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Lessons Learned Conducting the National Wetlands Inventory of the United States

The story started back in the early 1970s. I was working on my PhD in Forest hydrology at the University of Massachusetts. A professor in Wildlife Management was awarded a contract to compare the wetland classification system used to conduct the first wetland inventory with the landuse and landcover classification system developed by Dr. James Anderson, of the U.S Geological Survey. The question was which of these classifications systems should be used for the new National Wetlands Inventory of the United States. I conducted the comparison.

The first wetlands inventory was based on a classification developed by Martin et al. (1953), which included 20 classes of wetlands. It was clear that the Martin et al. classification was inconsistently applied across the United States. The primary reason was a lack of detailed of the definitions. Wetlands were only two of the landuse and landcover categories in Dr. Anderson's classification system. The Martin et al. classification system focused on waterfowl wetlands. When the National Wetlands Inventory was being planned, there was a surge of public and professional interest in wetlands that went well beyond the habitat functions of wetlands for migratory birds.

The first national meeting on the new National Wetlands Inventory of the United States was held at the University of Maryland in July of 1975. In hindsight, that meeting was a major event. I expect this meeting will be looked upon as a major event in the National Wetlands Inventory of Mexico and a life changing event for some of you in this audience.

In the fall of 1976, I joined the Fish and Wildlife Service's National Wetlands Inventory. It might seem an odd choice for a forester. Not really, foresters like to make maps and measure things. They do that to gather the information they need to make management decisions. You must ask yourself what question do I need to answer and what am I going to do with the information.

The last 35 years have not all been spent making maps and collecting information on the status and trends of wetlands. A huge amount of my time has been spent developing and refining our wetlands classification system, mapping standards and data collection procedures. I would estimate I have spent 10 years on these tasks spread over the last 35.

We spent the first four years refining our classification system and mostly developing what we called at the time our mapping conventions. You have no idea if your classification system will work until you test it by mapping wetlands in the various physiographic regions across your country. You need mapping conventions which we now call data collection procedures. Our Wetlands and Deepwater Habitats Classification System and mapping standard are both National Standards.

This is tedious and mostly thankless work. People who don't do this kind of work cannot appreciate the effort that goes into the process. It requires discipline and focus in my case, stubbornness and mindless endurance.

I don't know which wetlands classification system you will decide to use or if you will decide to develop your own.

The classification system you chose needs to be hierarchical. The first split needs to be between wetlands and uplands or between wetlands, riparian habitats and uplands. As you move down the hierarchy, you add detail. This allows you to answer questions from the national to local level.

How many wetlands are there in Mexico?

How many Estuarine (coastal) wetlands or how many Palustrine (inland) wetlands are there in a given region?

How many Palustrine, Emergent, Seasonally flooded wetlands exist on this property.

Do not include your current value bias in your classification system because as your understanding of the functions and values of wetlands increases, your appreciation for their values will change. You want a classification system that includes the data you need to make value judgments today and different value judgments as your understanding changes.

Select a classification system that maps the biological limit of wetlands.

If, as a Nation, you decide to regulate wetlands, don't restrict your wetland classification system to the subset of wetlands that you are willing to regulate today. The subset that was regulated increased over the first two decades of my career. More recently it has been restricted as the result of court actions. This doesn't mean that regulators don't consider the wetlands we map. Our wetland data is streamed real time into the U.S. Army Corps of Engineer's on-line permit application and tracking system. They regulate a subset.

I urge you to take a hard look at our wetlands classification system, mapping standards and data collection procedures. All these and many more documents are available from National Wetlands Inventory web site. Several links are included in the appendix.

What would I do if I could roll the clock back 35 years?

I would have produced a wall sized map of the wetlands of the United States. You need this map so the policy makers have the information they need to make sound long term policy decisions.

In 1990 a Congressman from Louisiana argued that his state needed 70 percent of the funds generated from excise taxes on fishing equipment and on motorboat and small engine fuels because his state had 70 % of the wetlands. In reality his state had less than 30 % of the wetlands. Louisiana was allocated 70 % of the money. The next year, we produced a wall sized map of the wetlands of the United States and had it delivered to the door of every Senator and Congressmen. We assumed that when the legislation was reauthorized the appropriation would be adjusted. We were WRONG.

After four reports to Congress on the status and trends of wetlands and 40,000 thousand detailed maps later, the most recent reauthorization extends the allocations until 2019.

Louisiana still receives 70% of the funds.
The remaining coastal States receive 15%.
The inland states receive 15 %.

The second task would have been to establish the wetland base and monitor changes over time using statistical analyses. We tried to conduct our national wetlands inventory by producing maps. That was a mistake.

The users demanded more and more detailed maps.
We started at a scale of 1:250,000 or 1 cm = 2.5 Kilometers, totaling just over 400 maps.
They pushed us to a scale of 1:100,000 or 1 cm = 1 Kilometer, totaling over 1,700 maps.
They pushed us to a scale of 1:24,000 or 1 cm = 200 meters, totaling approximately 55,000 maps.
Now we are down to 1:12,000 or less or 1cm = 50 meters, totaling approximately 220,000 maps. They are all electronic now.

We were in serious trouble. Upper level management was running out of patience. We had what we called a mid-course correction. We decided to establish the inventory of wetlands by using statistical analysis.

In 1983, we produced the first report to Congress on the Status and Trends of the Wetlands and Deepwater Habitats of the Conterminous U. S. We had aerial images from the 1950's and 1970's. We established that between the mid-1950s and by the mid-1970's we were losing an average of 458,000 thousand acres (185,000 hectares) each year. This was an average annual net loss of an area one-half the size of the state of Rhode Island every year for 20 years.

We followed up on our initial report to the United States Congress with reports covering the period between the:

Mid-1970s to mid-1980s, loss of 296,000 acres (120,000 hectares)

Mid-1980s to mid-1990s, loss of 58,500 acres (24,000 hectares)

Mid-1990's to 2004, gain of 32,000 acres (13,000 hectares)

But when we focused on the subset of coastal watersheds of the Eastern and Gulf Coast of the United States, we discovered we still had an average annual net loss of 59,000 acres (24,000 hectares) of wetlands.

Our next Wetlands Status and Trends Report to the U. S. Congress is due by the first of the year. It will cover the period from 2004 to 2009. This is 50 years of monitoring the status and trends of our Nation's wetlands.

We have a poster on our status and trends work. Our data collection procedures and reports are posted on our web site. We used a stratified, weighted, random sample: stratified by physiographic regions, weighted by expected wetland density and random within strata.

Why did wetland losses drop?

We documented that wetlands cover only 5.5 % and deepwater habitats only cover 1% of the surface of the conterminous United States. Wetlands are quite rare and they were being lost. We monitored changes in their status over the decades.

Most importantly, we helped educate the public about the values of wetlands. Our National Wetlands Inventory Program is an important source of information for educators. All these publications are available on-line from our electronic library through our web site.

The regulation of wetlands by the Clean Water Act of 1972 was a very important action. The Swampbuster Provision in the 1985 Farm Bill was also very important. You can't participate in agricultural programs if you drain wetlands.

I truly believe that the Swampbuster provision would not have been written if we had not documented it in our 1983 Status and Trends Report to Congress, that 87% of the wetland losses between the mid-1950's and the mid- 1970's was due to agricultural drainage.

The Department of Agriculture now has incentive programs like the Wetlands Reserve Program to re-establish and protect wetlands. Agricultural programs are now re-establishing and protect wetlands.

Detail wetland maps

Wetland maps change wetlands from a concept to a reality. People do not recognize areas as wetlands when they are only temporarily flooded. Detailed wetland maps are needed for local, watershed, and regional planning. The mapping should be directed by an identified need for flood control, streamflow maintenance, water quality maintenance, sediment retention, shoreline stabilization, fish and wildlife management, conservation of

other wetland functions, or wetland restoration needed to restore lost functions and values.

We have developed a coding system called NWI Plus to compliment the national wetlands classification system. NWI Plus adds modifiers to the existing codes to bridge the gap between the habitat classification and the functional assessment by providing descriptors for landscape position, landform, water flow path and waterbody type (LLWW). These are important for producing enhanced characterizations of wetlands and deepwater habitats. These data are valuable for estimating potential wetland functions.

Riparian Classification System

We developed a riparian classification system for the portion of our country where evaporation exceeds precipitation. This covers all the non-forested areas of Mexico. Riparian habitats are closely associated with water and topographic relief, but they are distinct from either wetland or upland. Riparian habitats lack the amount or duration of water usually present in wetlands, yet their connection to subsurface water distinguishes them from adjacent uplands.

Riparian habitats are important and people demanded we map them as wetlands. Since they were not wetlands, that required us to develop a classification system so we could map the Riparian habitats. In areas where the Riparian data has been mapped, our new on-line mapper allows you to view the wetlands and riparian habitats together or only the wetlands or only the riparian habitats.

In Conclusion

The first product should be a wall sized map or an electronic map of the wetlands of Mexico easily viewable over the Internet to ensure that the map is available for sound national policy decisions.

You do not need to produce maps to establish an inventory of Mexico's wetlands and monitor changes over time. This can be done through statistical sampling.

Detailed wetland maps that are needed for planning are expensive to produce. The mapping should be directed by an identified need for conservation of wetland functions and values that benefit people, fish and wildlife management or restoration needs to restore lost functions and values.

Once you have selected and tested your classification system, all three of these activities should be started, one after the other, nearly simultaneously.

It does not matter how much work you do or how good it is. It is meaningless until it is delivered to all decision makers. This includes all levels of government and the private sector down to the individual land owner.

My final point, all the inventory and mapping work needs to be done by Mexicans in Mexico. You need to understand the strengths and limitations of your inventory and your maps. You need to control your destiny.

Appendix

National Wetlands Inventory

URL: <http://www.fws.gov/wetlands/>

Geospatial Wetlands Data

URL: <http://www.fws.gov/wetlands/>

Download Digital Data by state

URL: <http://www.fws.gov/wetlands/Data/DataDownload.html>

Web Map Service (WMS)

URL: <http://www.fws.gov/wetlands/Data/WebMapServices.html>

View Wetlands using Google Earth

URL: <http://www.fws.gov/wetlands/Data/GoogleEarth.html>

View Wetlands Data and build a custom map

URL: <http://www.fws.gov/wetlands/Data/Mapper.html>

Layers and Metadata

URL: <http://www.fws.gov/wetlands/Data/metadata.html>

Wetlands Codes

URL: <http://www.fws.gov/wetlands/Data/wetlandcodes.html>

Hard-copy maps

URL: <http://www.fws.gov/wetlands/Data/hardcopymaps.html>

Helping the FWS build the NSDI Wetlands Layer

URL: <http://www.fws.gov/wetlands/WetlandsLayer/>

Fact Sheet

URL: <http://www.fws.gov/wetlands/documents/gNSDI/NSDIFS.pdf>

Classification of Wetlands and Deepwater Habitats

<http://www.fws.gov/wetlands/documents/gNSDI/ClassificationWetlandsDeepwaterHabitatsUS.pdf>

FGDC Wetlands Mapping Standard

<http://www.fws.gov/wetlands/documents/gNSDI/FGDCWetlandsMappingStandard.pdf>

Data Collection Requirements and Procedures

http://www.fws.gov/wetlands/_documents/gNSDI/DataCollectionRequirementsProcedures.pdf

Attribution and Verification tool

URL: <http://www.fws.gov/wetlands/Data/Tools.html>

Contributed Data

URL: <http://www.fws.gov/wetlands/WetlandsLayer/ContributedData.html>

Status of Wetlands layer

URL: <http://www.fws.gov/wetlands/WetlandsLayer/StatusInformation.html>

OMB Circular A-16

URL: http://www.whitehouse.gov/omb/rewrite/circulars/a016/a016_rev.html

Wetlands Status and Trends Procedures and Reports

URL: <http://www.fws.gov/wetlands/StatusAndTrends/index.html>

Riparian Classification System

http://www.fws.gov/wetlands/_documents/gOther/SystemMappingRiparianAreasWesternUS2009.pdf

National Wetlands Inventory Electronic Library

http://www.fws.gov/wetlands/_documents/search.asp?TOPIC=-1&DOC_CATEGORY=-1&STATUS=0

National wetlands Inventory Plus search for (LLWW)

[http://www.fws.gov/wetlands/_documents/gOther/WhatIsLLWWTinerFS.pdf#search="LLWW"](http://www.fws.gov/wetlands/_documents/gOther/WhatIsLLWWTinerFS.pdf#search=)