



## **The Oral History of Ralph Tiner**

February 15, 2019

Interview conducted by Bill Wilen

Phone Interview

## Oral History Cover Sheet

**Name:** Ralph Tiner

**Date of Interview:** February 15, 2019

**Location of Interview:** Over the Phone

**Interviewer:** Bill Wilen

**Approximate years worked for Fish and Wildlife Service:** 38 years

**Offices and Field Stations Worked, Positions Held:** Northeast Region Wetland Coordinator for NWI, Newton Corner and Hadley, Massachusetts.

**Most Important Projects:** Mapped a large portion of United States wetlands and created LLWW descriptors (Landscape Position, Landform, Water Flow Path, and Water Body Type) to be used to enhance NWI databases. Served as a representative on the Federal Interagency Committee for Wetland Delineation that prepared the first manual required for identifying wetlands at the federal level for regulatory purposes. Wrote numerous published articles/reports about wetlands including the significance of geographically isolated wetlands.

**Colleagues and Mentors:** Herb Bergquist, Mark Biddle, David Burke, Gabe DeAlessio, David Foulis, Robert Gilmore, Warren Hagenbuck, David Harden, Amy Jacobs, Bill Jenkins, Geoff Knapp, Curt Laffin, Dr. Michael Lefor, Laurie Machung, Shamus Malone, Ingrid Mans, Kevin McGuckin, Ken Metzler, John Montanari, Todd Nuerminger, John Organ, Blake Parker, Ralph Pisapia, Dr. Stubby Rankin, Porter Reed, Pat Riexinger, Dave Riley, Christie Foote-Smith, Glenn Smith, Matt Starr, Janice Stone, Dave Stout, John Swords, Dr. Peter Veneman, Bill Wilen, Don Woodard, Irene Huber, and Bill Zinni.

**Brief Summary of Interview:** Ralph enjoyed being outdoors in his childhood and pursued an academic study of biology. He went to University of Connecticut and received a degree in zoology and a master's degree in marine biology. He then began working for South Carolina Marine Resources, and also spent the rest of his career working for the U.S. Fish and Wildlife Service (USFWS) under the National Wetlands Inventory Program as the Regional Wetland Coordinator in the Northeast Region. He was responsible for mapping wetlands in 13 Northeastern states from Maine through Virginia. He created LLWW descriptors to be used in NWI databases to help predict functions of wetlands across the United States. He served as a USFWS representative on the Federal Interagency Committee for Wetland Delineation and initiated studies and wrote reports to raise awareness for wetland losses and their functions.

## INTERVIEW

**Bill Wilen:** “Today is Friday, February 15, 2019. This is Bill Wilen, I’m recording Ralph Tiner’s oral history. Okay.”

**Ralph Tiner:** “Alright, my name is Ralph Tiner, and I was Regional Wetland Coordinator for the Northeast Region from 1977 to 2015. I was born in Stuttgart, Germany on October 25, 1948. I was a so-called “war baby” and arrived in the U.S. just a few weeks after my birth, so I didn’t really spend much time in Germany. I spent most of my childhood in Somerville, New Jersey, and graduated from the local high school in 1966. During those years I was involved in the Boy Scouts, I played sports, and before high school I had a large paper route. In my neighborhood we played touch football and tackle football in the fall and spent hours playing baseball in the fields at a nearby elementary school. I also did a little hunting and fishing; I enjoyed being outdoors in nature more than the hunt as I didn’t continue hunting and fishing later in my life. In 7<sup>th</sup> or 8<sup>th</sup> grade I had a biology class that I enjoyed very much and at that point I decided that I wanted to be a biologist. In fact, in my acceptance speech to the National Honors Society in high school, I mentioned my interest in pursuing a career in biology. I attended the University of Connecticut on a football scholarship, and I graduated with a bachelor’s in zoology in 1970 and a master’s degree in marine biology in 1974. Upon acceptance to graduate school, I interviewed for a research assistant position that involved working on a field crew that would be mapping tidal wetlands in Connecticut. The State had just passed Tidal Wetland Protection Act that would regulate construction in salt and brackish marshes. A moratorium was placed on such development until the State completed the mapping of specific locations of those wetlands. These tidal wetlands were defined by a presence of a number of characteristic halophytic or salt-tolerant plants. As part of one team from UConn, I would be working with a plant taxonomist who would identify the plants. We would be identifying the limits of these wetlands based on the occurrence of salt and brackish marsh plants and then would be marking the boundaries with wooden stakes or blazes on trees. Okay – having a little technical difficulty here -.”

**Bill Wilen:** “Start it.”

**Ralph Tiner:** “I’ll probably be repeating myself here, but we would be identifying the limits of these wetlands based on the occurrence of salt and brackish marsh plants and then marking the boundaries with wooden stakes or blazes on trees. My role was basically carrying the wooden stakes and driving the stakes into the ground as we marked the wetland boundary. I think we completed the mapping of the State’s 15,000 acres of wetlands in 2 years and then we moved upstream to map freshwater tidal wetlands. So, I spent four years of graduate school time mapping wetlands besides attending classes and working on my thesis. Dr. Stubby Rankin hired me to do this work and was my major advisor for graduate studies. During my graduate studies – my thesis, I spent many hours on my hands and knees in a salt marsh counting snails and other invertebrates in sample quadrants for the thesis on the distribution of salt marsh macroinvertebrates. While working on the tidal wetlands survey I worked directly with Dr.

Michael Lefor, plant taxonomist, and learned a lot of plants during that time. My education also included a master's degree later in public administration from Harvard University's Kennedy School of Government, and then I did some work on a PhD at the University of Massachusetts while employed by the U.S. Fish and Wildlife Service. I didn't complete that degree due to a disagreement with one of my advisors over a dissertation topic and ultimately, I felt that it just wasn't worth the effort and aggravation from that standpoint, given that time in my career, and so I decided to focus my attention on scientific writing, and over the years I've written several books on wetlands. That's a little bit of my background, on how I got started in wetlands. My first job – full time job in wetlands was after graduate school, when I was hired by the state of South Carolina Marine Resources to review and comment on Federal permits, and environmental impact statements that involved wetlands and also to oversee the state's mapping of tidal wetlands. I think my experience with Connecticut's wetlands and tidal wetland mapping helped me land the job with South Carolina. In contrast to Connecticut, however, South Carolina had roughly a half a million acres of tidal marshes, so remote sensing techniques were required for mapping these wetlands. The actual photo interpretation was done by two staff members, Rob Dunlap and John Deveaux, and then we all went out in the field at various times to check the work. Recognizing that a wetland inventory is incomplete without a reporting on the findings, I wrote a report summarizing these – this work that reported on the actual acreage of various types of wetlands in each of the coastal counties in South Carolina. This was my first – well, actually it was the first of many technical reports on wetlands. During my time with South Carolina Marine Resources, I also attended the U.S. Fish and Wildlife Service's national workshop on wetland classification, where the Service was proposing a wetland classification system to be used for conducting an actual inventory of U.S. wetlands. I was excited about the prospects of this National Inventory but never thought that one day I'd be working on that project. On the permitting and environmental reviews, I worked closely with the personnel from the Charleston Ecological Services Office of the U.S. Fish and Wildlife Service, in particular, Curt Laffin, who was the supervisor of that office. We did joint reviews on most projects and for the most part submitted similar letters objecting to proposals to build in tidal wetlands along the South Carolina coast. Curt later transferred to the Regional Office of the U.S. Fish and Wildlife Service's Northeast Region, where he worked in the Ecological Services Branch. In the mid-1970s the U.S. Fish and Wildlife Service initiated its National Wetland Inventory and advertised positions for Regional Wetland Coordinators to oversee the inventory in various regions across the country. Given my background in wetlands and wetland mapping in particular, I applied for the position at the Southeast and Northeast Regions. The Southeast Region was filled by John Hefner, a field biologist from the Raleigh office who had experience mapping tidal wetlands in New Jersey and was already part of the Service, but I was hired as the NWI Coordinator for the Northeast region. I think my past working relationship with Curt Laffin had a lot to do with getting the job – thanks Curt, you've really helped me get started in that career. From April 1977 to my retirement in May 2015, I served as Regional Coordinator for Region 5. It was quite a challenge, setting up a regional program that involved coordinating activities with Fish and

Wildlife Service's offices and Federal and State agencies, and managing this mapping program across the 13 Northeastern states from Maine through Virginia. For example, about a month into the job I was invited by the New York State Department of Environmental Conservation to talk about the National Wetlands Inventory. At that time the State was actively mapping their wetlands, after hearing my presentation, they proceeded to state their concerns about duplication effort and waste of dollars. I assured them that New York State was not a priority given their ongoing inventory, and that we would only work there after inventorying the other 12 states. And as it turned out, New York was the last state completed by the NWI in the Northeast by the time that – by that time NWI had required cost-sharing from states and other partners to do NWI work so. In fact, New York actually supported the completion of the NWI in their state by providing funding. There were also other start-up challenges, such as what type of map product was the NWI going to produce. Initially the NWI, under leadership of John Montanari, an expert in mapping wetlands with remote sensing techniques, was focused on mapping the entire country within a few years...I can't recall how many. So, the target scale of the mapping was 1:250,000, and then it got down to 1:100,000 and these were all based on the available base maps largely. However, in selling the program to the Fish and Wildlife Service, the NWI was supposed to be producing data that could be used to help our Ecological Services field biologists make on-the-ground decisions about the impacts of the proposed projects seeking Federal permits through the Rivers and Harbors Act and the Federal Clean Water Act. And just a little note, in the 1970s. The 1970s were particularly challenging at times that significantly improved the Federal Government's ability to regulate activities that would or could impact wetlands. At the program level NWI had significant debate over the scale of the mapping. NWI management wanted less detail and quicker turn around, while the coordinators representing the regional perspective wanted more detailed information that could be used by ES field offices in their routine work with the Corps. Another note, at that time there were no formal procedures for identifying wetlands in the U.S. The Corps and Fish and Wildlife Service often disagreed on whether an area was wetland or not, where the boundary was ... an issue later resolved with the help from the NWI program. In terms of producing the products the differences were so wide that the NWI team leader, Montanari actually wanted to fire all the regional coordinators at one time but couldn't do so since we were regional employees and not under his direct supervision. But after the dust settled, the program decided that the target mapping unit should be whatever the scale of the U.S. Geological Survey topographic map for the most part that was 1:24,000 scale. With that issue decided, the next issue we faced was the product itself, initially the NWI produced overlays that could be used in conjunction with USGS topo maps in the field and used those same overlays to produce large scale cartographically produced maps at 1:100,000, in order to so that photographically the labels on the NWI overlays were huge. We called them "kindergarten-sized" letters. They were huge. The overlays were simply too busy and for areas with plenty of wetlands, extremely difficult to read. So, the size of the lettering was then reduced to a more readable scale and the overlay could then be registered on top of the USGS quadrant, on top of a USGS topo map for use in the field. Due to a back log in map productions, since we were

cranking out maps at an extremely high rate, or attempting to do so, and we were using cartographic procedures such as the use of a zoom transfer scope to transfer data from pen and ink photo overlays to a 1:24,000 overlay, and then relabeling to produce them and so on, we had a backlog and weren't able to get a lot of information – draft maps - out to our partners and our field offices for review. So, I had B.L. Makepeace in Boston make photo-enlargements of interpreted photo-overlays that we could then attach to – that would essentially serve as a draft map that we could put on top of an aerial image. Well, let me clarify that. Let me go back and restate that. Due to a backlog in map production from the use of cartographic procedures for making paper maps (we used zoom transfer scopes to transfer data from pen and ink photo overlays to a 1:24,000 overlay and the relabeling necessary to do so), we had this delay in producing draft products for review. So, I decided that we needed to get this draft information out before we even do these cartographic procedures, okay, so I had B.L. Makepeace make enlarged photocopies of the interpreted overlays that were already attached to an aerial photograph...this would then produce a “draft map” that we could use out in the field. So, the “map” then was just a blow-up of an interpreted image ... our photo overlays on top of the photo. These draft maps really facilitated review of draft data in the field and gave users like our field offices and other natural resources, and regulatory agencies some preliminary data that could be used to review proposed projects seeking Federal permits. Shortly thereafter, NWI decided that producing paper NWI maps, rather than the overlays – producing those paper maps by attaching the cartographically produced wetland overlay to the corresponding USGS topographic map, and then photographing the composite to make a template for a hard-copy NWI maps – was the way to go. These maps were more easily used in the field than working with an acetate overlay and a topographic map. The NWI program was instrumental in advancing computer mapping technology, and eventually the hard-copy maps were replaced by an online mapping tool. So, the early days of NWI were focused on the maps and getting intra- and inter-agency review of draft work and coordinating mapping activities with other government agencies. Now, since the program decided to focus on more detailed mapping rather than the small scale maps, 1:250,000 or 1:100,000, we realized that we wouldn't be able to produce any statistics, that is, estimates of the area and distribution of U.S. wetlands which was also an interest to Fish and Wildlife management and other government agencies. So, at one of our early NWI coordinator meetings, Warren Hagenbuck, the NWI Coordinator for the Southwest Region suggested that we conduct a statistically based project that would produce estimates of the status and trends in wetlands of the coterminous United States. Then periodic reports of the status and trends became an important product of the NWI program. The first trend analysis was the most influential study as it showed that the coterminous United States was losing wetland acreage at a rate equal to half the size of Rhode Island. During a detail in the Washington office, I worked with Bill Wilen on wetland issues, and we thought it would be worth writing a report on the significance of these losses, so Bill encouraged me to write the report: “*Wetlands of the United States: Current Status and Recent Trends*”. This was a report that summarized the findings of the recently completed National Wetlands Status and Trend

report and provided examples of the functions and values of wetlands and highlighted the significance of wetland losses in key areas of the country. By comparing the mid-1970s data with an assessment of what was estimated to be the original acreage of wetlands in the United States from a book by Rowe and Ayers in 1954, which was a book written on engineering for drainage, we predicted that the coterminous U.S. has lost over half of its – half of the wetlands that existed prior to European settlement. The fact that we had lost this much of the wetlands and we're losing wetlands at a high rate, 458,000 acres annually, captured the attention of natural resource policy makers and underscored the need to need to strengthen wetland regulations and policies. This report, published in March of 1984 was timely. The second meeting of the conference of contracting parties for the Ramsar Convention on Wetlands of International Importance, especially Waterfowl Habitat was held in May 1984. And although the U.S. at that time was not a member, it was planning to send a delegation to determine if the U.S. should join. The head of the delegation, Craig Potter, Deputy Assistant Secretary of the Interior for Fish and Wildlife and Parks, wanted to bring an important wetland-related report to the meeting. Bill Wilen suggested that the delegation should bring my report that he nickname the "So-What Report" because it described the impact of the wetland losses on functions and to society. The report demonstrated U.S. national concern about wetland losses and the need to strengthen wetland regulations and policy. It was a notable success and brought widespread attention to need for improving wetland conservation management. This was my first major report on wetlands while working for the National Wetlands Inventory (NWI)...I think 50,000 copies of this report were distributed to Federal, state agencies, NGOs, and other interested parties. Since my work in South Carolina, I had recognized the value of summarizing results of wetland mapping to give government agencies and the public a sense of how much, what types of wetlands occur and how wetlands were changing in their geographic area of interest. I saw the need to publish state reports on completion of our mapping since an inventory is not complete until the results are tabulated and reported. So, after finishing the NWI mapping for New Jersey and having the wetlands area measured by NWI St. Pete personnel, I took the summary data and wrote what was to be the first of several state wetland reports. *Wetlands of New Jersey*, published in 1985, described the methods we used in mapping, including mention of the limitations of such work and presented the findings of the mapping, like the wetland acreage for major types of wetlands by county and statewide, along with chapters on wetland hydrology, hydric soils and their extent, wetland plant communities found across the state, wetland values, wetland trends and wetland protection. This report and our mapping definitely advanced knowledge of the state's wetlands and I'd like to think it played a role in generating support for a state law passed in 1988 for regulating freshwater wetlands in New Jersey. Writing reports of the results of our projects in the Northeast became a standard operating procedure for NWI in the Northeast. By the end of my career, I'd written hundreds of reports ranging from the first national report on the significance of wetland changes to state wetland reports to regional wetland status and trends reports to local status and trends reports to watershed-based reports on wetland functions, and others on potential wetland restoration sites. While the main job of the Regional Coordinator was to direct and manage

wetland mapping for the NWI, Assistant Regional Director for Environment/Ecological Services, Dave Riley encouraged me to see what other information would be helpful for improving wetland conservation. In speaking with states, I learned that local wetlands status and trends would be useful in their efforts to strengthen wetland conservation, so the NWI program in the Northeast solicited funds mainly from Federal and state agencies to do local wetland trend studies...with many technical reports produced from such analyses, including a regional one for five Mid-Atlantic States and the Chesapeake Bay Watershed. The State of Maryland was also interested in developing a guide for wetland identification, so they supported my work on the *Field Guide to Non-Tidal Wetland Identification* that even today serves as an important training tool for individuals interested in identifying wetlands by vegetation and soils in the Northeast. In mapping wetlands across 13 states, I learned much about wetlands: their vegetation, their soil characteristics, their diversity. While doing graduate work at UMass. I took a soil taxonomy course where I developed a longtime friendship with Dr. Peter Veneman. For my research paper, I wrote a paper on hydric soils. We took that paper and expanded it into a field guide called, "*Hydric Soils of New England.*" That was the first publication to describe hydric soil properties and show in full color their features for field identification. Even by the 1980s ...early 1980s... there were no formal procedures for identifying wetlands. With NWI we tended to focus on plant communities but also used the combination of vegetation and soils to identify wetlands. Blake Parker, a USDA Soil Scientist on staff at NWI headquarters in St. Pete, was there to develop a concept and field indicators of hydric soils. He introduced us Regional Coordinators to hydric soils. I believe one of the earliest field studies of hydric soils was held at Maine where Blake Parker, Porter Reed (the NWI Plant Ecologist), and I met with USDA Soil Conservation Service's head scientists from their National Headquarters and State Offices to examine field characteristics of hydric and neighboring non-hydric soils. The hydric soils seemed to go beyond what could be readily identified as wetland by vegetation alone. We learned a lot about soils over the years as did USDA's soil scientists. In 1988, after U.S. EPA and the Corps developed and tested respective manuals designed to identify wetlands for regulatory purposes, they invited the USDA Soil Conservation Service and the Fish and Wildlife Service to participate in discussions to seek agreement on concept of wetland and field identification. Bill Wilen recommended me to serve with him and Dave Stout as FWS representatives on the committee, later called the Federal Interagency Committee for Wetland Delineation. That committee was comprised of three individuals from each of four agencies: the Corps, EPA, Fish and Wildlife Service, and Soil Conservation Service. After the first meeting, the members felt that it would be best to combine the two manuals - the Corps manual and the EPA manual, with techniques used by NWI and the Soil Conservation Service into a single interagency manual for identifying vegetated wetlands in the U.S. At the second meeting, this one in Harpers Ferry, West Virginia, the committee nominated me to write the manual - by combining the existing methods into a single manual. I compiled this manual from those methods coupled with my own on-the-ground experiences. The committee held several meetings facilitated by two independent persons, Howard Bellman and Leah Haygood, during which we went through the document word by word and had to reach

consensus before moving onto the next paragraph. After several meetings and revisions, we finally agreed on a manual that was published as an interagency publication signed by agency administrators in January 1989, it was called, “*The Federal Manual for Identifying and Delineating Jurisdictional Wetlands.*” Later in January, the manual was officially adopted by EPA and the Corps as the required manual for identifying wetlands for Federal Regulations. This manual was the first wetland manual mandated for use by the Corps and EPA and others seeking Federal Permits under authority of the Clean Water Act. If there’s one thing that I could change in the manual, it would be the title, for the longest time it was titled, “*Federal Manual for Identifying and Delineating Vegetated Wetlands.*” It could be used for non-regulatory purposes such as identifying wetlands and verifying boundaries for natural resource inventories, or proactive wetland restoration or for wetland creation projects. However, in the eleventh hour, the Corps personnel on the committee requested changing the title to replace “vegetated” – the word “vegetated”, and the committee agreed to replace it with “jurisdictional”. Happy to finally reach agreement on the manual at that time, we didn’t consider that the revised title could create a perception problem signaling that the manual was developed exclusively for regulatory purpose. Although a main use would be for regulatory purposes, the manual would also be used to verify vegetated wetlands for mapping, or to evaluate the success of wetland restoration projects. In any event, this manual helped set a scientific standard for wetland identification and delineation, despite being recalled later due to largely a failure to have gone through appropriate public review prior to adoption for regulatory purposes. The basic approach used in the manual is consistent with the way wetlands are identified today through the use of regional supplements to the original Corps manual. I later wrote a few articles on wetland delineation including a 1991 paper titled, “*The Concept of a Hydrophyte for Wetland Identification.*” that was published in *BioScience* (issue 41, pages 236 to 247) that described how the use of the term “hydrophyte” had changed over time and its current application and how plants have adapted to wet environments. Then another paper, a 1993 paper titled, “*The Primary Indicators Method: A Practical Approach to Wetland Recognition and Delineation in the United States*” that was published in *Wetlands* (Volume 13, pages 50 to 64), and that detailed how we, NWI, basically used unique vegetation and soil characteristics to verify wetlands in the field for our wetland mapping projects. As wetland losses were reduced due to stronger wetland regulations and enforcement, interest in wetlands became focused on wetland restoration and accessing the functions of wetlands for mitigation purposes. Dr. Mark Brinson developed a hydrogeomorphic or HGM wetland classification to separate wetlands into groups that should have similar functions based on largely, physical and hydrologic features. I saw that adding HGM descriptors to the NWI database would make it possible to more accurately predict wetland functions. Since Brinson used terms from the Cowardin et al. classification system but defined them separately, I felt the need to develop other terms consistent with the concept of HGM that could be added to NWI data to create an enhanced NWI database, what we call today – “NWI Plus database” - that would be for better characterizing wetlands and then for predicating wetland functions. I created what are now called LLWW descriptors...LLWW stands for: Landscape Position, Landform,

Water Flow Path, and Waterbody Type. These HGM type features when combined with the Cowardin terms (system, subsystem, class, subclass, water regime, water chemistry and special modifiers) could be used to predict wetland functions for any area where wetlands were mapped by NWI. The LLWW descriptors would be added to the NWI data for each mapped wetland to provide a more complete characterization of the wetland and to later predict its functions. I was able to work on this classification enhancement while on a part-time detail with the State of Massachusetts...helping them develop a watershed-based wetland restoration program. Working with Christie Foote-Smith in the Executive Office of Environmental Affairs I was able to apply these techniques for identifying significant wetlands in select watersheds and to use the approach to identify likely functions of potential wetlands restoration sites. This would allow agencies and organizations interesting in restoring wetlands to prioritize sites based on problems that needed to be addressed in the watershed. For example, to target wetland restoration for improving flood water storage, or improving water quality, or improving wildlife habitat strategically in the watershed. These techniques were also incorporated into NWI mapping in the Northeast as we applied LLWW attributes to most projects we were updating NWI data. A large number of the wetland characterization and wetland functional assessment reports were prepared for areas in the Northeast including the states of Delaware, Connecticut, Rhode Island, and for numerous watersheds elsewhere. Although not included in the update of Cowardin et al. system (only minor revisions were made), the LLWW descriptors were included in recommendations by the Wetlands Subcommittee of the Federal Geographic Data Committees in their standard for wetland mapping...recognizing that these features would produce a more powerful analytical database. Today a few states (for example, Colorado, Connecticut, Delaware, Georgia, Michigan, Minnesota, Montana, New Mexico, Pennsylvania, and Vermont) and some local governments like Lake County, Illinois have added or are adding LLWW descriptors (or minor adaptations) to NWI mapping projects. Also, BLM plans to add LLWW descriptors to their wetland mapping projects in 13 western states. So, the whole concept of producing enhanced NWI data has become important, and it is recognized by many other agencies. Why don't we take a break at this point Bill?"

**Bill Wilen:** "Okay – [Pause] Okay."

**Ralph Tiner:** "Another major contribution to our understanding of wetlands came in response to a 2001 U.S. Supreme Court decision about Federal jurisdiction over an isolated wetland. This was the case called: *Solid Waste Authority of Northern Cook County vs The Corps*, the so-called SWANCC decision (Number 99-1178, published on January 9<sup>th</sup>, 2001). The court had decided that the Corps had exceeded its jurisdiction under authority of Section 404 the Clean Water Act, in regulating an isolated wetland by virtue of its importance to migratory birds. There were questions raised about how much wetlands could be effected by this decision, and subsequent regulatory changes. I saw an opportunity to use the NWI database to produce information on the extent of these wetlands to give some folks some perspective on the issue. To identify isolated wetlands, you could simply add LLWW descriptors to NWI data, especially the water flow path

descriptors. I made a proposal to our Washington office to do a study of selected areas across the country to estimate the extent of isolated wetlands and to receive \$20,000 to do this work. I had Herb Bergquist, Gabe DeAlessio, and Matt Starr do the enhanced classification and GIS analysis while I worked on the document, the ecological significance of these wetlands. Our report titled, "*Geographically Isolated Wetlands of Preliminary Assessment of their Characteristics and Status in Selected Areas of the United States*" was a major starting point for discussion about the need to include isolated wetlands in wetland conservation efforts. I gave two invited presentations at the next Society of Wetland Scientists annual meeting in Lake Placid, New York, that were ultimately written up as articles and published in a special issue of the journal, *Wetlands*, on one devoted to isolated wetlands. One of those articles, "*Geographically Isolated Wetlands of the United States*", published in *Wetlands* 23, pages 494 to 516, defined the term "geographically isolated wetlands" while presenting descriptions of diversity of wetland types in the U.S. that may qualify as such. This article was later recognized by the Society of Wetland Scientists as one of the 30 most important papers for furthering the field of wetland science in the last 30 years. To this day the term "geographically isolated wetland" has become part of the lexicon of wetland scientists and many scientists have continued to study these wetlands and have furthered our understanding of these wetlands and their functions.

Bill Wilen asked me about missed opportunities by NWI and concerns about NWI. Although the first National Status and Trends study had a significant impact on strengthen wetland policy, the updates hadn't had the same effect as losses had been greatly reduced by Federal and State wetland regulations and policies (although I recognize this can change in time). More importantly from a program standpoint, the focus of the Status and Trends took funding away from wetland mapping and placed more emphasis on getting other government agencies to fund updates of our mapping. At the time of my retirement in 2015, most of the NWI data were from the mid-1980s so as a result, we really weren't producing as many maps in the later years because so much funding was going to the Status and Trends project. The NWI program really needs to look at ways to more rapidly update the map data. There were ways to streamline the Trends work, perhaps the biggest time and cost saving could be realized by focusing on wetlands in the 4-square mile plots and not evaluate all land use changes therein - as much more changes were happening outside the wetlands and that was well beyond our objective and actually never reported on. Another consideration would be to combine wetland trend analysis to updated mapping but that was not pursued. The availability of digital data should facilitate incorporation of trend analysis into standard NWI mapping, so a mapping project could produce both maps and trend data. We did this for Connecticut and the report was titled, "*Changes in Connecticut Wetlands, 1990-2010*" ... during the mapping update for Connecticut we integrated a trend analysis into the process. The NWI missed the boat on adding LLWW descriptors to its updated mapping across the country, although many funding agencies, state natural resources agencies, in particular, have included this information in their funding of wetland map updates. These agencies have recognized the importance of enhanced NWI data to include LLWW for use in

getting a better understanding of wetland functions provided by the wetlands and for more detailed characterization of wetlands. So even though we don't have the NWI program using it as a standard, the concept has been adopted by a lot of our cooperating agencies. Overall, my work on NWI was highly rewarding from both a personal and professional level. Along with a number of Fish and Wildlife Service awards, including Distinguished Service Award from the Department of Interior, I was recently elected Fellow by the Society of Wetland Scientists for my contributions to wetland science. In NWI and the Fish and Wildlife Service I found a place where I could use my abilities to their fullest. It was a fantastic voyage and I appreciate the support and assistance by others that made this happen.

I'd like to make some acknowledgments here because anybody doing any work is always working with others, which is vital to the success of that person as well as the program. All the work that I was able to do would not have been done without the support and assistance from others. So, I'll mention a few that I haven't already mentioned above; this would be my NWI assistants over the years, especially John Organ who was the first Assistant Regional NWI Coordinator for any region, Bill Zinni, Glenn Smith, Dave Foulis and John Swords. Assistant Regional Directors of our program who supported the NWI program and my work in wetlands, Dave Riley, Don Woodard, and Ralph Pisapia in particular. Personnel from the University of Massachusetts who worked on NWI, especially Janice Stone, Irene Huber, and Todd Nuerminger; personnel from Virginia Tech's Conservation Management Institute that was a prime contractor for NWI during the digital mapping era, namely, Kevin McGuckin, and Ingrid Mans. And then personnel from other agencies that provided financial support for NWI over the years, especially David Harden, Amy Jacobs and Mark Biddle from Delaware, David Burke and Bill Jenkins from Maryland, Ken Metzler and Robert Gilmore from Connecticut, Shamus Malone from Pennsylvania, Pat Riexinger from New York, Geoff Knapp and Laurie Machung from New York City DEP, and Jim Butch from USEPA. And on that note, the above are the most notable among many others who have helped the NWI program flourish in the Northeast and many thanks to the above and to all the others who have helped us along the way, thank you."

**Bill Wilen:** "Thanks Ralph, that was an excellent presentation, this is Bill Wilen, and this ends Ralph Tiner's oral history."