

EXPLORING OPPORTUNITIES FOR INTEGRATED MAPPING AND FUNCTIONAL ASSESSMENT OF RIVERINE AND COASTAL FLOODPLAINS AND WETLANDS



April 10, 2018

A Natural Floodplain Functions Alliance and Wetland Mapping Consortium Workshop

This paper presents the topics, key findings and next steps from a one-day workshop held as part of a multi-year initiative exploring innovative ways to integrate geospatial data and functional assessment of wetlands and riparian and coastal floodplains.

**Exploring Opportunities for Integrated Mapping and Functional Assessment of
Riverine and Coastal Floodplains and Wetlands**

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A NATURAL FLOODPLAIN FUNCTIONS ALLIANCE AND
WETLAND MAPPING CONSORTIUM WORKSHOP

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Photo Credit Front Cover: John McShane, Racquette River Floodplain Wetlands

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INTRODUCTION:

The National Oceanic and Atmospheric Administration (NOAA) has found that there has been a significant increase in the intensity of precipitation events in most parts of the United States over the last few decades due to climate change. Flood losses are continuing to increase as a result and greater efforts must be employed to adapt to the impacts of climate change, especially flooding. Record flooding in 2016 alone resulted in \$3.5 billion in National Flood Insurance Program (NFIP) claims. The NFIP has now reached its \$30.4 billion borrowing limit. Even if the recent measure by the U.S. Senate to forgive \$16 billion of the NFIP debt receives President Trump's approval, it does not include any broader changes to the program to make it more sustainable over time.

This means there is a critical need to make our communities more resilient before the next major flood event to reduce future damages. Increasingly, efforts to protect, restore, enhance and create natural floodplains and wetlands are being employed to improve watershed health and to support climate change adaptation and mitigation. Approximately 80% of wetlands are located in floodplains. Wetlands and natural floodplains are especially important as they store a significant amount of floodwater, provide critical habitats for wildlife, improve water quality, and recharge groundwater. Although wetland and riparian functions provide critical ecosystem services to mitigate flood risk (and other related climate change impacts), floodplain mapping programs do not include this data for evaluating flood risk.

The wetland mapping community (and more recently the riparian mapping community) has a long history of developing and applying data on wetland functions to inform scientific research, policy and land-use decisions. However, the floodplain mapping community has primarily focused its efforts on providing data on floodplain extent to inform the NFIP regarding the boundaries of the 100 year floodplain. Floodplain management efforts would be dramatically improved if they could be informed by geospatial data that describes floodplain functions (including wetlands, streams and rivers) as a component of a larger watershed to support more strategic land use decisions and reduce risk.

Interestingly, the NFIP's Community Rating System (CRS) promotes comprehensive floodplain management planning, analysis and evaluation related to the protection of the natural functions of floodplains and habitat protection. Communities that produce maps of the natural functions and resources of their flood-prone areas can receive CRS credit for taking that step toward broader management of their local floodplains. However, FEMA's Risk Mapping, Assessment and Planning (MAP) program generally only includes data on elevation, hydrology, infrastructure, hydraulics and land use for the purpose of informing NFIP rates. In fact, many small streams in rural areas are not mapped at all by FEMA, leaving states like Vermont with approximately 80% of their streams and rivers unmapped for potential flood risk.

Background:

The Association of State Wetland Managers (ASWM) has a long history of collaboration with the Association of State Floodplain Managers (ASFPM), beginning in 1983 when ASWM, founded by Jon Kusler, Ph.D., Esq. and Scott Hausmann, first opened its doors, just down the hallway at the Wisconsin Department of Natural Resources from the office of Larry Larson, ASFPM's former Executive Director. The relationship flourished over the years with both organizations dedicated to building strong state programs that protect our critical wetland and floodplain resources. In 2011, ASWM and ASFPM joined forces to create the Natural Floodplain

Functions Alliance (NFFA), an affiliation of nonprofit and private organizations, government agencies and individuals dedicated to the protection, restoration and management of natural floodplain resources. The NFFA is led by a Steering Committee consisting of members representing ASWM, ASFPM, Pew Charitable Trusts, Earth Economics, American Planning Association, American Rivers, The Nature Conservancy, NOAA, and the State of Vermont as well as several private consultants.

In 2008, ASWM founded the Wetland Mapping Consortium (WMC), an interdisciplinary group of wetland scientists and managers interested in mapping and monitoring wetlands with remotely sensed images and using the resultant products to best manage wetland resources, ultimately resulting in increased conservation of wetlands and the enhanced delivery of wetland ecosystem services. Steering members include representatives from the U.S. Fish and Wildlife Service National Wetlands Inventory, U.S. Geological Service, Virginia Tech, Saint Mary's University and the State of Minnesota. ASWM facilitates both the WMC Steering Committee and the NFFA Steering Committee and has been working with members of both committees on this initiative.

In 2017, ASWM began facilitating a discussion between the NFFA and WMC about the possibility of creating a multi-year initiative to improve floodplain mapping by integrating geospatial data being developed and used by the wetland mapping community to identify wetland and floodplain functions. The two groups identified individuals from each organization to participate in a Planning Committee. The Planning Committee began holding monthly conference calls and decided to hold three annual workshops with a final long-term goal of developing a baseline national classification standard for functional assessment of wetland and floodplain functions that could be built on based on regional environmental variations as well as different project goals and state policies to better inform land-use decisions and reduce risk in local communities.

Goals:

The goal of this initial workshop was to develop a case for support for the overall project goal and to create a roadmap for what needs to be done to successfully execute the long-term goal. The overall long-term goal of the broader multi-year initiative is to integrate wetland and riparian geospatial mapping techniques and data into floodplain mapping programs to assess individual and combined functions of these natural systems and better inform land-use decisions. This will provide the basis for developing more effective, landscape scale floodplain management practices and policies to make communities less prone to flood risk, more resilient, and to attain multiple co-benefits, such as healthy streams and wetlands, clean drinking water, wildlife habitat, and recreational open space. The Planning Committee recognized right away that the long-term goal is very ambitious and would require more than one workshop to succeed. Therefore, they proposed a four-year project with three annual workshops from 2018-2020 with activities in between the workshops (e.g., webinars, meetings, conference calls) to build momentum toward achieving the overall goal of the project. The grant provided by the ASFPM Foundation in 2017 supported the first phase of this initiative: the first workshop held on Tuesday, April 10th, 2018 at the Tommy Douglas Conference Center in Silver Spring, MD.

WORKSHOP SUMMARY

On Tuesday, April 10, 2018, the Natural Floodplain Functions Alliance (NFFA) and the Wetland Mapping Consortium (WMC) combined forces to host a workshop at the Tommy Douglas Conference Center in Silver Spring, Maryland entitled, “Exploring Opportunities for Integrated Mapping and Functional Assessment of Riverine and Coastal Floodplains and Wetlands.” The overall goal of this workshop was to discuss current and potential opportunities to integrate wetland, floodplain, coastal and riparian geospatial mapping efforts, techniques and data on ecosystem functions in order to improve decision making and resource management, as well as reduce risk, and to create a roadmap for the future. To accomplish this goal, a planning committee was formed with members from both NFFA and WMC who met weekly over several months to develop the workshop, identify funding, invite speakers and participants, and manage the various logistical details required. The Association of State Wetland Managers (ASWM) facilitated the planning committee and a generous grant from the Association of State Floodplain Managers (ASFPM) Foundation provided critical financial support for the workshop.

Jerry Sparks from the ASFPM Foundation started the day with a warm welcome for participants, followed by an opening presentation by Jeanne Christie, Executive Director at ASWM and Dr. Maria Honeycutt, a Coastal Hazards Specialist at NOAA’s Office for Coastal Management. This was followed by five case study presentations that highlighted ways in which functional assessments are being used for decision making. Presenters included: Mike Kline, Vermont Department of Environmental Conservation Rivers Program; Sinan Abood, Ph.D., U.S. Forest Service; Andy Robertson, Saint Mary’s University of Minnesota; Tim Beechie, NOAA Northwest Fisheries Science Center; and Elliott Campbell, Ph.D., Maryland Department of Natural Resources. Afterward, Eileen Shader from American Rivers moderated a round robin discussion of the case studies.

Mike Kline discussed Vermont’s effort to work on mapping tools that will advance their ability to restore the hydrology and fluvial processes of what they are calling, the entire “riverscape” - to help identify the natural wetland hydrology necessary for wetland restoration and to support process-based restoration of floodplain systems. Their goal is to maximize flood attenuation, habitat and water quality which requires an examination of the connectivity (or disconnection) of flows at the landscape scale -

Charges for the Day

1. What if functional assessment efforts were integrated?
2. How can this be achieved?
3. What are the advantages and disadvantages?
4. How do we address initial data inventory?
5. How do we incorporate mapping innovation?
6. How do we fund map/data maintenance?
7. How can we share methods and data layers?
8. How do we promote safe, healthy communities?

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longitudinally, laterally, vertically and temporally.

Sinan Abood discussed his Riparian Areas Inventory & Assessment project for the U.S. Forest Service. Some of the project's objectives include: 1) develop a national context inventory of riparian areas and their condition within national forests and rangelands; 2) meet Forest Plan revision schedules and sage grouse management information needs; 3) develop a multi-scale approach to provide a national and regional report map and create a product for managers to easily understand where to apply the information at various scales; 4) and provide a framework and an end product to stakeholders and apply the information into management actions and strategies.



Case study presenters from L to R: Andy Robertson, Elliot Campbell, Mike Kline, Sinan Abood, Tim Beechie. (Photo credit: Jeanne Christie)

Andy Robertson shared an overview of a few projects that Geospatial Services at Saint Mary's University have worked on. They have provided landscape scale wetland mapping for a wide variety of partners (U.S. Fish and Wildlife Service (FWS), National Park Service, state DNR's, and tribal communities). Many of these projects have included a wetland functional assessment and exemplify how this type of data can be incorporated or understood in terms of typical wetland and watershed planning processes.

Their goal in these projects is to map (or update) the locations of present day wetlands

and provide additional information beyond the wetland classification codes that could be used to help prioritize where wetlands might be restored, preserved or enhanced; and to support informed decision making. Their Wetlands Geodatabase includes the mapped wetlands (both polygon and linear) that have been digitized through photo-interpretation aided by a variety of collateral datasets. Each wetland is classified according to the NWI and LLWW (landscape position, landform, waterbody, water flow path) schemes (aka NWI Plus) which is required for the function correlation. Other specific classifications can be included by request. In the West, many partners request they also map and classify riparian features using the FWS Western Riparian Classification.

Tim Beechie discussed his work with NOAA performing floodplain analysis to evaluate habitat loss, identify restoration opportunities, and



Federal panel from L to R: Jay Thompson, Maria Honeycutt, Megan Lang, Stephen Aichle, Luis Rodriguez. (Photo credit: Jeanne Christie)

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monitor habitat change for Endangered Species Act status reviews. He is working in the Pacific Northwest primarily on salmon habitat. To evaluate habitat loss, they are using maps of historical floodplain habitats, merged with current datasets such as the National Hydrography Dataset (NHD) and Washington State's WBHYDRO, to summarize historical and current habitat availability. By looking at historical and current data, assisted by LiDAR data, they can identify areas where habitat may be able to be reconnected and restoration opportunities.

Elliot Campbell wrapped up the morning case studies with a presentation entitled "From Functions to Ecosystem Services: The Economic Value of Floodplains and Wetlands." Final ecosystem services are the "benefits gained by people from the environment," i.e., the benefits provided by natural ecosystem functions. Dr. Campbell discussed how ecosystem services vary spatially across the landscape and in the biological supply of the service (e.g., amount of water being recharged into aquifers). They also vary in the way and amount that people benefit from them (i.e., if flooding is a problem, then flood water attenuation is a great benefit, but not if flooding does not exist). He then shared his findings from a study performed on Maryland floodplains. The ecosystem services that they modeled included air pollution mitigation, carbon sequestration, groundwater recharge, nitrogen removal, flood prevention and wildlife habitat which resulted in an estimated \$8 billion in ecosystem service benefits per year.

Federal Panel Summary

- Provided excellent overview of mapping efforts and available data
- Summarized agency priorities for coastal and riverine floodplain/wetland functional assessment
- Identified how agencies are using their own data to address agency mandates
- Outlined plans for future development including opportunities, challenges and threats
- Reinforced the need for partnership efforts at all levels

The afternoon session started out with a federal panel discussion that explored what federal agencies are doing in regard to integrated mapping and functional assessment of riverine and coastal floodplains and wetlands and how they might support state efforts within the federalism context. The panel was moderated by Marla Stelk, ASWM, and included Dr. Megan Lang, U.S. Fish and Wildlife Service National Wetlands Inventory; Dr. Maria Honeycutt, NOAA; Stephen Aichele, U.S. Geological Service; Luis Rodriguez, FEMA; and Jay Thompson, Bureau of Land Management.

Following the federal panel, Larry Larson from ASFPF and Andy Robertson from Saint Mary's University facilitated a break-out session with workshop participants who were divided into three groups. Each group was assigned one topic for discussion: 1) Areas of Overlap and Distinction, 2) Key Challenges and Information Gaps, or 3) Opportunities to Leverage Resources. Within the group's assigned topic area, each group had to develop 2-3 bullet points that described: 1) What are the needs based on our discussions?, 2) What are some actions that can be taken to address the needs?, and 3) What are the challenges? The break-out groups reported out

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to the full workshop and Jeanne Christie, ASWM, wrapped up the day with a full group round robin discussion covering final thoughts, lessons learned and next steps for an action agenda to move forward.

Overall, participants expressed significant support for continuing this effort to explore ways to integrate wetland and floodplain mapping and functional assessment. Water resources are naturally integrated systems – by addressing them more holistically and identifying the capacity of their beneficial functions we can make better land use decisions. Mapping these functions can also provide useful visual aids in efforts to communicate about the natural and beneficial functions of natural floodplains and wetlands which can potentially lead to changes at the program and policy levels.

Some of the common recurring themes in regard to final thoughts by the group included:

- A need for improved communication among professionals, knowledge sharing, tools, models
- Partnerships, likely and unlikely, are critical to provide technical assistance, combine funding, expertise, etc.
- Digital data availability is important (identify who has it, where it is, and how to obtain it)
- Continuity of knowledge is key (stop reinventing tools and/or data that is already out there)
- Leverage existing mandates and legislative tools
- Clearly articulate use cases to demonstrate success and generate fiscal support
- Innovate and embrace technology while bridging the gap
- Tie mapping efforts to societal needs, hazards and costs
- Embrace social science to tell the story of social significance
- Make avoidance a priority
- Tools can be complex, but results should be easy to explain
- We need to provide clear, consistent, accessible, and consumable messaging about the benefits and enhanced decision-making tools provided by integrating maps and providing site specific information about natural floodplain functions and services

After the workshop, Jerry Sparks from the ASFPM Foundation said, “I thought it was an excellent workshop. I learned many new things and perspectives as a 29-year practitioner in flood mapping and flood mitigation. The day left me excited about the possibilities of integrating floodplain and wetland mapping and I’m certainly eager to see where things head.”

So what are the next steps? This workshop was intended to be the first step in a larger multi-year initiative. Next steps include:

1. Continuing to work with the Planning Committee and others, exploring opportunities and challenges over the next year, developing webinars, participating in conference calls and planning the next workshop.

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2. Coordinating and attending in-person meetings with agencies such as FEMA, TMAC, ACOE, DOI, EPA, USGS, Planning Committee members and others to discuss the opportunities and technical challenges of mapping floodplain functions and using that data for decision-making.
3. Identifying existing tools that use condition and function (existing or potential) as an indicator for prioritization of floodplain, riparian and wetland protection and/or restoration and explore how these tools can be used to inform land use decisions. Different regions, with different geology, geography, climate, and socio-economic context may need to create different mapping products to support local decisions. What works in VT may not work in FL, CO, or AZ. By cataloging the different techniques, we can all build decision-support tools informed by methods being implemented in other states and regions.
4. Planning for a second workshop in 2019 that will dig deeper into the technical challenges and opportunities. The 2019 workshop will focus on the floodplain technical issues, i.e., what kinds of data are most useful, how to integrate functional data into floodplain mapping programs and where gaps in data and capacity may exist that need to be addressed. The workshop will also include discussions regarding the potential application of data on floodplain and wetland functions (e.g., the capacity for natural systems to attenuate flood waves as they move downstream - both in terms of storage and slowing the flows and possibly the erosion and sediment in the systems) and the potential for such data to be used in the creation of new crediting systems within the Community Rating System (i.e., a storage credit system) as well as for communications and advocacy efforts. Other funding and incentive program possibilities will also be explored. During the workshop an action plan will be developed for the third year.
5. Planning for a third workshop in 2020 to identify program and policy changes that need to be made to implement an integrated approach.

Our primary objectives include floodplain/wetland protection and restoration. The political aspects of these objectives include: a) changes in land use; b) the regulation of land use; c) structural flood hazard mitigation; and d) flood recovery (i.e., how and where we rebuild). Assessments might therefore include a) land use / land cover data; b) mapping and operational data associated with flood control structures; and C) the risks to economic assets and public infrastructure as a measure of vulnerability and criticality. Wetland and floodplain mapping concerns (e.g., consistency, standardization, communication, capacity, etc.) are almost exactly the same - the benefit from integration is clear. This long-term initiative has significant potential to advance the science, policy and practice of floodplain management.

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AGENDA: Tuesday, April 10TH, 2018

- 8:30 – 9:00 Check-in
- 9:00 – 9:45 Welcome: Jerry Sparks, Association of State Floodplain Managers Foundation (15 minutes)
Introductions: Jeanne Christie, Association of State Wetland Managers (10 minutes)
Why We're Here: Identifying the Need and Potential Rewards: Maria Honeycutt, NOAA and Jeanne Christie, ASWM (15 minutes)
Agenda Review: Jeanne Christie, ASWM (5 minutes)
- 9:45 – 10:00 Management Implications of Vermont Wetland and Floodplain Functional Assessment and Mapping: Mike Kline, Vermont DEC Rivers Program
- 10:00 – 10:15 Functional Assessments in Current Wetland and Floodplain Mapping: Sinan Abood, U.S. Forest Service
- 10:15 – 10:45 Break
- 10:45 – 11:00 Contributing to Riparian Area Management Using Wetland Functional Assessment Data: Andy Robertson, Saint Mary's University of Minnesota
- 11:00 – 11:15 Floodplain Mapping for Salmon Habitat Restoration and Monitoring: Examples from the Pacific Northwest: Tim Beechie, NOAA Northwest Fisheries Science Center
- 11:15 – 11:30 From Functions to Ecosystem Services: The Economic Value of Floodplains and Wetlands: Elliott Campbell, Maryland DNR
- 11:30 – 12:00 Round Robin Discussion of Case Studies: Moderated by Eileen Shader, American Rivers
- 12:30 – 1:30 Lunch
- 1:30 – 2:30 Federal Panel: Megan Lang, FWS NWI; Maria Honeycutt, NOAA; Stephen Aichele, USGS; Luis Rodriguez, FEMA; Jay Thompson, BLM: Moderated by Marla Stelk, ASWM
- 2:30 – 3:30 Facilitated Group Discussions – Challenges & Opportunities
Moderated by Larry Larson, Association of State Floodplain Managers and Andy Robertson, Saint Mary's University of Minnesota
- 2:30 – 2:45 Overview and Distribution of Break-Out Groups
- 2:45 – 3:30 Break-out Groups to Address Topics Below:
- Areas of Overlap and Distinction
 - Key Challenges and Information Gaps
 - Opportunities to Leverage Resources
- 3:30 – 4:00 Break
- 4:00 – 4:15 Break-out Group Report-Outs
- 4:15 – 5:00 Facilitated Group Discussion: Facilitated by Jeanne Christie, ASWM
- Next Steps – An Action Agenda
 - Final Thoughts

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Assessment of
Riverine and Coastal Floodplains and Wetlands
Tuesday, April 10, 2018**

PARTICIPANT LIST

In alphabetical order by last name.

- Sinan Abood, USDA Forest Service
- Stevie Adams, The Nature Conservancy
- Steve Aichele, U.S. Geological Survey
- Betty Andrews, Environmental Science Associates
- Tim Beechie, NOAA Fisheries
- Siavash Beik, Association of State Floodplain Managers /Christopher B. Burke Engineering, LLC
- Mark Biddle, Delaware Department of Natural Resources and Environmental Control, Watershed Assessment
- Robert Brooks, Riparia at Pennsylvania State University
- Elliott Campbell, Maryland Department of Natural Resources
- Jeanne Christie, Association of State Wetland Managers
- Denise Clearwater, Maryland Department of the Environment
- David Conrad, Association of State Floodplain Managers
- Dave Goerman, Pennsylvania Department of Environmental Protection
- Lisa Hair, U.S. Environmental Protection Agency
- Tom Harcarik, Ohio Environmental Protection Agency, Division of Surface Water
- Kathleen Hoenke, Southeast Aquatic Resources Partnership
- Maria Honeycutt, NOAA Office for Coastal Management
- Kristen Carol Hychka, University of Maryland, Center for Environmental Science

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- Michael Kline, Vermont Department of Environmental Conservation, Rivers Program
- David Knipe, Indiana Department of Natural Resources
- Rose Kwok, U.S. Environmental Protection Agency
- Megan Lang, U.S. Fish and Wildlife Service
- Larry Larson, Association of State Floodplain Managers
- Collin Lawrence, U.S. Geological Survey
- Les Lemm, Minnesota Board of Water and Soil Resources
- Jennifer Linn, U.S. Environmental Protection Agency
- Dominic MacCormack, U.S. Environmental Protection Agency
- Rachel Marks, Maryland Department of Natural Resources, Chesapeake and Coastal Service
- Sarah Murdock, The Nature Conservancy
- David Olson, U.S. Army Corps of Engineers
- Andy Robertson, Saint Mary's University of Minnesota
- Luis Rodriguez, Federal Emergency Management Agency
- Eileen Shader, American Rivers
- Jerry Sparks, ASFPM Foundation
- Marla Stelk, Association of State Wetland Managers
- Jay Thompson, Bureau of Land Management
- Ruth White, The Pew Charitable Trusts
- Bill Wilen, Former U.S. Fish and Wildlife Service - retired
- George Xian, U.S. Geological Survey
- Eugene Yacobson, The Nature Conservancy