAMM shows the possible effects of sea-level rise on coastal wetlands and thus on fish, wildlife, communities, infrastructure, and economies. These models are run using NWI wetlands geospatial data that change over time as the ocean levels rise.” Kevin Doherty, Plains & Prairie Joint Venture (PPJV) Science Coordinator, explains the relationship with Thunderstorm Maps: “The NWI provides the foundation for all of the spatially explicit conservation planning for waterfowl and other wetland-dependent migratory birds in the US

Plains & Prairie Region (USPPR). The FWS Four-Square-Mile Breeding Duck Pair Survey sampling design is based on NWI basins, and the resulting statistical models are applied to NWI basins to produce the “Thunderstorm Map” and other habitat conservation targeting tools.”

The NWI program has had to navigate the wave of technological advancement in order to provide the American public, academics, scientists, contractors and government with the most up to date, user friendly maps possible. Although the new world of computerized mapping services has made digital cartography more accurate, cleaner, and more accessible, the time and cost involved in collecting data remains financially prohibitive to many government and nonprofit organizations. Because of the expense involved, those entities, private or public, which are able to make the significant investment in data collection and validation, more often than not, do not readily share their proprietary data.

The NWI data, however, is a public resource which enables states, nonprofits, and academic institutions to develop the tools and programs that are integral for successful wetland conservation. The availability of the NWI data saves a significant amount of time and expense and it allows for a more efficient decision-making process in states with limited and/or declining revenues. For example, according to the Water Quality Certification Program at the Department of Environmental Protection of Kentucky, “NWI layers are the only source of reference for assessments via desktop of wetland impacts for the state of Kentucky...we would have nothing without it...” Or as Michael Mitchell, a GIS Analyst at Ducks Unlimited wrote: “Not having the NWI would cause me to have to recreate a wetlands layer for the region I work in. This would take a large amount of time and funding, which isn’t available. All projects relying on NWI data would be put on hold, or have to use data that, if available, may not be as accurate as what is provided by the NWI.”

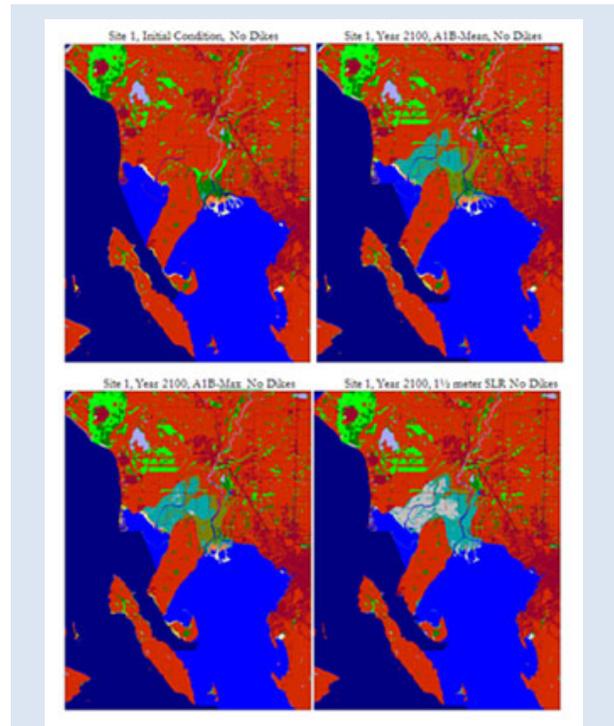


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In addition to providing data, the NWI has provided financial, technological, physical and educational support to numerous tribal, Federal, state, and local government agencies as well as private, academic and nonprofit institutions who are partnering and collaborating on research and planning projects in joint efforts to respond to some of today's most pressing environmental issues such as habitat loss and climate change. "Sea level rise is certainly one of the most pressing issues facing many coastal communities, as well as national wildlife refuges," said Chincoteague Wildlife Refuge Manager Lou Hinds. "SLAMM will be used by many coastal refuge managers to involve the public in discussions concerning sea level rise as part of the Comprehensive Conservation Planning process. This planning process must be undertaken every 15 years and unless something changes dramatically, coastal refuges will be dealing with this issue over the next 100 years."¹

The increasing cost to NWI of providing these services, the massive learning curve entailed in constantly learning and adapting to new technologies, and the rapid increase in demand has been a challenge for NWI but it is one which they have risen to meet, albeit there is still much work to be done. NWI's newest advancement, the Surface Waters Inventory (SWI), exemplifies their commitment to continually improve their product. Once it is up and running, it will provide consistent information about wetlands and water bodies and their connectivity from a hydrological perspective.

NWI explains on their website that the new SWI maps will "assist in resource management, planning, and strategic habitat conservation efforts. Applications include various geospatial analyses, tracing contaminant pathways through aquatic systems, identifying and prioritizing habitat restoration opportunities, examining continuity or dissection of habitat corridors, quantifying aquatic and wetland resource types, and facilitating ecological modeling. Modeling changes at the community level (e.g., species richness, diversity, cover, and biomass) are often linked to the



In order to predict the impacts of climate change induced sea-level rise on Pacific Northwest coastal habitats, the Sea Level Affecting Marshes Model (SLAMM) was utilized to simulate future coastal habitat configurations under various sea-level rise scenarios at several sites in Washington and Oregon, USA. The model was run for 2025, 2050, 2075, and 2100. Historical or "initial condition" habitat classifications are also available for some sites. Several sites were also modeled with existing dikes removed.

hydrologic characteristics of wetlands or the surface water bodies adjacent to wetlands. Current hydrography that attempts to trace surface water flow is often incomplete or misleading because it lacks one or more of the landscape-level components that make up surface water features. The SWI dataset provides more complete geospatial data on surface waters and wetlands than has been available in the past and will provide a more efficient means to make determinations of flow and water movement in surface water basins and channels as well as in wetlands."

¹ <http://www.fws.gov/slamm/>

Ironically, due to budgetary concerns, the future of the NWI program is at risk. The message is that because of anticipated budget reductions NWI will look different going forward. However, the budget proposed by Congress actually reduces the current NWI budget by about the same amount so the future funding for the NWI remains uncertain.

In response to these funding challenges, the Association of State Wetland Managers (ASWM) has embarked on an effort to reach out to private and public organizations which utilize the NWI data in order to: collect stories which highlight various projects which use or have used the NWI mapping service; discern who is using the data and what it is used to do; and to estimate the cost and time savings benefits of using the NWI as well as the potential consequences of not having NWI maps with up-to-date data available.

“Given the scope and scale of investments in wetlands conservation by FWS and its partners, the widespread use and application of the NWI data in the U.S. Prairie Pothole Region and across the country more than justifies continuation of the program.”

Johann Walker, Lead Scientist
Ducks Unlimited Great Plains Office,
Bismark, North Dakota

What we found was not surprising. Respondents unanimously reported back that, if anything, the NWI needed increased funding in order to catch up on the backlog of areas which still do not have any digitized mapping or current data available as well as to update areas of rapid environmental change such as the Louisiana and New Jersey coastlines. ASWM has been overwhelmed with stories of successful collaborations, increased ability to track wetland changes and typology, and advances in strategic planning for habitat restoration as well as development. The tools and staff support provided by the NWI were identified as integral to their various projects’ success and to conserving priority wetlands.

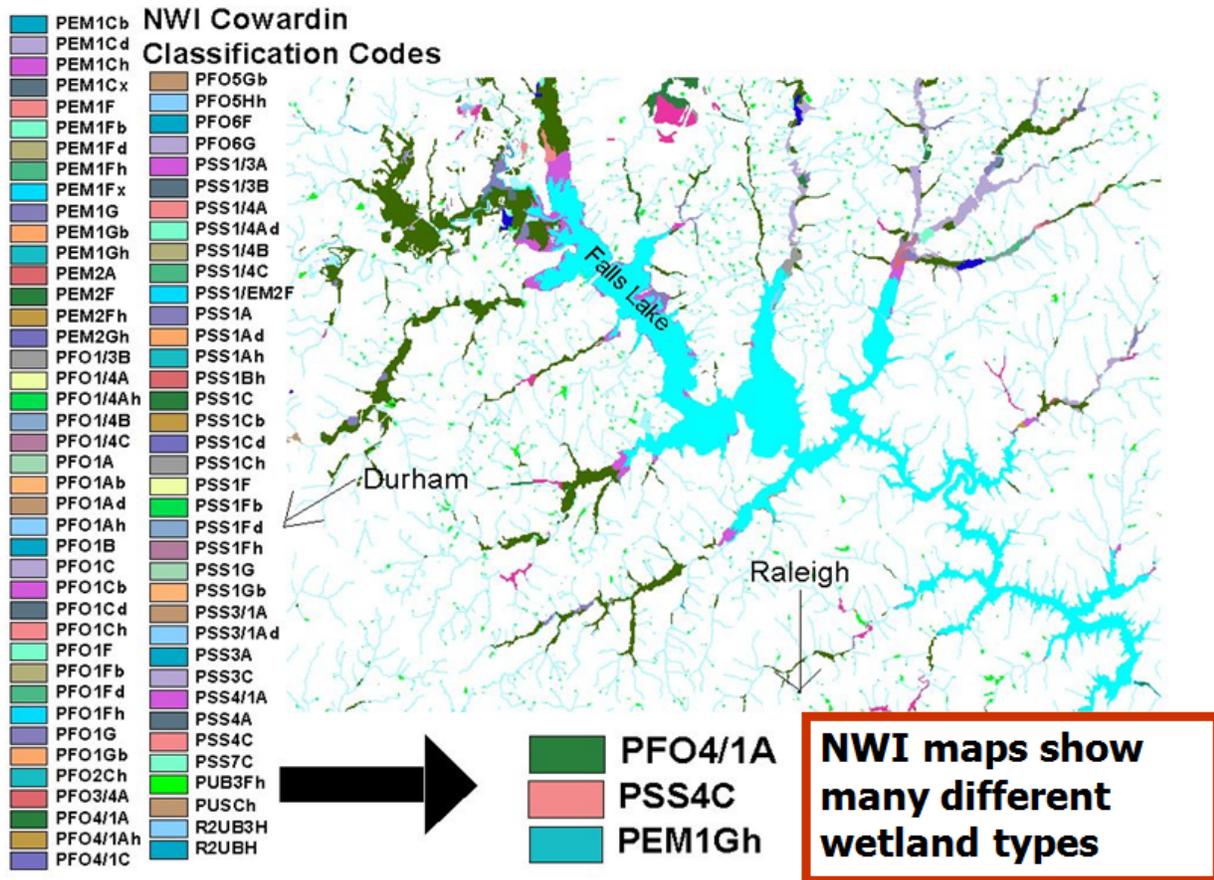
Clearly, the NWI is an integral resource for advancing the FWS mission “to protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit for the American people.” NWI data is critical to developing sound, science-based conservation strategies for waterfowl and other wetland species. Some species which respondents specifically identified as being assisted by the NWI program through habitat identification, restoration and preservation include:

Alaskan Salmon	Gadwall Duck	Plymouth Redbelly Turtle
Alaskan Sea Duck	Hine’s Emerald Dragonfly	Queen Snake
Arid Land Ribbon Snake	James Spinymussel	Rails
Blanchard’s Cricket Frog	King Rail	Roanoke Logperch
Blanding’s Turtle	Least Bittern	Roswell Springsnail
Blue-Winged Teal Duck	Least Shrew	Sonora Tiger Salamander
Bog Turtle	Longtail Salamander	Southwestern Willow Flycatcher
Bogbean Buckmoth	Mallard Duck	Spectacled Eider
California Red-Legged Frog	Massasauga Rattlesnake	Spiny Softshell Turtle
Canadian Geese	Mexican Tetra	Tomah Mayfly
Caspian Tern	Northern Cricket Frog	Tundra Swans
Chiricahua Leopard Frog	Northern Pintail Duck	Wood Duck
Common Tern	Northern Shoveler Duck	Wright’s Marsh Thistle
Devil Crawfish	Pecos Pupfish	Several species of damselfly and dragonfly
Eastern Massasauga	Pecos Sunflower	Several fish, snail and crawfish species
Freshwater Mussels	Pied-Billed Grebe	Several rare plant species

Christina Sloop from the San Francisco Bay Joint Venture wrote: “NWI is often the only wetland maps available for some of the breeding grounds for birds that over winter or migrate through the San Francisco Bay and the Central Valley.” According to Chad Fizzell, Wetlands GIS Specialist (Wetlands, Lakes, and Streams Unit) at the Michigan Department of Environmental Quality, “Losing this resource, and the efforts to keep it up to date, severely limits the State’s ability to track the long term status and trends of its wetlands. This makes it near impossible to track the success of any number of regulatory and non-regulatory efforts to protect wetlands, and clouds the knowledge that we’ve gained observing our wetlands at a landscape scale. There is no doubt that suspension of these efforts will result in a drastic decrease in wetland protection and restoration projects going on in the State.”

Michael Mitchell, a GIS Analyst with Ducks Unlimited wrote: “I use the NWI for multiple projects during the data development stage to calculate base wetland acreage, target conservation priorities, mask out known areas to enhance classification of different habitat types, and refine waterfowl forage calculations. This data is crucial for early development of foraging models and habitat classification.” And Jennifer Boyer, PWS, Wetland Supervisor for Dupage County, Illinois, told us that “If wetland maps cannot be used in the planning process to site projects or make program decisions, more time and money must be spent for on-the-ground reconnaissance to achieve the same level of information. Opportunities to maximize water quality, habitat, and flood control benefits without impacting existing wetland resources may be missed if wetlands are not considered in the early planning stages.”

Example of National Wetland Inventory (NWI) Map



Additionally, the NWI has fostered collaborations in multiple states and among many different partners. The projects they have supported are incredibly diverse. This is due, in part, to the influence of the Clean Water Act, failing infrastructure systems, the Federal government's emphasis on increasing the development of domestic energy sources (including renewables), as well as the impacts of climate change. "The NWI provides the historical background for spatially explicit wetland loss and wetland change assessments. These efforts are increasingly important to inform conservation strategies as the landscape of the U.S. Plains & Prairie Region is altered by row-crop expansion, energy development, and climate change." (Ducks Unlimited Great Plains Office, Bismark, North Dakota)



Jeanne Christie photos

HOW THE NATIONAL WETLANDS INVENTORY IS USED

For Spatial Modeling Efforts

- ↪ to create Thunderstorm maps to manage for migratory waterfowl
- ↪ in SLAMM models to predict changes in tidal marsh area and habitat type in response to sea-level rise
- ↪ as a data layer in NOAA'S SLOSH model to predict storm surge heights
- ↪ in NOAA's C-CAP program to produce a nationally standardized database of land cover and land change information for the coastal regions of the U.S.
- ↪ by the Office of Surface Mining, Reclamation & Enforcement Services for their GeoMine Federal Viewer to address Federal geospatial and hydrologic data needs
- ↪ in Primordial's Ground Guidance® software to plan fast and concealed routes on- and off-road for dismounted and mounted soldiers

For Planning & Decision-Making

- ↪ agricultural planning
- ↪ aviation & military installation assessments
- ↪ biological monitoring
- ↪ efficient permit processes
- ↪ emergency management planning
- ↪ endangered species recovery efforts
- ↪ energy development project planning
- ↪ enforcement & compliance efforts
- ↪ habitat conservation, identification & delineation
- ↪ hurricane planning & recovery efforts
- ↪ informed real estate decisions
- ↪ invasive species control programs
- ↪ land acquisition decisions
- ↪ land use planning
- ↪ legal defense cases
- ↪ license reviews
- ↪ prioritization of conservation & restoration projects
- ↪ research & education
- ↪ stormwater management & flood control planning
- ↪ to evaluate wetland permits
- ↪ to identify ecosystem services
- ↪ to write applications for wetland permits
- ↪ transportation planning
- ↪ water quality planning & compliance
- ↪ watershed planning
- ↪ wetland restoration & mitigation efforts

These situations require a multidisciplinary and multi-stakeholder approach. The increase in severe weather events (such as Hurricanes Katrina and Rita, the tornados in Oklahoma, and the increase in droughts and wildfires) has devastated communities physically, emotionally and financially. Fortunately, the ability of healthy wetlands to mitigate some of

these impacts (to buffer the impacts of storm surges, to filter stormwater contaminants, and to sequester carbon) has gotten the attention of a critical mass of leaders in government, business and the public. The benefits of maintaining and restoring priority wetlands have now been recognized by others as integral to issues such as national security, economic sustainability, and public health.

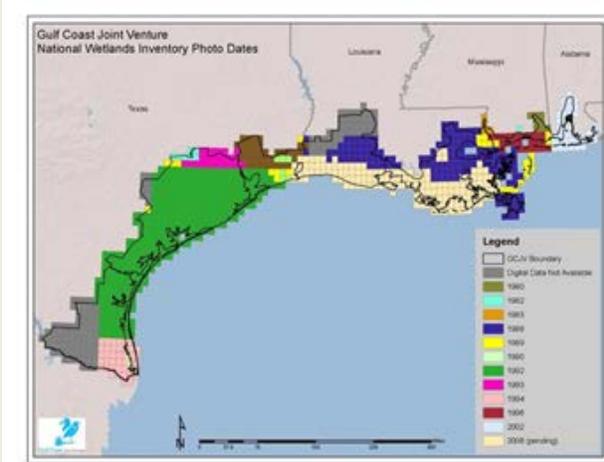


Figure 2. Collection dates for NWI data in the Gulf Coast Joint Venture region.

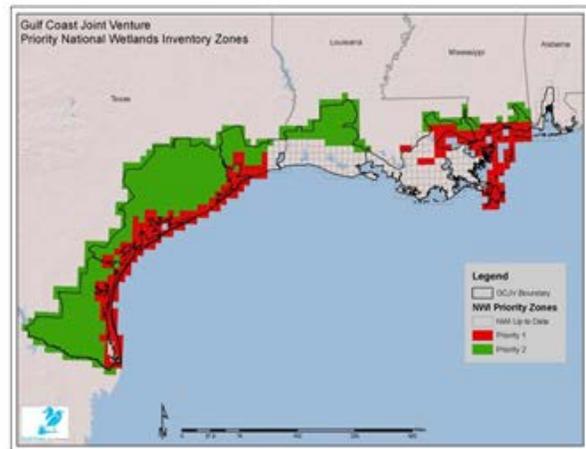


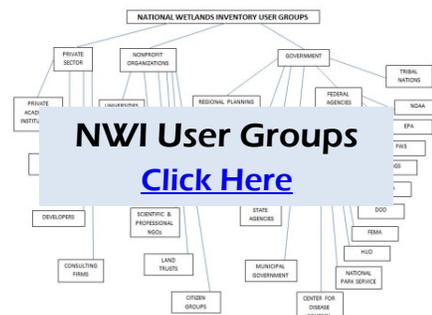
Figure 3. Geographic priorities (Level 1 and 2) for NWI remapping in the Gulf Coast Joint Venture region.

The diverse list of NWI partners include: the U.S. Geological Service; the U.S. Army Corps of Engineers; the U.S. Department of Defense; U.S. Center for Disease Control; U.S. Department of Agriculture’s Centers for Epidemiology and Animal Health; the U.S. Bureau of Land Management; the U.S. Environmental Protection Agency; the National Oceanic and Atmospheric Administration (NOAA); HUD’s Office of Environment; the Tennessee Valley Authority; national parks; the national wildlife refuge

system; private development firms and environmental consultants; joint ventures (comprised of federal agencies, state fish and wildlife agencies, non-governmental organizations, tribes, universities, policymakers, corporations, foundations, and private landowners); municipal, regional and state planning agencies; the National Wildlife Federation; the Nature Conservancy; Ducks Unlimited; Landscape Conservation Cooperatives; land trusts; tribes; universities and schools; statewide energy and natural resource agencies; statewide natural heritage programs; state departments of transportation; and many utility and energy companies.



Jeanne Christie photo



If you would like to help ASWM document the many uses of NWI, please provide a summary addressing the following topics and forward that information to Jeanne Christie at <mailto:jeanne.christie@aswm.org>. We will collect and share your stories.

In addition to supporting future NWI funding, describing the various uses of wetland maps will help practitioners around the country continue to improve program delivery since good wetland maps can lead to substantial time and cost savings in program management.

Please provide:

1. Project Name
2. Project Description
3. Who is Using the Data
4. What it is Used to Do
5. Consequences of not having wetland maps (NWI) as well as not having up to date wetland maps if applicable.
6. Cost and time savings if applicable
7. For more information (contact/website)

Individuals interested in discovering more about the National Wetlands Inventory and related GIS tools can visit [wetland one-stop mapping](#).

Thank you very much!

- See more at:
<http://aswm.org/wordpress/the-compleat-wetlander-wetland-maps-are-important/#sthash.ZVtVDyKT.dpuf>

We've come a long way from the days of my youth and the summer vacations spent trying to refold those unwieldy paper maps (they never fold back the way they unfolded!) and deciphering where one map ended and the other map begun. But technology and convenience has come with a hefty price tag – and one which many people, governments, and organizations cannot afford. The issues we are facing from climate change, population growth and habitat loss require partnerships, collaboration, and open source data in order to conserve our nation's wetlands and wildlife, whose boundaries do not usually fall neatly into local, regional or state boundaries. The NWI offers Americans the opportunity to work together, share resources and knowledge, to literally see the bigger picture and to steer our country into a sustainable future. The Association of State Wetland Managers strongly supports the continuation of the National Wetlands Inventory (and enhanced funding for its programs) and encourages anyone who feels similarly to let the U.S. Fish and Wildlife Service and Congress know how valuable a resource the National Wetlands Inventory is.



Jeanne Christie photo

Delegation from the Shandong Province, China visits the U.S. Fish and Wildlife Service's National Wetlands Inventory July 9, 2013

On the international level, other countries are interested in learning about the National Wetlands Inventory as a prototype for future wetland mapping work abroad. On July 9 a delegation from Shandong Province, China visited with U.S. Fish and Wildlife Service's National Wetlands Inventory headquarters for a technical discussion about NWI, status and trends reporting, and the standards and data collection procedures and tools available to anyone in the world over the internet from <http://www.fws.gov/wetlands/>.

In recent years China has embarked on several large and ambitious projects to restore wetlands [such as one currently underway in Heilongjiang province](#) in response to studies showing that an increase in droughts, floods and sandstorms were linked to wetland loss. The Shandong Province where the delegation originated from is located on the eastern edge of the North China Plain and in the lower reaches of the Yellow River and extends out to sea in the form of the Shandong Peninsula. Shandong is one of the most populous and



Bill Wilen, FWS, NWI and Yuchen Gao, Director General, Qingdao Municipal forestry Bureau

“In recent years China has embarked on several large and ambitious projects to restore wetlands such as one currently underway in Heilongjiang province in response to studies showing that an increase in droughts, floods and sandstorms were linked to wetland loss.”

most affluent provinces in the People's Republic of China. It ranks first among the provinces in the production of a variety of products, including cotton, wheat, sorghum, and maize as well as precious metals such as gold and diamonds. Their Victory Oil Field is one of the major oil fields in China. [The province has also spent \\$204.6 million to protect wetlands in recent years.](#) The meeting was one of the many international meetings arranged through organizations such as Triway International Group to bring together individuals with the knowledge and expertise in an area of interest.



Shandong Province, China visitors at FWS, July 9, 2013