Examining the status of Hydrologic Assessment and Hydrologic Restoration in Wisconsin

An evaluation of barriers, needs, and opportunities

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wetland icon created by Dan Hetteix from the Noun Project

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For more information about this evaluation contact Amber Mase at amber.mase@wisc.edu or Erin O'Brien at policy@wisconsinwetlands.org

Natural Resources Institute
UW-Madison Division of Extension

Wisconsin Wetlands Association

US Environmental Protection Agency

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Acronyms

DNR: Wisconsin Department of Natural Resources

DATCP: Wisconsin Department of Agriculture, Trade, and Consumer Protection

HR: Hydrologic Restoration

HA: Hydrologic Assessment

LiDAR: Light Detection and Ranging

LCD: Land Conservation Department

NRCS: Natural Resources Conservation Service

TMDL: Total Maximum Daily Load

WWA: Wisconsin Wetlands Association

WGNHS: Wisconsin Geologic and Natural History Survey

UW: University of Wisconsin

WEM: Wisconsin Emergency Management

Executive Summary

This report explores current activity in Wisconsin on hydrologic assessment and restoration – watershed-scale efforts to understand and address how degraded hydrology contributes to today's water management problems. The evaluation can inform policy and program development discussions on improving the integration of watershed-scale hydrologic assessment and restoration in state-sponsored programs, with an emphasis on the restoration of upper watershed wetlands and the reconnection of streams with adjacent floodplains.

Goals and Methods

Why?

The goals of this project were to:

- **Investigate** conservation practitioners **understanding of hydrologic restoration** and the role of hydrology in shaping Wisconsin's environmental outcomes
- **Confirm** that hydrologic assessment and restoration approaches are **not well integrated** with current land and water management projects and programs
- **Characterize the barriers** to further integration of hydrologic assessment and restoration, and **understand needs** that, if addressed, could improve integration
- **Explore opportunities** for interagency, interdisciplinary, and cross-jurisdictional collaboration to **incorporate more hydrologic assessment** and voluntary restoration into Wisconsin's land and water projects and programs

How?

This evaluation used a short **survey** and three virtual **focus group** sessions in the winter of 2020-2021 to address the above goals. **UW-Extension Natural Resources Institute (NRI)** evaluators and the **Wisconsin Wetlands Association (WWA)** collaborated on the development and implementation of this evaluation**.** A project team including NRI, WWA, and advisors from the Wisconsin Department of Natural Resources and Wisconsin Department of Agriculture, Trade, and Consumer Protection worked together to develop goals, methods, and key audiences for participation.

Who?

32 individuals whose work relates to hydrologic restoration from WI state agencies, academia, county land conservation departments (LCDs), and non-profits participated in these focus groups. The project team and other partners helped identify and recruit participants from three audiences: technical experts, state agency program managers, and local conservation implementers.

Extension

Executive Summary cont.

Definitions

The definitions below were developed by members of the project team and shared in the survey and focus groups to ensure evaluators and participants had a shared understanding of terminology and key concepts.

Hydrologic Assessment

Looking at geology, topography, soils, surface and groundwater interactions and flow, human caused and natural disturbances, and other metrics to understand:

- How and where water used to move across the landscape?
- What's changed?
- What can be restored or improved to help address specific water challenges?

It is watershed-based and interdisciplinary.

Hydrologic Restoration

Practices designed, to the extent possible, to return wetland, stream, and floodplain hydrology to a natural and self-regulating condition in order to achieve goals such as:

- Slow the flow of runoff
- Restore surface and groundwater interactions
- Increase soil retention
- Increase baseflow
- Improve flood resilience
- Reduce flood peaks
- Improve water quality
- Increase groundwater infiltration
- Increase upper watershed storage
- Restore wildlife habitat

Assumptions

The project was designed to present and assess agreement with the following assumptions:

- Historical and current land uses have altered Wisconsin's hydrology and reduced the capacity of wetlands, rivers, floodplains to manage runoff.
- Restoring degraded hydrology can help address many water management challenges.
- Wisconsin does not have, but would benefit from, increased coordinated efforts to restore hydrology.

Executive Summary cont.

Findings

Barriers

- Wisconsin's current **funding structures limit the capacity** of county land conservation departments to engage in watershed-scale hydrologic restoration.
- **Limited knowledge about hydrology** among state agencies and the public contributes to plans and projects that ignore hydrology to the detriment of waterway health and project success.
- **Lack of coordination and communication** between agencies creates inefficiencies. The current approach involves fragmented and siloed programs, rather than utilizing resources through a coordinated strategy to achieve shared goals.

Needs

- A more **hydrology-focused watershed-scale funding** and **policy regime** would enable greater capacity, stability, and promote better restoration practices.
- **Data and decision support tool are needed**, including data sharing infrastructure, to assess hydrologic conditions, design restoration projects, and communicate with lay audiences about hydrologic issues.
- **Policies or structures to increase interagency coordination** would help build knowledge, streamline processes, and enable development of unified strategies for hydrologic restoration in the state.

Opportunities

- **Highlight and explain hydrology to the public and conservation practitioners** to elevate the relevance of hydrologic solutions to water challenges across the state.
- **Increase incentives for voluntary wetland, stream, and floodplain restoration** to encourage more participation from private landowners.
- **Invest in watershed-scale pilot and demonstration projects** to encourage creative solutions, promote learning, produce measurable improvements, and test collaboration structures.

Executive Summary cont.

Conclusions and Next Steps

Our findings validated the assumptions that **hydrologic assessment and restoration have been poorly integrated in Wisconsin**, and **identified barriers** in hydrologic awareness, collaboration, policy and funding structures, and data availability.

Focus group participants largely agreed that increasing hydrologic restoration and assessment could significantly improve the state's ability to address water management challenges. However, results suggested that Wisconsin does not have the structural framework in place to support watershed-scale hydrologic assessment and restoration. Rather than a single barrier, a combination of organizational, technical, and policy factors stand in the way of comprehensive hydrologic restoration work.

Though this evaluation did not seek to identify a complete list of actions or recommendations, participants offered several ideas on how to improve the pace and efficacy of hydrologic restoration in Wisconsin. These included but were not limited to:

- **Working together across agencies** and jurisdictions and **developing more accessible data** to increase consideration of hydrologic conditions and quantify and **communicate the benefits** of hydrologic restoration.
- Producing **longer-term, hydrology-oriented, and watershed-scale funding** opportunities to increase investment in staff capacity to proactively tackle hydrologic challenges.
- Retooling **voluntary restoration programs with stronger incentives for hydrology-focused practices** to help increase restoration work on private lands.

These ideas are discussed in more detail throughout the needs and opportunities sections of the full report. Addressing some, or all, of these barriers would create a better environment to support hydrologic assessment and restoration through state agency programs and county land conservation department projects in Wisconsin.

These evaluation findings will be distributed widely to inform ongoing discussions around hydrologic restoration. Immediate next steps include distribution and discussion with focus group participants, key state agencies and partners, and policy makers across Wisconsin. The report and findings will also be used by WWA to help inform current and future policy and program development work in Wisconsin.

Introduction

Hydrology in Wisconsin

For decades, Wisconsin has grappled with water management challenges including surface and groundwater contamination, erosion, and flooding. As the frequency and intensity of flood events across the state continue to increase, the situation has become urgent. Hydrology in Wisconsin has been altered and degraded by human development for agriculture, housing, roadways, and other purposes. Human developments have fundamentally changed the pathways of water. Degraded hydrology contributes to most of Wisconsin's water management concerns. In functioning hydrologic systems, upper watershed wetlands and middle watershed floodplains provide critical storage and infiltration of rain and snowmelt. They help slow the flow of water moving downstream and retain sediment and nutrients on the land. When we remove or damage those wetlands and floodplains, or disconnect them from associated streams, we lose this storage, and runoff moves swiftly downstream. This produces elevated and flashy flood peaks, causes erosion, degrades habitat, and contributes to water quality issues downstream.

Across Wisconsin, state and local governments and nongovernmental organizations (NGOs) carry out efforts to control runoff and reduce the associated risks to people and the environment, but more tools and coordinated approaches are needed. Watershed-based hydrologic restoration is one of the most effective ways to address water management concerns in Wisconsin. Hydrologic restoration requires assessment to understand how water moves through the landscape, how hydrology has changed, and what can be restored to reduce flooding, erosion, nutrient loss, habitat loss, and other impacts. It involves planning and implementation of practices designed to reestablish - to the extent possible in a modern landscape - wetland and stream connections, condition, and functions.

Despite the many benefits of watershed-based hydrologic restoration, its practice is not yet widespread in Wisconsin. Prior work by Wisconsin Wetlands Association (WWA) and others suggested that a combination of policy and program barriers, low awareness, and a lack of relevant data and decision-support tools contribute to the limited investment in hydrology focused water management. The purpose of this evaluation was to confirm the level of hydrologic assessment and restoration activity across Wisconsin's publicly funded water-management programs, and to identify barriers, needs, and opportunities to better integrate hydrologic assessment and restoration into state-sponsored programs.

Example of a headwater creek disconnected from adjacent floodplain wetlands. Without the ability to spread out across the wetlands, the fast-moving water from rain events carves the channel even deeper. The ditch behaves like a drain, causing further loss of wetland storage and sending more water, more quickly downstream. Simple grade control practices can be installed to raise the creek bed and reestablish the floodplain connection and adjacent wetland storage.

Evaluation

WWA and Evaluators at the UW-Extension Natural Resources Institute collaborated on this evaluation of in hydrologic assessment and restoration, with input from key state agencies including the Department of Natural Resources (DNR) and Department of Agriculture, Trade, and Consumer Protection (DATCP). Utilizing semi-structured focus groups, and an online pre-survey, among key audiences, we sought to:

- Investigate conservation practitioners understanding of hydrologic restoration and the role of hydrology in shaping Wisconsin's environmental outcomes
- Confirm that hydrologic assessment and hydrologic restoration approaches are not well integrated with current land and water management projects and programs
- Characterize the barriers preventing further integration of hydrologic assessment and restoration, and understand the needs that if addressed could help improve integration
- Explore opportunities for interagency, interdisciplinary, and cross-jurisdictional collaboration to incorporate more hydrologic assessment and voluntary restoration into Wisconsin's land and water projects and programs.

The evaluation was not aimed at producing specific recommendations, but rather gathering from key stakeholders the status of and barriers to hydrologic assessment and restoration, and factors that could improve opportunities in the near and longer-term. For theses purposes, we defined hydrologic assessment and restoration for participants as follows:

Hydrologic Assessment

Looking at geology, topography, soils, surface and groundwater interactions and flow, human caused and natural disturbances, and other metrics to understand:

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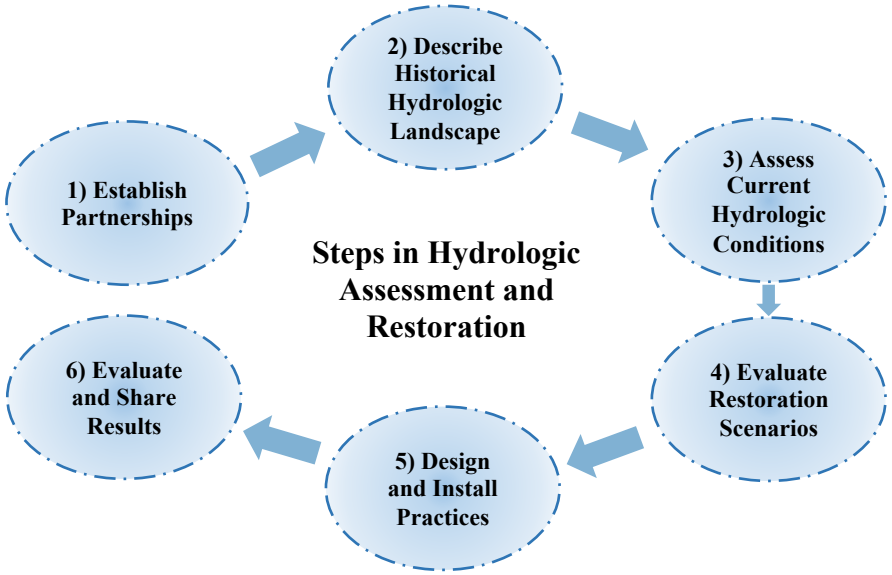
Steps in Hydrologic Restoration

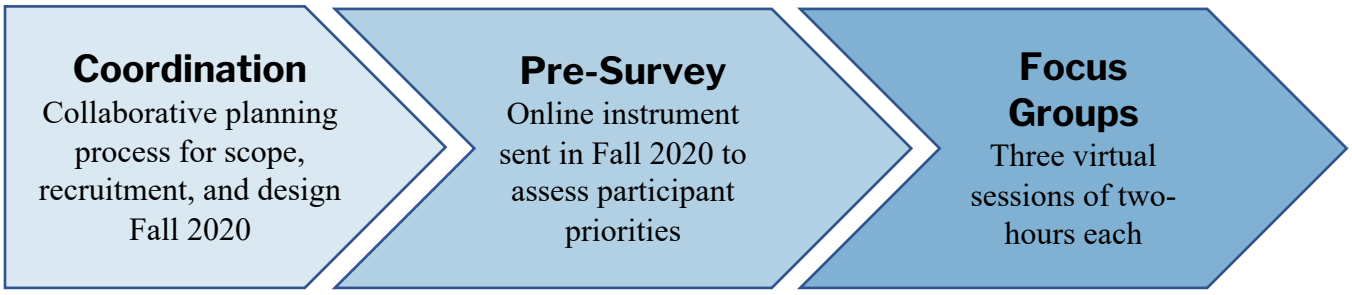
In service of the above goals, this evaluation included some description and inquiry around the steps in the process of hydrologic assessment and restoration, and participant understanding and perspectives on the relative level of activity across Wisconsin.



1: Establish Partnerships	2: Describe Historical Hydrologic Landscape	3: Assess Current Hydrologic Conditions	4: Evaluate Restoration Scenarios	5: Design and Install Practices	6: Evaluate and Share Results
Reaching out to private landowners and other stakeholders in an area, but also includes state managers and others who identify restoration needs, priorities, and goals with other members of the community.	Understanding how changes to the landscape have affected the movement of water. Next, identify if any challenges were introduced. *(Some participants may have interpreted it as describing the distant past, when the focus is on changes over the last 50 to 100 years.)*	Understanding how the current hydrologic system is functioning and identifying challenges or problems. May characterize flow rates, pathways, and landscape features contributing to these outcomes.	Takes the knowledge generated in previous steps to identify restoration needs are and approaches or practices which might mitigate or resolve challenges.	Selecting and designing practices to restore hydrology and changing the landscape by installing these practices.	Takes place after practices have been completed and working for some time. Determine how well a project has been working to learn how to improve or encourage adoption of the practice.

Methods

The main evaluation methods for this project were three focus group sessions, accompanied by a pre-event survey, which we utilized to understand the priorities and perceptions of our participants and to aid development of focus group questions.



Coordination

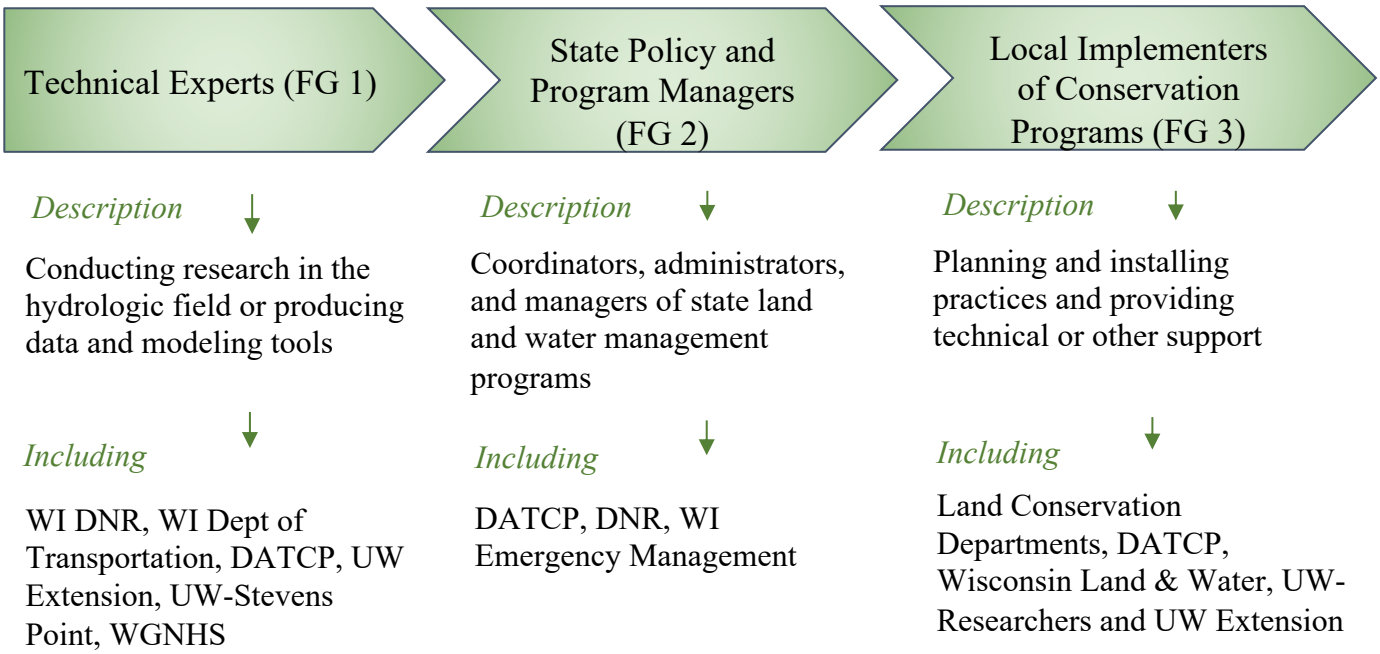
The evaluation was developed through a team effort led by the Wisconsin Wetlands Association and the UW Extension Natural Resources Institute, with input and support from partners at the Department of Agriculture Trade and Consumer Protection (DATCP), the state Department of Natural Resources (DNR), the Wisconsin Geologic Natural History Survey (WGNHS), and Wisconsin Land + Water. This planning committee collaboratively defined the scope, identified individuals for participation, and developed data collection instruments. Collaboration improved the identification of individuals in key roles, and topics of importance to a wide range of state and local agencies connected to state sponsored land and water management work.

Participants

The target population of the evaluation is those who manage, work in, or otherwise support state-led programs focused on land and water management. We identified three audiences for participation: technical experts, state policy and program managers, and local implementers of conservation programs. With input from the planning committee, we purposively selected key individuals in each of the categories across Wisconsin. We grouped participants with similar roles for the sessions, and thus refer to audiences by FG1, FG2, and FG3. Not all participant roles aligned neatly with these distinctions, and there are overlaps in expertise within each session. More detailed, anonymized descriptions of the participants are included in appendix A.

Focus groups are most effective with small groups that allow rich participation from everyone, therefore we invited 11 to 13 participants to each session. Out of 36 individuals invited, 32 attended for a response rate of about 89%.

Methods continued



Pre-survey

We developed an online survey to understand how key audience experiences, assumptions, and perspectives of barriers and needs around hydrologic assessment and restoration differed or aligned with each other. The online survey was distributed using Qualtrics software a few weeks before the first focus group, and 23 completed surveys were analyzed. The results helped the evaluators develop focus group questions, and a subset of survey results were presented in each focus group to encourage conversation. The pre-survey served as a tool to contextualize the most immediate needs for discussion within our limited time, as well as setting a shared understanding with the participants, who came from a range of backgrounds. Evaluators incorporated the most highlighted items by the participants into questions during the sessions, including discussing why some items were ranked differently than others. The survey instrument and results are discussed in detail in the next section.

Focus Groups

Focus groups are valuable qualitative methods for the contextual detail and generative conversations they can produce. Three focus group sessions were held online through Zoom due to the COVID-19 pandemic. Sessions ranged from 90 to 120 minutes in length. The sessions were organized by audience, allowing them to be iterative and additive conversations flowing from scientific expertise, to policy managers, and concluding with on the ground needs at LCDs (See chart on previous page). The focus groups were structured similarly but tailored to the experiences of the three audiences. In addition, we intentionally ordered the sessions so that the technical and data experts met first, and then the questions were refined after each focus group for clarity and to gather perspectives on the previous conversations. Each focus group included sections introducing hydrologic restoration, discussing current efforts, identifying technical or other support needs, and developing policy or actions moving forward. Specific questions asked in each focus group are included in Appendix D.

Methods continued

Data Analysis

The pre-survey was closed two-weeks prior to the first focus group and data were analyzed through descriptive statistics and cross tabs of responses by key audiences. NRI evaluators and WWA subject matter experts reviewed the data collaboratively to interpret the responses. The small non-random sample somewhat limited statistical analysis, which focused on relative distributions of responses to identify areas where the three audiences generally agreed or disagreed, an initial indication of key barriers and needs, and topics for further discussion.

Each focus group was recorded via zoom with permission of participants. Transcripts of the recordings were then created through an online service and screened for accuracy by evaluators. After discussion of the high-level themes, the transcripts were divided between the evaluators and coded independently for additional themes, before trading for validation. Once coding was completed, the coded segments were reorganized to aggregate thematically and evaluate the breadth of the topics in further analysis. Evaluators consulted subject matter experts at WWA to ensure comments were read in context and conveyed accurately. Participant quotes are presented in this report anonymously and may be lightly edited for clarity or length.

Limitations

This evaluation focused on key audiences in state-sponsored land and water projects and programs in the context of Wisconsin, but other voices are also relevant to understanding how to improve conservation approaches. One important limitation is that we did not include perspectives from the general public, private landowners, tribal nations, and other relevant stakeholders. Other efforts may seek to add these voices to understand their roles, barriers, and needs in this space.

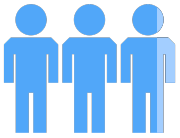
Additionally, findings are reported at a high-level, so this report speaks to general features across these domains, but certain nuances may not have been captured or reported. Further work to fill in these details could improve policy and program development in Wisconsin.

Survey results

Selected survey results are presented below, with the full questionnaire and results in Appendix B and C. The **23** completed surveys represent a **72%** response rate among the 32 focus group participants. The small non-random sample limits statistical comparisons, but the distributions were still informative as we planned the topics and questions for the focus groups.

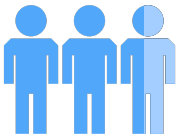
a. Agreement with the status and value of restoring hydrology n=23

The survey confirmed wide agreement regarding the impact of and need for hydrologic restoration in the state of Wisconsin.



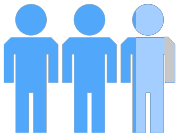
91% agree 9% Neutral

Historical and current land uses have altered hydrology and reduced the capacity of wetlands, rivers, floodplains to manage runoff.



83% agree 17% Neutral

Restoring degraded hydrology can help address many water management challenges.

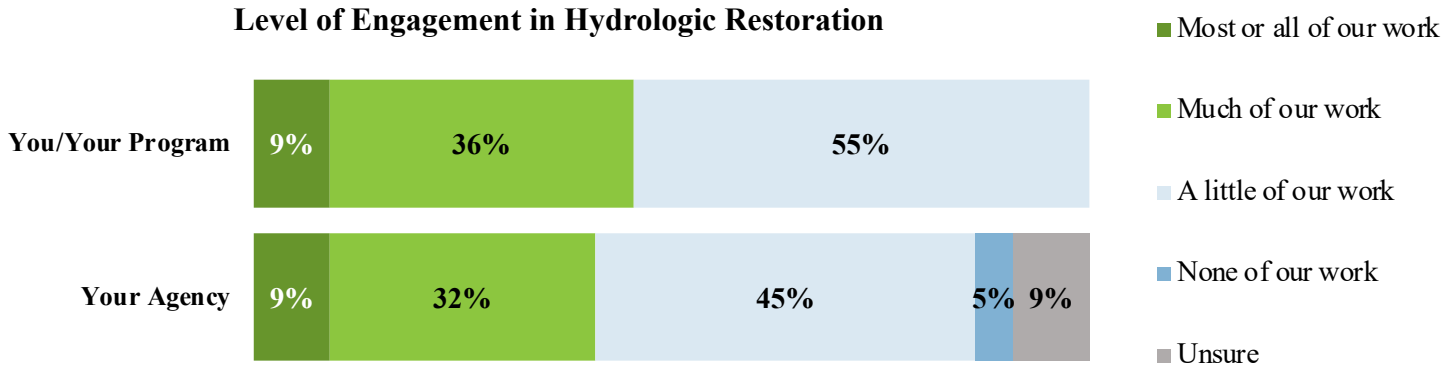


78% agree 17% Neutral 4% Disagree

Wisconsin does not have, but would benefit from increased coordinated efforts to restore hydrology.

b. Program and agency level of engagement n=22

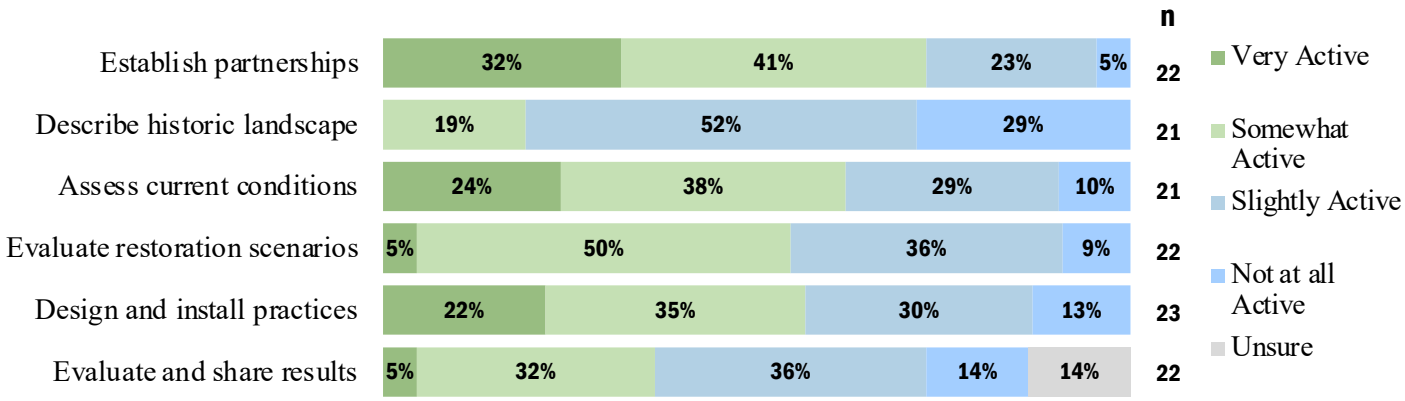
Results showed a **low level of engagement** on hydrologic restoration activities, helping to validate that more work to integrate HR was necessary. While participants represented agencies or programs involved in land and water management, **more than half indicated a low level of engagement** in work to assess and restore degraded hydrology. These results were used to frame questions regarding barriers to wider engagement.



c. Local hydrologic assessment and restoration activity

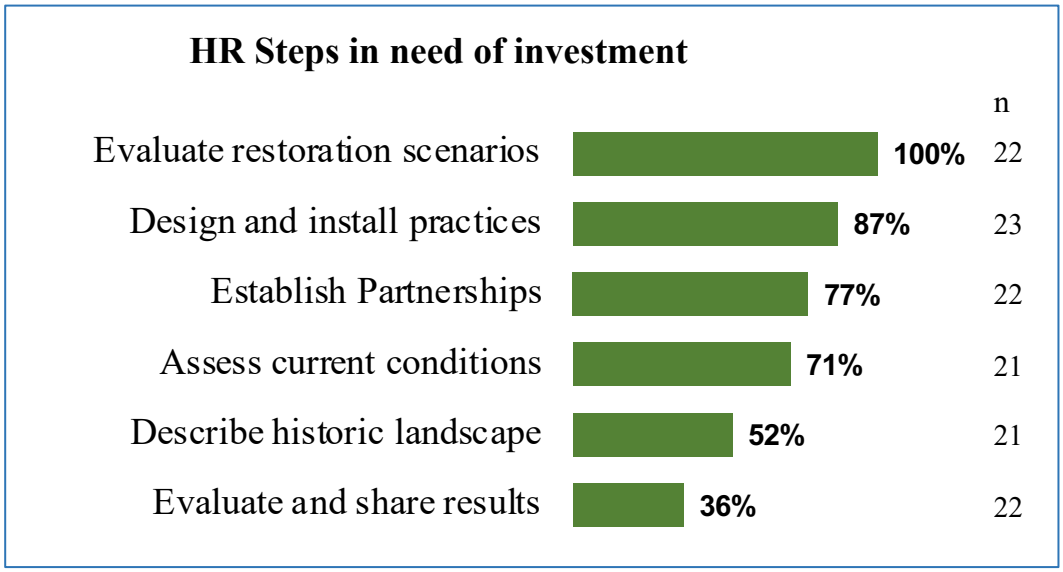
The survey identified **six** steps in hydrologic assessment and restoration and asked respondents to report the level of local activity on each step. The chart below lists the steps in order.

Overall, most respondents indicated that **four of the six steps were somewhat or very active** locally: establishing partnerships, assessing current conditions, designing and installing practices, and evaluating restoration scenarios. However, activity was concentrated in restoration over assessment. These results informed focus group conversations on the importance of assessment and barriers, including the availability of data. We sought to understand whether current assessments are sufficient to develop robust restorations that improved landscape function, or if limited assessment presented challenges.



d. Investment priorities

Participants were next asked to select their top two investment priorities out of the six HR steps. Responses again coalesced around restoration steps rather than the assessment steps. This finding was addressed in the focus groups when we sought to understand reasons for this lack of prioritization of assessment. These results also led us to ask about how to invest in improving restoration activity among LCDs and other entities.



e. Rating of barriers to hydrologic restoration

Respondents emphasized lack of data and decision support tools to quantify benefits of hydrologic restoration, and institutional silos as the most significant barriers. About 32% indicated that lack of coordination and lack of understanding of impacts of degraded hydrology were significant barriers. Technical experts were more likely to see limited understanding of hydrology as a significant barrier than the other two audiences. These results led us to probe on the structural challenges preventing integration of HR, including the lack of data and poor collaboration, rather than educational barriers.

f. Top actions to improve state-sponsored restoration

Respondents selected their top three out of eight actions to improve integration of state sponsored hydrologic restoration. There was relatively wide agreement that top actions should include:

- supporting local government in planning and implementation of restoration,
- investing in pilots and demonstration projects,
- developing models and decision support tools, and
- recognizing hydrologic restoration goals in policy.

Crosstabs revealed distinct preferences among certain groups, outlined in the appendix. These results led us to inquire in the focus groups about the types of support local governments would need, and how to tailor the preferred actions to the audiences and specific issues.

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Focus Group Findings:
I. Status of Hydrologic Assessment and Restoration

I. Status of Hydrologic Assessment and Restoration

We began each focus group by asking participants to reflect on hydrologic restoration in Wisconsin and any connections to their program or agency goals. Definitions had been provided in our background materials and pre-survey, and were presented again after introductions in each focus group (See Executive Summary and Methods for the full definitions). In general, participants held similar and scientifically grounded understandings of the goals of hydrologic assessment and restoration and identified many connections to state programs.

In sum, Hydrologic Assessment refers to the scientific study and characterization of a hydrologic system, with consideration to a range of interdisciplinary factors and influences. Hydrologic Restoration refers to the acts and practices designed and implemented on the landscape that seek to return hydrology to a more natural and self-regulating condition. Participants expanded on these definitions and offered their own perspectives about the goals and limitations of restoration in returning landscapes to their natural conditions. In the focus groups, participants identified the assessment stage as key to understanding "what are we restoring *for*."

"To me, it's bringing back the conditions that persisted prior to man's influence upon those conditions and bringing it back to qualities that we could continue to use and have in its natural settings." Session 1, DATCP

"I think it's more of trying to improve the system to meet...competing needs and having that focused around water as this unifying process to get there." Session 1, Research Scientist

"I don't think of it as restoring to some static precondition, but it's restoring functions, integrity, resilience. It's that idea of promoting resilience to withstand changes that would have happened before, but it's going to look potentially very different than it did in the past." Session 2, DNR

Participants expanded that key goals in Wisconsin's hydrology are to restore infiltration, storage, and connectivity. The participants also added that while the principles guiding HR are consistent across geography, each region or site must be considered within its local context to understand which specific functions have been lost and what practices are most appropriate to restore them.

"To look at the state as a whole is dangerous, because you have so many different land uses and geologic types throughout the state, that, when you are talking about something in a general term, that could be very different or wrong for certain parts of the state. So it's hard to generalize discussions about restoration, because you have so many different …areas, comparing central sands to the Driftless area or even to the Northern thirds or along the tight clays, along Lake Michigan. There's so many different components that go with it." Session 1, DATCP

The discussion also highlighted the importance of scale in restoration. Participants described the interconnectedness of hydrologic systems describing how the benefits of restoration are often shared downstream, rather than exclusively local. They agreed that landscape level changes are needed to meaningfully address lost functions such as infiltration or storage. Thus, hydrologic assessment and restoration must both be considered at the watershed scale.

"A lot of that water is coming from far beyond the city and they struggle with dealing with water hydrology issues that they have no control over. The issues are to scale and we need to look at it in terms of scale" - Session 3, LCD Specialist

Climate Change and Restoration

Participants acknowledged that a changing climate adds urgency to the need for restoration work while adding uncertainty to predictions of how water systems will behave in the future. References to the impacts of climate change peppered the discussion, often regarding the impacts to Wisconsin's infrastructure.

"We're seeing more rainfall, increased flows, more extreme incidents happening in terms of the intensity… With bridges and culverts. They're undersized. They're not designed to 100-year flood events, and we're seeing those more frequently. How do you bring the infrastructure, the modeling, the design with what you're seeing, and bring the regulation and the actual implementation of that into play? So, …those are things that we're really questioning and looking at, and how do we start moving that forward" - Session 2, Engineer DNR

"Climate change has been mentioned. That's just exasperating these processes even more. We've seen it in our water quality assessments, and on streams where we're measuring flows, and the intensity of storms and when they occur and how often and the frequency. And we have to adjust our approaches and our planning and our practices to reflect that." - Session 2, DNR

Programmatic Connections to Hydrologic Restoration

As illustrated in this section, the focus group conversations highlighted many benefits of hydrologic restoration and the ways HR could support the goals and priorities of existing state programs, from water quality to emergency response.

Improving Water Quality

Many participants working in water quality described the role of hydrologic restoration in addressing problems related to nutrients and sediment.

"One of the biggest components of improving water quality is hydrologic assessment and restoration. We're using watershed-based planning as a key strategy or a framework within our state for implementing TMDLs and restoring impaired waters, and obviously addressing, restoring hydrology so there's more adequate flow and recharge and everything else to the system, so we have better water quality and better habitat." - Session 2, DNR

Agriculture

Participants engaged in the design and installation of on farm soil and water conservation practices noted that altered hydrology undermines the potential benefits of those practices.

"If some of those same fields have soil health practices installed in them and they have drain tiles, it's one step forward, two steps back. We're increasing infiltration, but we're short-circuiting the system if some of those fields are tiled as well. So it's a big challenge. And there's a lot of further work to do with respect to better understanding how agricultural drainage is altering hydrology." - Session 2, Watershed Coordinator

Fish and Wildlife

Fish and wildlife experts discussed the importance of understanding hydrology when working to restore or improve habitat.

"The driver in our program is to provide habitat for waterfowl. One of the best ways to do that is to restore wetlands. How that ties in with hydrologic assessment is you need to understand the hydrology of a system to restore it. To efficiently restore wetlands, you have to understand how the water works and then how hydroperiods are affected. And that affects the biotic communities, which waterfowl depend on" Session 2, Scientist DNR

"…how I think of hydrologic restoration, from a fisheries background, thinking about how fish respond to the hydrologic influences in streams and lakes. So it's more of this ecosystem service endpoint, we're thinking about how to restore or increase ecosystem services, especially those ones that relate to fisheries, but more broadly as well." Session 1, Scientist DNR

Infrastructure and Emergency Response

Participants involved in flood risk reduction and response recognized the ways that degraded hydrology contributes to flood damage and acknowledged the flood risk reduction benefits of restoring wetlands and other waterways.

"We're trying to expand what type of projects we're working with communities on, specifically to restore waterways. Healthy waterways mean more storage for floodwaters and less sediments washing down a stream to take out infrastructure. So we're trying to think creatively about how to pair funding for some of these projects that enhance ecosystem services" Session 2, WEM

County Land Conservation Departments

Representatives of County LCDs described hydrologic restoration as an element of runoff management and expanded on the many economic and environmental benefits it can provide.

"The objectives in our county are to responsibly manage runoff and groundwater resources. Water resources are important from a recreational perspective, economic perspective, and an ecological perspective. Each year our office tries to undertake at least one restoration project, wetland restorations. We look at those as opportunities to enhance groundwater recharge and water quality in our county." Session 3, LCD Specialist

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Focus Group Findings:
II. Importance of Hydrology and Addressing Degraded Hydrology for Land and Water Management

II. Importance of Addressing Hydrology

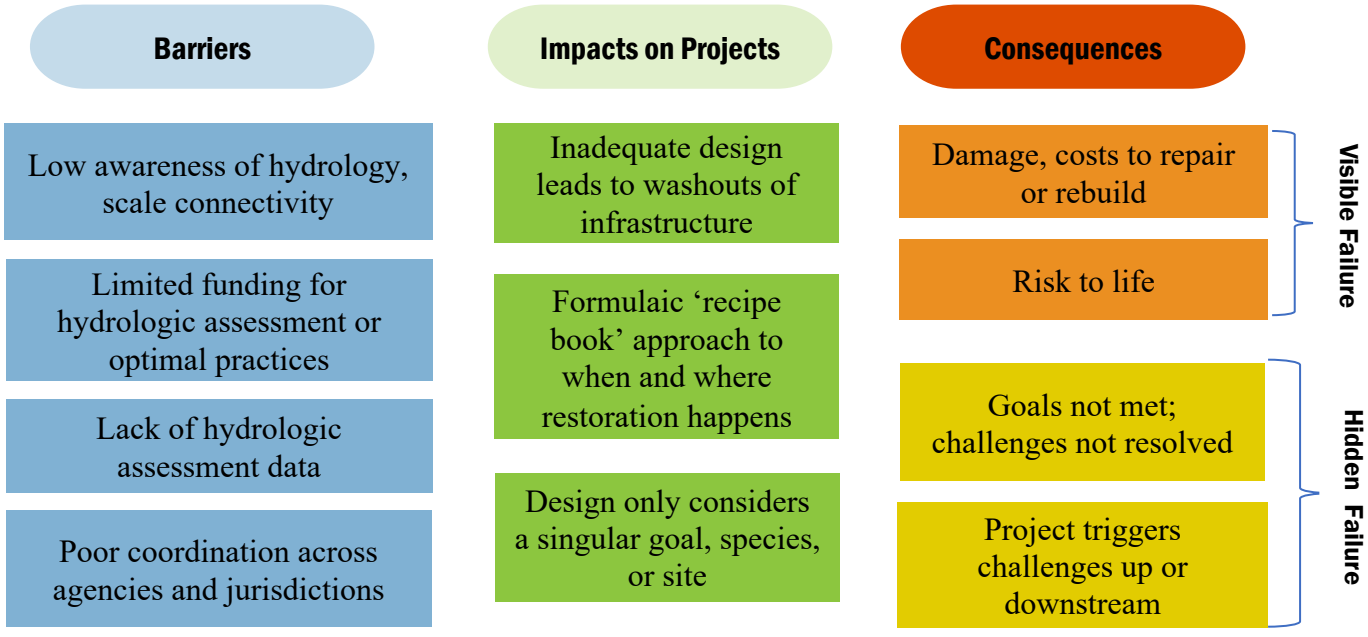
In the pre-survey, our focus group participants strongly agreed that degraded hydrology has reduced the capacity of wetlands and streams to manage water, and that restoring degraded hydrology could help address many water management challenges. They also indicated low levels of engagement in HA/HR work. We carried these findings forward in the focus groups to explore the consequences of proceeding with projects without fully understanding or considering hydrology. The overall perspective was that without understanding and addressing hydrology, water challenges would not be resolved, and practices or infrastructure would not be stable.

"I think the consequences of not understanding hydrology are the problems are not going to get better despite practices on the landscape. Also if we don't understand the hydrology now, the practices that we're putting on the landscape, not only is that not going to solve it now, but in 30 to 40 years, how's the hydrology going to be even more different? And…money that we're spending now is that even going to be efficient in the future?" -Session 3, LCD Specialist

"Consequence is a failed project, which is pretty common… My observation working in the full spectrum is, if you really don't understand the natural hydrologic system that it was meant to be, and you really don't understand how it's currently behaving as you're working in designing the future project, then usually that project fails." - Session 1, DOT scientist

Participants concluded that Wisconsin generally pays insufficient attention to understanding and addressing hydrology and identified a variety of reasons, impacts on projects, and consequences (Fig. 1).

Figure 1: Consequences of not considering hydrology



Washouts

The most evocative form of failure discussed was infrastructure washout. Participants recalled images of washed-out highways, roads, or homes on local news following severe storms. Participants described how placement of infrastructure and poor assessment of the range of historic, current, and predicted hydrologic conditions contribute to these damages.

"I agree 100% as someone who spends my working hours looking at failed infrastructure and failed interventions, specifically with bridges, culverts, and road infrastructure. Once you get out of more developed areas, most water crossings in rural Wisconsin were not built based on a knowledge of hydrology, it was just someone put it there." - Session 2, WEM

"I wonder whether the issues are that we didn't understand existing hydrology or whether it's really that we have unpredicted and unprecedented conditions that have caused these. So I'm curious whether all these bridges, if it's not understanding the past hydrology, or if it's the future hydrology that we don't really understand or accept that's going on." Session 2, DNR

Failure to Achieve Objectives

While providing less dramatic visuals, participants highlighted the significance of projects that fail to meet their restoration objectives - such as creating better habitat, slowing water flows, or promoting infiltration. Participants described failures in this category as falling along a spectrum from possibly meeting only a fraction of the expected potential impact, up to projects actively creating new challenges locally or distantly along the stream. Some involved *formulaic* approaches to restoration design that assume all the pieces that fit in one place will fit in another, rather than looking at site-specific hydrologic context.

"We have people tasked with implementing habitat for various wetland dependent organisms, there's more of a history and culture of thinking about prescriptive, formulaic approaches to creating good habitat for these critters, but without an understanding of the dynamic nature of hydrology. It becomes more in tune to, 'If we can put these pieces and ingredients together and come up with a formula to make this habitat…' We follow the recipe and it's productive for a little while, and then that dynamic nature disappears, and we turn into a really unproductive system and whatever hydrologic restoration functions we facilitate[d] at the beginning have been lost." Session 1, DNR Scientist

"Hands down, the biggest thing I see awry on the landscape is the systematic rocking of our streams and locking in the alignment. That stream has nowhere to put its energy, it turns its energy to the bed, it down cuts it in sizes, it gets disconnected from its floodplain." Session 1, DATCP Engineer

"The comment on streambank protection is interesting because I think most of the public believe this is a good thing - good for fishing, looks good, seems to prevent local erosion, etc. but might not be best for the watershed overall." Session 1, WGNHS

Participants described other failures arising from myopic approaches that consider only the project site or establish goals to enhance habitat for a single species. They fail by overlooking broader and connected restoration goals or by creating challenges up or downstream.

"If you look to [the] county's response to some of this [groundwater flooding] is conveyance. "Oh, we need to dredge." Their investment portfolio is dredging. Or clearing macrophytes in the chain of the river. It's not about hydrologic restoration, it's about conveyance of flood flows and high water...to pass it downstream." - Session 2, DNR Scientist

"In general, the myopic look at just a small reach of a stream without considering the impacts on the upstream and downstream watershed, in my opinion, would be a failure." - Session 1, DATCP Engineer

Participants connected these failures to not understanding and accommodating hydrology, conveying that, for Wisconsin to sustainably address its water challenges, understanding hydrology will need to play a more significant role.

Failure or Learning?

One participant argued optimistically that the failures being described should be considered an inescapable part of the learning process and suggested that by taking stock of the knowledge and results gained through past efforts, we may learn and improve going forward. This evaluation represents an effort in this spirit, to catalogue past experiences and improve efforts in the future.

"We're learning as we go along, watershed restoration is what, 30, 40, 50 years young or old…so we're learning as we go. No blame on what our predecessors had done before us, but it's nice to see that we're opening up our view to a more holistic approach to the entire watershed and the impacts up and downstream of our projects...I think the failure is not necessarily a failed project as it is more of a learning process as we move forward." - Session 1, DATCP Engineer

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from Noun Project

Focus Group Findings:

III. Barriers: Why isn't more Hydrologic Assessment and Restoration happening?

a. Limited understanding of hydrology
b. Lack of coordination
c. Funding constraints

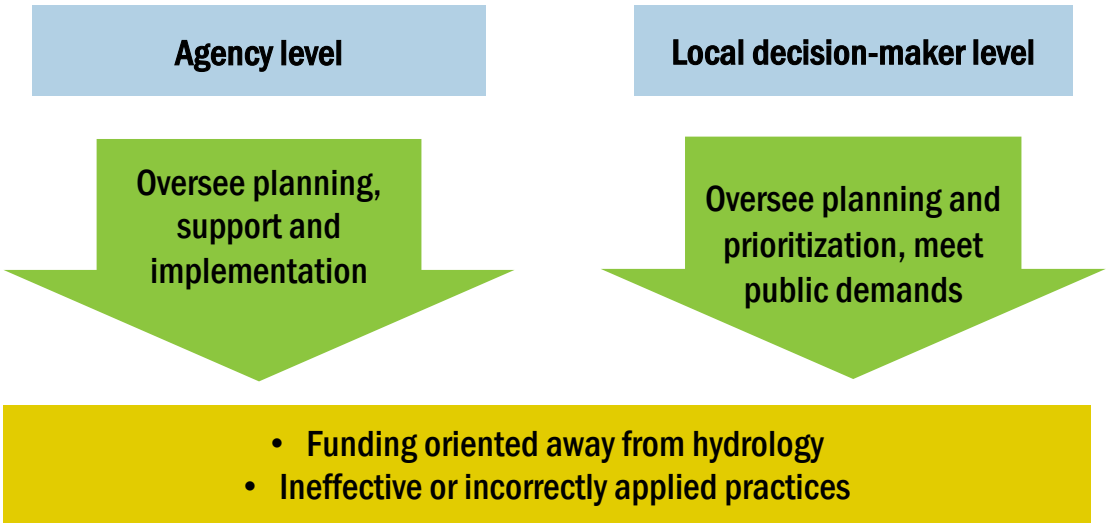
III. Barriers

a. Limited understanding of hydrology

Recognizing the importance of hydrology to Wisconsin's conservation outcomes, the focus groups also covered barriers holding back further integration of hydrologic restoration in the state.

A significant reason that hydrologic restoration has not been better integrated into state programs is lack of awareness or understanding of hydrology. Participants described this as a shortcoming amongst key stakeholders including state agencies, local decision makers, and local landowners. Perspectives on the roles of each of these stakeholder groups are described in more detail below. Overall, hydrologic restoration is not seen as a priority, as reflected in local plans, funding requests, and assessments. Focus group participants recognized that degraded hydrology is a core cause of many water challenges, and that those connections must be understood and utilized for effective solutions.

Figure 2: Planning Impacts of Misunderstanding Hydrology



State Agencies

Participants detailed instances where state agency professionals ignored or misunderstood hydrology. In some cases, they suggested a lack of training on these topics as a driver of misunderstanding.

"A lot of people doing work on projects don't really appreciate the variability of the hydrologic system, they just don't. And so, design projects will happen where they're doing their assessment and it happens to be a serious drought period, and then they wonder why, after this project's done, it's too wet or too dry, and the simple answer in a lot of cases is I don't think they really appreciate the variability of fluctuation." - Session 1, DOT

However, in other cases a disconnect between groups with different types of expertise and new advances in restoration practices contributed to limited understanding of hydrology.

"[At an orientation], a specialist was talking about how we manage banks and habitat and he said, 'You can look at it and you know it works. Habitat restoration is an art, not a science, and we don't need to collect data.' It was astounding to me that's a perspective out there. There's not a lot of thinking of the science or data in general, let alone hydrologic connectivity or…how the fish interact with it. It's a professional silo where the people taking these actions on the landscape...they're heavy equipment operators. It's different than people coming at it from this whole system, interdisciplinary scientific approach. There needs to be a better connection between those two groups." - Session 1, Scientist DNR

Participants noted that underestimating how degraded hydrology contributes to water challenges is reflected in existing state level program administration and project planning.

Local decision-makers

At the local decision-making level, elected officials and conservation practitioners developing plans and policies must respond to public pressures for action on water issues. However, if they are unable to identify hydrology as a key cause, and do not address it in their plans, then they are unlikely to encourage or invest in hydrologic restoration work. Participants felt that hydrologic expertise and awareness was lacking among these audiences, and their constituents, though recent severe flooding had helped to raise awareness.

"For those counties that have issues come to the surface through their planning process, our funding would be able to be used for practices...and in the last couple of years, when there was a lot of flooding, we did see the land and water plans starting to talk about that, and how to prevent that, what sort of practices that might need to be done. But really, we would need more engagement at that local level from stakeholders to drive changes in the land and water plan that would then change the way our money would be being used." - Session 2, DATCP

Landowners

Members of the public and landowners typically do not recognize the connection between the challenges they face and degraded hydrology. The lack of focus on hydrology among citizens, particularly landowners with promising sites for voluntary restoration, was discussed as a barrier. Participants described how a lack of awareness of hydrology contributes to a lack of participation in conservation and restoration programs, restricting the areas of land that can be restored. They indicated that many landowners focus on their own needs without full appreciation for the connectivity of hydrology, while some may find the costs of restoration to be prohibitive. Participants spoke frequently about the difficulty of recruiting landowners without a strong economic incentive and that improving participation rates would be necessary to achieve landscape-wide restoration goals.

"DATCP pours millions of dollars…and that's on top of the tens of millions of dollars that the Federal EQIP Program puts into... on the landscape into practices. A challenge is that there's always a cost share, right? There's 25, 15, 10% cost share to the landowner to have these practices implemented. And so, when the farm economy is down...they're not investing any money into practices and new equipment, they're just hanging on to survive and service their loans from previous years. And so that's a challenge when it comes to the grant funding …So looking for opportunities to bring in other funding sources to help landowners cover that 25% cost share might be a good mechanism to get more projects on the ground." Session 1, DATCP Engineer

Hydrology Disruptors

Another element preventing broader hydrologic restoration are actors or entities actively disrupting restoration efforts. In our focus groups, drainage districts were raised as emblematic of this challenge. Drainage districts emerged prior to Wisconsin's statehood and authorize groups of farmers to exert legal authority over land to promote agricultural drainage. Often these practices contribute to degrading hydrology, and drainage district areas are not subject to enforcement of conservation regulations. Participants described them as a barrier to restoration in areas of need.

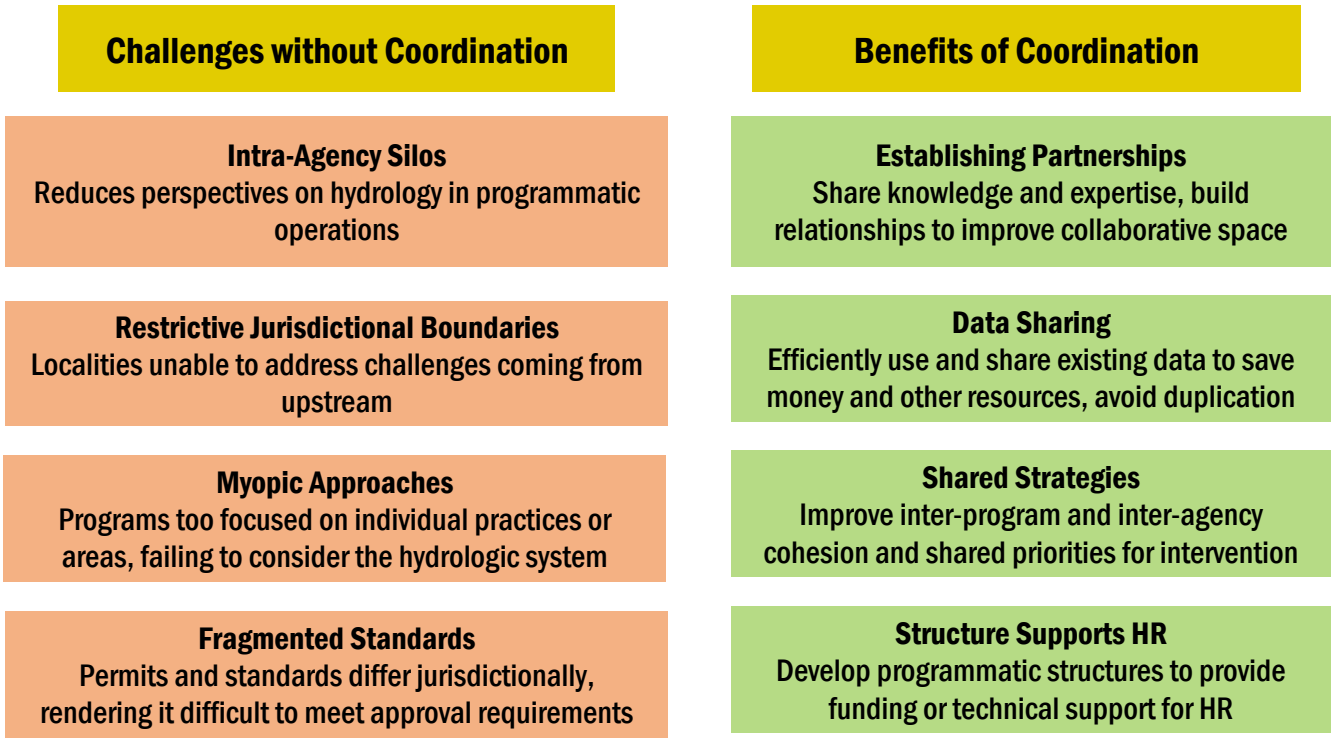
b. Lack of Coordination

Simply increasing awareness of hydrology will not address other barriers to greater integration of hydrologic restoration. Coordinating efforts to prioritize, address barriers, and improve the scope of restoration projects in Wisconsin will also be important. Participants described how the current approach involves fragmented and siloed programs, rather than utilizing resources through a coordinated strategy to achieve shared goals. In Wisconsin, this lack of coordination begins high-up at program level planning. Participants expressed that coordination has regressed in recent years as statewide program resources and supports were removed.

"It was all around basins…we divided the state into 23 major basins, we had basin supervisors, we had basin planning. We fully embraced this idea, and it was bringing everybody together within the DNR, but we also had external partner teams…I think we've lost that, or we have it, but it's not consistent around the state. There are places where I think there are effective partnerships that have evolved or been maintained, but without necessarily all of the institutional support that once existed."
Session 2, DNR

Participants argued that coordination is essential to hydrologic restoration due to the scale, technical data requirements, and interdisciplinary nature of this work. No single entity can fix these water challenges alone. Instead, state agencies, counties, and other stakeholders must strategically contribute their expertise, perspectives, objectives, and resources in more coordinated approaches. The figure below illustrates some of the consequences of not having a coordinated strategy for restoration across the state, as well as benefits of coordination identified by participants.

Figure 3: Challenges and Opportunities in Coordination



Program-level Coordination

This evaluation was most interested in coordination at the program level where planning, strategies, and development of tools, guidance, and policies to support hydrologic restoration occur. Participants identified that the absence of coordination made planning and implementation of projects more difficult in numerous ways. These included making relevant data harder to locate or access, creating a complicated web of differing requirements and standards, and more generally, failing to synthesize interventions to produce a cohesive strategy. The decisions made, or not made, at these high levels trickle down into the LCDs as they complete assessments, seek funding, secure permits, or locate technical assistance.

"Because of resource constraints and staffing constraints, we do tend to go where there's interest. We target, but it's definitely a piecemeal approach...I'm really trying to figure out how to do this in a more coordinated fashion at a statewide level, or to facilitate that. It seems like some kind of overarching framework would just help galvanize resources and get us to do this more consistently without creating new regulations or policy." - Session 2, DNR

More broadly, the absence of coordination promotes a piecemeal rather than landscape or systems-scale approach to land and water management. This lack of coordination also fails to develop support tools and resources for communities that would prefer a more comprehensive approach, but lack the resources or know-how to do so.

"So many projects can compartmentalize, they just do little compartmentalized projects in sequence. There really is this need to take the bigger picture look that the Wisconsin Wetlands Association is promoting, the watershed look. It's the people that are doing the site-by-site projects versus [the people doing] the big picture. And then how you understand the variability through time, not only the legacy variability, the current variability, but the future variability likely coming online with those landscape changes." Session 1, Scientist DOT

Local Coordination

The local nature of on-the-ground conservation planning creates another barrier to watershed-scale hydrologic restoration. Ecological systems do not conform to political boundaries and interventions often must be coordinated across watersheds to produce meaningful impacts. Many state policy managers felt limited in their ability to promote HR because LCDs have the primary authority for planning and implementing projects. At the same time, LCD representatives discussed how many local challenges were caused by factors in upstream communities beyond their political boundaries.

"As an example, the Fond du Lac River runs right through the city of Fond du Lac before it gets to Lake Winnebago, but a lot of that water is coming from far beyond the city of Fond du Lac, and they struggle…with water hydrology issues in the city, but a lot of it they have no control over…the issues are to scale and I think we need to look at it in terms of scale." Session 3, LCD Specialist

"It's this whole idea of managing at a watershed scale, and that same thinking is probably what we need to be doing to think about hydrology. It's the state policies, but it's the local government, they're the ones that can actually help make it happen, versus the state right now. At least the way things are set up in our state. We don't have watershed organizations that have any kind of legal teeth, or authorities to make these decisions. But at the local level, or maybe county level, that's where some of that does exist." Session 2, DNR

Project-level Coordination

Participants also described how lack of coordination at the program level leads to confusion and delays at the project implementation level. The most cited example was permitting standards and processes which vary by agency and jurisdiction, adding a great deal of complexity to executing conservation or restoration.

"If we had better inter-agency coordination, we could find consistency between what's been done in certain places that's worked or share insights on ways to do things well, and find some consistency on how policies or permits would be approached. It's constant that I'm hearing or finding inconsistencies in …requirements. And yeah, there's differences in the watersheds, but like inherent differences in the way the rules are applied seem very different."- Session 3, DATCP Engineer

Need for Data Coordination

Several participants discussed how the lack of data sharing between LCDs and state agencies created significant barriers to accessing data as well as learning from successes and failures across the state. They recognized that a great deal of relevant data has already been collected, but it is siloed in various programs and agencies. This makes it needlessly time-consuming to determine *if* the data exists somewhere, and then *where* it is. Participants felt that better coordination could develop a data sharing infrastructure to aggregate data and streamline locating relevant data. This topic is discussed with more detail in the data and decision support needs section.

"This is an example of where we may have data that are not used widely because we're not sharing data across our silos. The data and the technologies are there, we can have a lot of this data at our fingertips, we just need to get across those institutional silos to make it available." - Session 1, DNR Biologist

c. Funding Constraints

Some of the most significant barriers to adoption of HR in the eyes of participants are Wisconsin's conservation funding mechanisms. For example, LCD base-funding comes in two-year grants from DATCP. Cost-share funds are allocated to projects based on plans developed by LCDs or to help landowners comply with regulatory standards. Participants felt that current state approaches to funding restricted their capacity to engage in HR.

Overall, participants expressed that inadequate funding reduced staff capacity and made it difficult to invest in new approaches. They described constraints created by short-term grants, such as rushed planning and implementation, and the need to reapply frequently to fund the next stage of a project. Grants or other funding that supports a limited number of practices or responds only to non-compliance with agency standards make it difficult for LCDs to carry out long-term or preventative HR work. Instead, under the current system, LCDs must focus on responding only after visible challenges and non-compliance emerge. These structures hamper the ability of LCDs to engage in HR across Wisconsin.

"One thing that we've seen in the past is perhaps there are some solutions for work in streams, but current permitting or state agencies don't allow for those types of practices. So that's one thing that we're considering now is, are there changes that could be made to policies or shifts in the way that things are designed or permitted?" - Session 3, LCD Specialist

Similar challenges arise from the narrow geographic reach of many grants or cost-share programs, which fund assessment or practices for a specific site, but do not permit or encourage a broader approach. Hydrologic restoration, and effective conservation, require consideration of the bigger picture, and resources to address degradation across a watershed. It is difficult to achieve hydrologic restoration when funding structures are strictly geared toward singular, site-specific projects.

"When you are designing piece by piece, within a larger watershed, the challenge is the funding usually just comes to that one piece at a time and so, you don't have the funding for the entire watershed as a whole. It's...project by project and therefore you may be missing points in your funding that has the whole ecosystem in thought and process rather than just those individual projects. When you're funding, you got to deal just with that individual project, whereas in reality, you should be looking at the entire ecosystem…" - Session 1, DATCP

Participants also described how Wisconsin's overall financial investment in conservation was below what is needed. They described how limited staff available for LCDs creates severe resource constraints leading to backlogs of work. A lack of staff also reduces opportunities to build relationships with private landowners and other stakeholders, which are key steps in hydrologic restoration.

"Counties are big areas, though. It is a very limited amount of funding that they're provided for staff for Land and Water plans, though. Some counties have other funding sources and they have more staff, others have very limited staff. The ones that do more watershed-based work, I would say, have other sources of funding and they're being more comprehensive" - Session 2, DNR

Figure 4: Hydrologic Restoration Funding Constraints and Quotes

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Focus Group Findings:

IV. Needs: How to Support Hydrologic Assessment and Restoration

a. Improved Coordination
b. Watershed-Oriented Funding
c. Data and Decision Support

IV. Needs

a. Improved coordination

As they discussed the challenges created by lack of coordination, focus group participants also expressed approval for a collaborative forum to provide frameworks and support for hydrologic restoration. Participants described a coordinating forum that could identify challenges to adoption of HR across the state and produce guidance and policies to overcome them. It could support planning that acknowledges the importance of hydrology, be interdisciplinary, incorporate watershed-scale approaches, and address priorities of diverse stakeholders. They also said that ideally this type of forum would allow professionals to break out of silos and could provide infrastructure across programs and jurisdictions to improve the quality and ease of conducting hydrologic assessment and restoration.

"If there was this forum that would help map these ideas and then have a program associated with it that would allocate funding, if there was funding allocated for staff, if there was a toolbox that included the tools that we need, and funding allocated for project implementation - ideally if all those pieces came together, then we'd have a package to be able to efficiently implement this type of work…it would take all of those pieces because you can't actually implement projects on the ground with any of those pieces missing. It's a huge concept." - Session 3, LCD Specialist

Structuring a Forum

The participants acknowledged some likely obstacles to organizing such a forum. They offered ideas on how to foster productive engagement that would be inclusive of interests from the local level up to the federal level. Participants also offered numerous accounts of past or contemporary coordinating entities to learn or build from, and highlighted partnerships with NGOs that provided expertise, technical assistance, and other types of support. The box below provides a few examples, for more quotes from participants, see Appendix E.

"Whatever model, it needs to recognize the structures we already hold. Every agency has its own structure and dogma. We don't have to organize staffing around watersheds, we can think and manage by watersheds. But there still has to be a house for this collaboration somewhere. And if it's really voluntary and non-regulatory in nature, it's got to step down to a more local level." - Session 2, Scientist DNR

"I'm just curious as to some thoughts about... drainage districts and in essence, maybe that one of our tools might be the creation of something that's hydrologic function districts rather than drainage districts" - Session 3, Researcher

Coordination Examples Mentioned:

- Fox-Wolf Watershed Alliance
- WI Producer-Led Watershed Protection Grants Program
- Minnesota 10-Year Watershed Assessment and Planning
- WI Groundwater Coordinating Group (GCC)

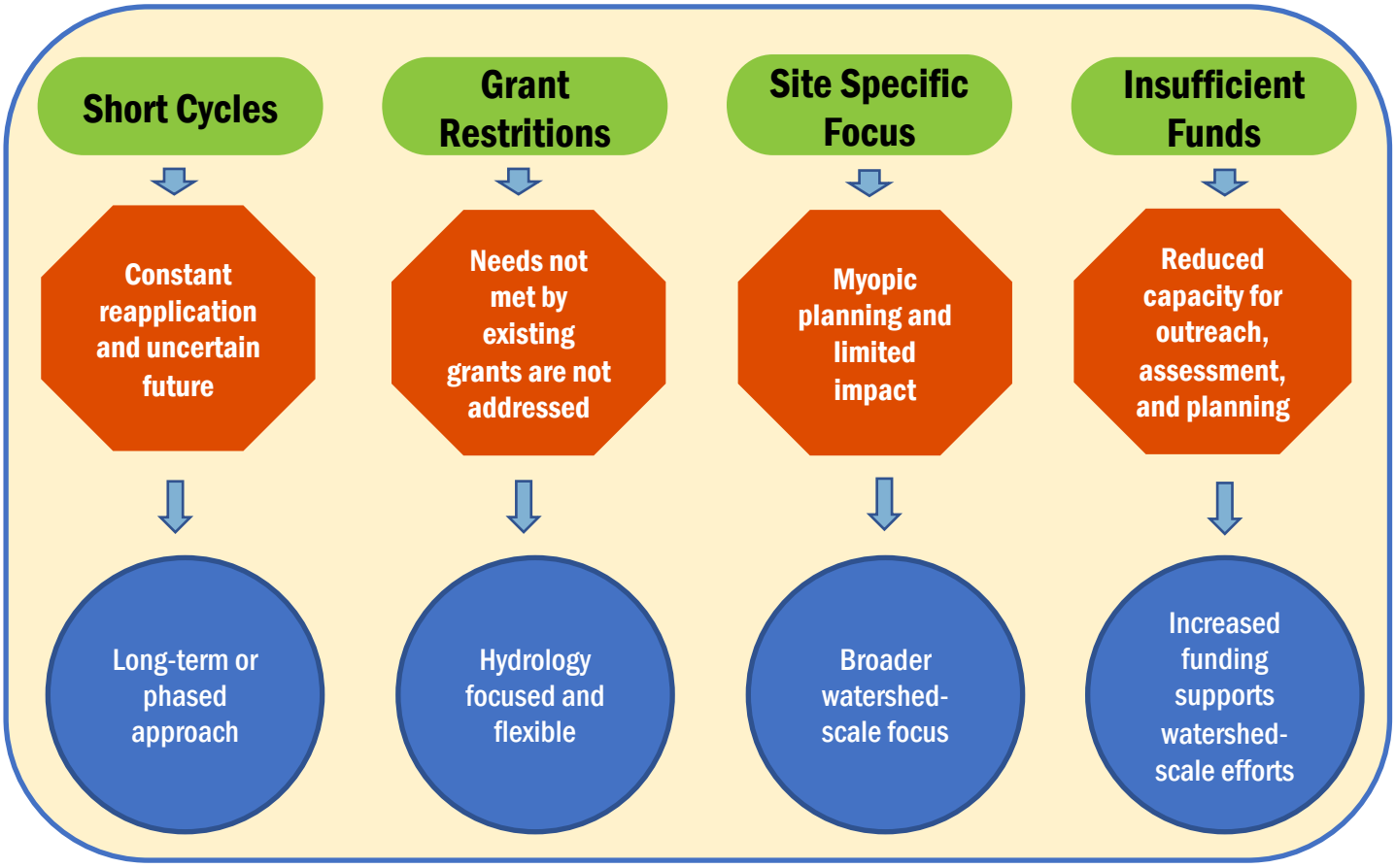
Role for NGOs

Participants highlighted the efforts of a range of NGOs and community organizations as instrumental to supporting HR. They said these entities helped address technical and resource constraints within LCDs, and the wide reach of NGOs provided some coordination across jurisdictions and entities. Participants advocated for the value of these organizations and encouraged further partnerships and engagement moving forward.

b. Watershed-Oriented Funding

Participants provided many ideas and recommendation to address the barriers in current funding structures. To meet the scale of these challenges, they proposed longer funding cycles to cover both assessment and implementation phases, more interdisciplinary and hydrology-focused funding to expand the types of projects and concerns that may be addressed, funding that is watershed-scale, and increased net investment to alleviate staff shortages and bottlenecks. Figure 5 connects these recommendations to the barriers described earlier.

Figure 5: Recommendations for Funding Hydrologic Restoration



Long-term or Phased Approach

Specifically, participants argued that to promote hydrologic restoration, funding to LCDs should be offered in a more stable long-term approach than current two-year cycles. Grants should consider the timeline of on-the-ground projects from planning to implementation and reduce the need for practitioners and implementers to continuously re-apply for grants.

"I'd love to see more funding opportunities be offered in a "Phased" approach, where recipients of funding can collect data and do plans, and then receive additional funds in future cycles for implementation. I would love to see more opportunities that support plan implementation and demo projects." - Session 2, WEM

"Whichever strategy…they have to be committed to the long-term, with resources and people to implement the plans. They don't work on two-year cycles or four-year election cycles. We're talking about 10, 15-year timeframes at a minimum." - Session 2, DNR

Hydrology focused and flexible

Over the long term, agencies and other funders should develop hydrology-focused grant programs and allow more flexible funding to recognize the value provided by a variety of hydrologic restorations.

"What would be even more helpful is if we can look at a stream, a ditch ...and know that it doesn't have the capacity, we build more capacity to retain water, that would fix other resource concerns, maybe farther down. But our [current] funding is not really geared towards just dealing with hydrologic stuff." - Session 3, LCD Specialist

Broader watershed-scale focus

Participants also emphasized that funding should be provided across a wider geographic scope so that assessment and implementation may take place more effectively across multiple sites in a watershed, and across political boundaries.

"We implement projects patchwork around the county, we don't typically focus on looking at a watershed scale or a reach of the stream and look at the erosion hazards and concerns ...in a particular area. What we're trying to do now is work with multiple landowners in adjacent areas. But our DATCP funding, it's not structured for us to work in that fashion." - Session 3, LCD Specialist

Increased funding supports watershed-scale efforts

Finally, participants in these focus group sessions recommended increased levels of funding to meet staffing, assessment and implementation needs to promote more hydrologic restoration projects across the state.

"The average costs to implement TMDL-focused watershed plans [are] around $5 to $7 million over a 10-year period. But the funding sources we have available ...at the state and federal level is much smaller than the cost of those plans. So, we're limited in terms of the bottleneck of available funding, and one of the biggest costs is staff to implement the plans. So it's a huge challenge, it will require a large-scale effort that needs to be phased over time." - Session 2, DNR

Priority Watershed Program in Wisconsin

During discussions on funding, some participants recalled the former Priority Watershed Program as an example of a productive funding structure. They remarked at capacity the program provided to LCDs to complete work. However, they were critical of the program's focus on agricultural and site-specific needs rather than hydrologic function and environmental goals. They agreed that some principles for effectively funding hydrologic restoration could be drawn from this program.

"[The Priority Watershed Program] dumped a lot of money into a given regional area and you could do a lot of cultivation in a five-to-six-year period. The bad part about it is we focused on getting practices installed instead of stepping back and looking at watershed-based approach. I would do it differently now, but the amount of funding that the counties were getting and the robust staff they had allowed them to do many practices compared to what we do now." - Session 3, Engineer DATCP

"Three-fourths of Fond Du Lac county, at one time, was covered by priority watersheds at the same time. It was just a tremendous large-scale program. I think all the counties are trying to figure out in their own way how to get back to doing something like that. But it definitely provided resources that most counties weren't going to get and still haven't seen since." Session 3, LCD Specialist

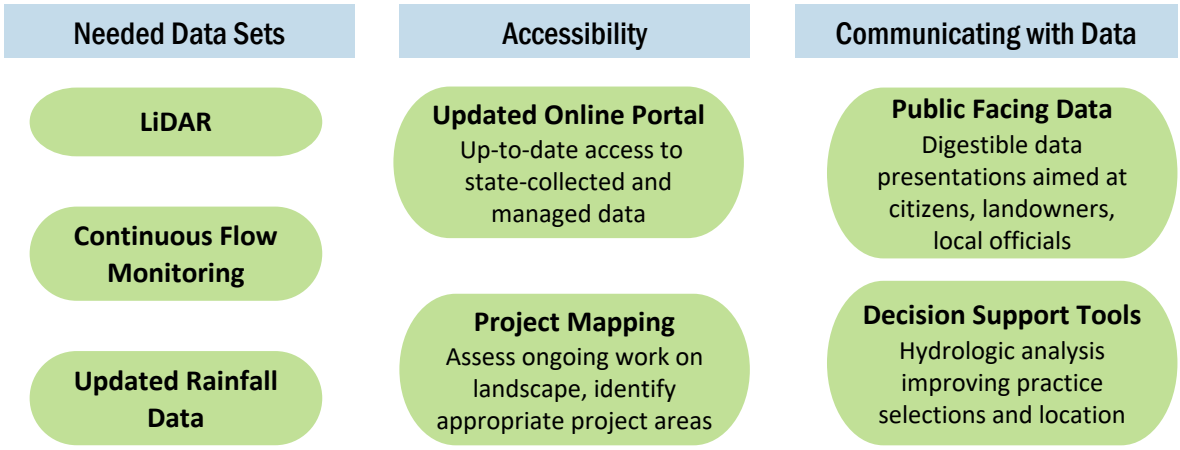
c. Data and Decision Support

Hydrologic assessment requires a range of data sources describing current and past conditions of a watershed, as well as technical expertise to interpret them. The results of our presurvey clearly indicated that data on indicators of human practices and natural processes influencing hydrology are lacking. Participants commented in the focus groups that funding constraints and coordination barriers contributed to data barriers by reducing the capacity of LCDs to collect comprehensive data and limiting opportunities to efficiently share data. Participants also felt that data gaps resulted from not prioritizing the collection of data on human and natural influences of hydrology. Other cited constraints included limited hydrological expertise among LCDs and a lack of existing data in usable formats for practitioners and the public.

"One of the barriers we have is [a lack of] some sort of streamlined toolbox where we would have updated accurate LiDAR photos, geomorphic field assessments. We're working with the USGS on that, doing assessments on stream gullies and ravine systems to look at what is the rock interface, the vegetation like, the stream banks, the slopes, the erosion potential? Then comparing with LiDAR maps, historical aerial photos, and the watershed size. Some way to streamline these processes would help us determine what are we up against to help us in our design process." - Session 3, LCD Specialist

Participants expanded on the key data needs that would aid HR across the state. They shared several examples of datasets that could be collected or processed to improve assessments and planning, such as data on both human practices and natural processes that influence hydrologic conditions. Participants also suggested that sources of useful data may exist within silos in state programs and could be better utilized with investment in data sharing infrastructure. The participants described the need for data tools and visualizations to inform non-technical audiences about the importance of hydrology. Figure 6 provides an overview of the data and decision support discussions.

Figure 6: Improving Hydrologic Data and Decision Support Availability



Needed Datasets

LiDAR (Light Detection and Ranging)

"LiDAR data, of the land surface, the geomorphology, is something we have now, pretty much statewide. It just isn't suitable in its raw form, but we have it now. Investing in turning those into indicators of both human influence on geomorphology and hydrology, as well as the natural processes would be my suggestion as a priority." - Session 1, LCD Specialist

"I think one of the barriers there is related to connectivity of the landscape and it's really important for processing LiDAR specifically, where are culverts that go underneath roads, that is critical information for turning LiDAR DEMs [Digital Elevation Models] into something that you can then use in a model, for instance. I think the lack of that data is a huge barrier." - Session 1, UW Researcher

Continuous Flow Monitoring and Updated Rainfall Data

"Technology exists to have more continuous data monitoring for groundwater and surface water flows. We just don't do that, and I think that's a big impediment for our practitioners to understand and characterize a big portion of the hydro period." -Session 1, DNR Scientist

"Rainfall data is not reflecting what we're seeing from more intense storms over time. Having up-to-date and current rainfall depths to be working with in regards to runoff volumes, runoff rates, groundwater recharge, all that good stuff, is constantly changing." - Session 3, LCD Specialist

Data Accessibility

Participants agreed that Wisconsin's lack of infrastructure for sharing data across programs, counties, and other entities presented a barrier to their work. Participants detailed their efforts to track down relevant data through a maze of phone calls, emails, and online searches that diverted their resources and attention from higher-value work and made it difficult to take advantage of investments in data already made by the state.

"This is an example of where we may have data that are not used widely because we're not sharing data across our silos. The data and the technologies are there, we can have a lot of this data at our fingertips, we just need to get across those institutional silos to make it available." - Session 1, DNR Scientist

"We're limited to the...landowner that we're working on. When you start branching out to look at a broader watershed sense, it's hard to know where you can glean the information from. So you're forced to make several calls coming up with who to contact to get the data, but there's not a place to get that information easily. It takes a lot of time and effort and when you're just working on one single project, it's hard to seek out that data to look at it in a better picture." - Session 3, DATCP Engineer

Similar accessibility needs arise in transforming raw data into useful formats at the practitioner level. Participants highlighted the need to prepare data sets for wider use among different levels of expertise.

"There is another step at the end, in terms of converting that data into relevant metrics to the practitioner…it's one thing to just show annual precipitation in a graph to someone, but it's another to make that next step to actually show why that's important… There's a lot of great climate data out there. More of the issue is digesting it and incorporating it into planning and assessment in a simple way for a lot of different types of practitioners." - Session 1, Researcher

Communicating Hydrology through Data

Lastly, participants described a need for better data-communication tools that convey how hydrology is relevant to individuals in Wisconsin and the challenges they face. Participants identified needs for data, tools and communication targeted at less technical and hydrologically informed decision makers, the public and landowners, for example. These processes can be aided with development of decision support tools that transform confusing data into interpretable recommendations on where to target restorations, and the causes and impacts of hydrologic changes.

"In Outagamie County, working with a consultant, they looked at historical flows of water across the entire watershed, and then …what type of storage capacity would need to be added back across the entire lower Fox watershed. That's a pretty good model as far as …how we translate that into a decision support tool. That's one approach to collecting data that could be useful for targeting, and also understanding the extent of implementation that might be needed in a particular, sub-watershed." - Session 3, Researcher

"I like the technical stuff because I take that knowledge to plan, design and install a practice. But I also have to have data sets that I can take to a landowner that doesn't know, or a land conservation committee...there's two levels of data sets, and when we're going to sell programs or policies, we have to have simple ones that are easy to follow and digest so they can understand the magnitude of the problem and what their actions do to exaggerate or minimize the issue." - Session 3, DATCP Engineer

"I liked the historical data compared to where we're at today. That gives people perspective as to changes over time and what that means, to the issues that they're dealing with. This is what it used to be like, this is what it is now, and this is why you're seeing what you're seeing." Session 3, LCD Specialist

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Focus Group Findings:

V. Opportunities to improve Hydrologic Assessment and Restoration

a. Centering Hydrology
b. Retooling Voluntary Engagement Programs
c. Pilots and Demonstration Projects

V. Opportunities

Related to the needs outlined above, the focus group participants described several opportunities to move forward more immediately towards long-term HR. These opportunities utilize existing momentum or focus on spaces where tangible results seem more achievable.

Participants felt that elevating the relevance of hydrologic restoration in conservation activity and communication held substantial promise. They suggested that broader participation in voluntary conservation programs could be supported with updated incentives that produce win-win outcomes for landowners and conservation. Finally, they proposed that even a few watershed-scale pilot projects would demonstrate the value of hydrologic restoration and inform the development of improved structures to support this work.

a. Centering Hydrology in Assessment and Outreach

Participants felt that LCDs must do more to center hydrology in communications with landowners and communities. They expressed that the hydrologic aspect of these issues comes as too much of an afterthought to agency and public actors. However, these dynamics may be changing as damage from extreme flooding events occur with greater frequency across the state.

Increased understanding of hydrology may encourage landowners to support conservation activities by highlighting the connections between their land and the rest of the system, and the scale of the challenges faced. Participants suggested that if the public understood the complex causes of flood events, they would better recognize the necessary long-term solutions.

"We just need, even at the land conservation level, just need to build the case that the resource issues we're dealing with and talking about, are obviously part of a much larger problem. We not only need to better understand where that's coming from, but we need to be able to communicate that to the people in the watersheds we're working in. I don't feel we've been able to build that case from the hydrologic standpoint of a watershed that has significant water quality issues. We come at it with practices, but we need to build landowners buy-in to want to address the hydrologic part of it as well." - Session 3, LCD Specialist

Highlighted opportunities included developing communication tools to clearly describe hydrologic restoration and watershed concepts to state practitioners, public officials, landowners, and the general public. Similarly, some stated that conservation departments ought to be equipped with hydrologic focused decision support tools to elevate these factors in planning and assessment and that state entities should ensure local governments have the resources to obtain these tools as they are available. Participants stated that a renewed investment in outreach staff would ensure adequate "boots on the ground" to spread these messages across the state.

b. Retooling Voluntary Engagement Programs

In describing challenges of regulatory approaches to conservation, participants indicated that new strategies were necessary to promote voluntary restoration Particularly given recent struggles in the farm economy, conservation programs that provide meaningful financial security to farmers may produce significant opportunities for restoration. Opportunities mentioned in this domain include improving program structures to materially reward participation or otherwise incentivize specific restoration outcomes over a cohesive geographic area to address the scattered and isolated nature of current interventions.

"In terms of voluntary efforts, we're seeing innovative approaches and successes with folks taking the 'pay for performance' or environmental services concept, rather than the long-running tradition of paying a flat rate for certain practices to be installed through EQIP. I think taking an approach that truly incentivizes the benefits derived from a project is one additional way we might have opportunities to reach new folks and make sure the projects being implemented are of the highest quality." - Session 2, DATCP

"We know there is a lot of unprofitable land still being farmed…. Focusing on those types of win-win scenarios, particularly where the farm economy is and where government dollars are, because there's not going to be enough money to cost share our way to get these things done. We've got to focus on things that have inherent benefit both for the property owner and the broader watershed." - Session 1, DATCP Engineer

c. Pilots and Demonstration Projects

Given the shortcomings of current fragmented interventions, participants described opportunities to pave the way forward with investment in watershed-scale pilot and demonstration projects. Such projects would provide opportunities to build and test coordination infrastructure, identify and resolve challenges in watershed-scale work, and provide proof-of-concept results for innovative on-the-ground practices that could be applied more broadly across the state.

"A demonstration project with a good amount of funding, you can work with multiple landowners in...a geographical area that can have cumulative improvements, that can demonstrate good work." - Session 3, LCD Specialist

"Who's willing try a bold approach and invest limited resources into it if they haven't seen success elsewhere? So the value of being able to see examples of success, what they've tried, what's worked, what hasn't worked and to learn from each other. That carries a lot of weight to learn from each other and to build a collective knowledge...there's no shortage of value to be found in some of those demo sites." Session 3, Wisconsin Land + Water

Conclusions

Conclusions

This evaluation sought to uncover the barriers, needs, and opportunities in hydrologic restoration for policymakers, conservation program managers and practitioners in Wisconsin. Targeted focus groups and a short survey suggested that broadly, Wisconsin does not have the structural framework in place to support watershed-scale hydrologic assessment and restoration. Rather than one single barrier, a combination of organizational, technical, and policy factors stand in the way of comprehensive hydrologic restoration work.

A general lack of understanding of hydrology was identified as a primary barrier at multiple levels. Because this understanding shapes state program incentives and local priorities and investments, hydrologic restoration is often overlooked as a solution to water management challenges. Instead, current investments more heavily emphasize practices that address the symptoms rather than root causes of water problems. Subsequently, many water-related challenges go unresolved, reoccur, or get passed along to downstream communities.

Funding structures that limit eligible practices and favor short-term and site-specific interventions also make it difficult for LCDs to engage in watershed-scale, hydrologic assessment and restoration work. Participants also reported that Wisconsin's communities do not have access to the technical support or data needed to streamline hydrologic assessment and facilitate identification of effective restoration strategies. Policy adjustments are needed to increase investments, incentives, and technical support for watershed-scale hydrologic restoration work designed to achieve multiple environmental and social benefits.

Finally, a lack of a state-sponsored strategy and limited interagency coordination on hydrologic assessment and restoration creates barriers to implementation and decreases opportunities for shared learning and communication around effective hydrologic restoration approaches.

Though this evaluation did not seek to identify a complete list of actions or recommendations, participants offered ideas to improve the pace and efficacy of hydrologic restoration in Wisconsin. These included:

- Working together across agencies and jurisdictions and developing more accessible data to increase consideration of hydrologic conditions and help quantify and communicate the benefits of hydrologic restoration.
- Producing longer-term, hydrology-oriented, and watershed-scale funding opportunities would allow greater investment in staff capacity to proactively tackle hydrologic challenges.
- Retooling voluntary restoration programs with stronger incentives for hydrology-focused practices will help increase implementation of restoration work on private lands.

Participants largely agreed that increasing hydrologic restoration and assessment could significantly improve the state's ability to address water management challenges and were optimistic about movement towards more coordinated, watershed-scale programming. They recognized the challenges ahead were significant, but believed the tools and technology exist to tackle Wisconsin's hydrologic challenges.

Next steps

This evaluation described the barriers, needs, and opportunities for hydrologic restoration for Wisconsin policymakers, land and water program managers and practitioners. It was intended to inform policy and program development discussions geared towards improving the integration of hydrologic restoration in state-sponsored programs, with a particular emphasis on the restoration of upper watershed wetlands and the reconnection of streams with adjacent floodplains.

Findings will be distributed widely to inform this ongoing discussion. Immediate next steps include distribution and discussion with focus group participants, key state agencies and partners, and policy makers across Wisconsin.

The report and findings will also be used to help inform current and future policy and program development work in Wisconsin. Examples of work underway that draw on these results include but are not limited to:

1. Development of a General Permit for Hydrologic restoration as per 2021 WI Act 77.
2. A new project exploring opportunities to increase eligibility of wetland restoration practices for state and local cost-share dollars and to increase capacity for the design of wetland practices.
3. Pilot watershed scale assessments and hydrologic restoration demonstration projects in the Marengo River and Little Plover River Watersheds.

Appendix A: Anonymized Participant Backgrounds

Focus Group 1: Technical Experts	Focus Group 2: State Agency Managers	Focus Group 3: Implementers
1. Scientist, DATCP 2. Geologist, Wisconsin Geologic and Natural History Survey 3. Scientist, DOT 4. Researcher, UW-Madison 5. Biologist, DNR 6. Researcher, UW - Stevens Point 7. Scientist, DNR 8. Watershed Manager, County Land and Water Resources 9. Engineer, DNR 10. Engineer, DATCP	1. Grant Manager, DNR 2. Biologist, DNR 3. Biologist, DNR 4. Water Quality Manager, DNR 5. Program Coordinator, DNR 6. Planning Coordinator, DNR 7. Conservation Specialist, DATCP 8. Soil and Water Management, DATCP 9. Land and Water Resource Management, DATCP 10. Engineer, DATCP 11. Nutrient Management Program, DATCP 12. Program coordinator, WEM	1. Conservation Specialist, County in Southern Wisconsin 2. Conservation Specialist, County in Northern Wisconsin 3. Conservation Specialist, County in East-Central Wisconsin 4. Engineer, DATCP 5. Engineer, DATCP 6. Natural Resource Educator, UW-Extension 7. Leadership, Wisconsin Land & Water 8. Program Manager, Wisconsin Land & Water 9. Researcher, UW- Green Bay 10. Conservation Program, DATCP

Appendix B: Full Pre-survey Instrument

1. Help us understand the role of your program and agency.

	We do so in all or most of our work	We do so in much of our work	We do so in a little of our work	We do not do this in any of our work	Not sure
To what extent do **you and others working in your program** engage in work to assess and restore degraded hydrology?	○	○	○	○	○
To what extent are **other programs in your agency** engaged in hydrologic assessment and restoration planning?	○	○	○	○	○

2. Please indicate your level of agreement to the following statements:

	Agree	Disagree	Neutral
Historic and current land uses have altered hydrology and reduced the capacity of wetlands, rivers, and floodplains to manage runoff. *(Uses include drainage, development, logging, stream channelization, and groundwater withdrawals)*	○	○	○
Restoring degraded hydrology can help address many of Wisconsin's water management challenges *(Challenges include polluted runoff, flooding, erosion, groundwater concerns, etc.)*	○	○	○
Wisconsin does not have, but would benefit from, increased and coordinated efforts to restore hydrology to solve problems.	○	○	○

3. Some of the steps required to effectively assess and restore degraded hydrology are broadly identified below.

Please drag and drop the steps (listed on the left) into the box that most closely matches your description of how actively those steps are ongoing at local levels. We ask that you **only place two items in an investment category**, recognizing there may be more than two items you feel need investment.

By local we include efforts led by local government, farmers, watershed groups, or other similar efforts.

Steps:	**Categories:**	
Establish partnerships to discuss watershed management concerns and develop shared priorities	Very active and no investment needed	Very active and investment needed
Describe the historic hydrologic landscape *(i.e., how, why where water moved, what natural communities were present, what's changed)*	Somewhat active and no investment needed	Somewhat active and investment needed
Assess current conditions *(connectivity, flow, drainage, stability, water quality, and affect on natural communities)*	Slightly active and no investment needed	Slightly active and investment needed
Evaluate hydrologic restoration scenarios and prioritize restoration actions	Not at all active and no investment needed	Not at all active and investment needed
Design and install hydrologic restoration practices		
Evaluate, learn from, and share project results		Unsure of the activity on this step

4. To what extent are support for the following types of data, and support for use of this data, available to those working in local implementation and planning?

The types and locations of human practices that have altered hydrology (i.e., drain tiles and ditches, stream channelization, road and culvert placement, etc.).

	Widely Available	Somewhat Available	Rarely Available	Not at all Available	Unsure
Raw data sets at a relevant geographic scale	○	○	○	○	○
Prepared data sets at a relevant geographic scale	○	○	○	○	○
Interpretations of data findings at a relevant geographic scale	○	○	○	○	○
Decision support tools such as models based on this data	○	○	○	○	○
Access to professionals specialized in the collection or interpretation of this data	○	○	○	○	○

5. To what extent are support for the following types of data, and support for use of this data, available to those working in local implementation and planning?

Evidence of natural processes that further restrict or alter water storage and flow (i.e., stream incision, gullies/ravines, depositional areas, etc.).

Response window for Question 5 is formatted the same as Question 4.

6. Please identify the top three actions that would be most useful to help integrate hydrologic assessment and restoration approaches into state-sponsored land and water management programs.

- Investments in statewide data sets
- Investment in pilot projects and demonstration sites
- Development of models and other decision support tools
- More flexibility on how existing funds can be used
- Development and delivery of trainings for key audiences
- Increase support for local governments to plan, review, and implement hydrologic and floodplain restoration projects
- Recognition of hydrologic restoration goals in state and local policies
- Creation of an interdisciplinary/inter-agency forum to help identify and address program, policy, and technical barriers

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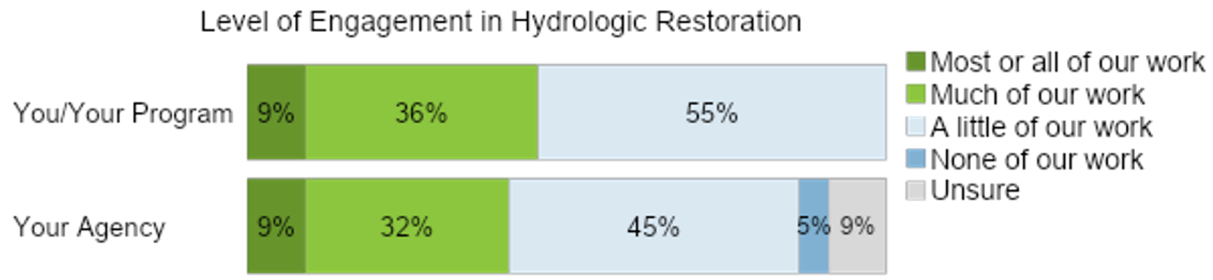
7. How much of a barrier are these factors posing in holding back broader use of hydrologic assessment and restoration?

	A significant barrier	Somewhat of a barrier	A small barrier	Not posing a barrier at all	Unsure
A lack of shared understanding on what hydrologic assessment is and its benefits					
A lack of understanding on how degraded hydrology contributes to local water management concerns					
Institutional silos creating narrow approaches to how we assess and address water resource problems					
A lack of a designated agency, program, or person responsible for developing and implementing hydrologic restoration programs and policies					
A lack of data/decision support tools to quantify the potential benefit of hydrologic restoration actions					

Appendix C: Full Pre-survey Results

Program and agency level of engagement

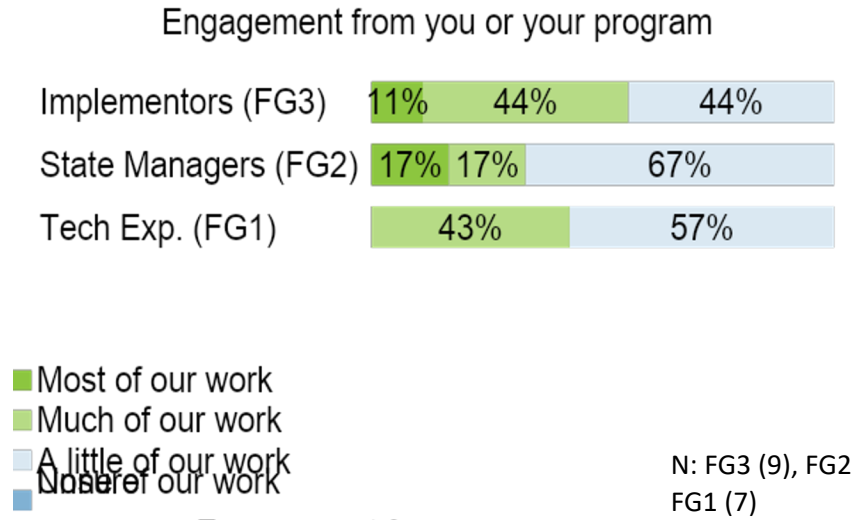


N=22

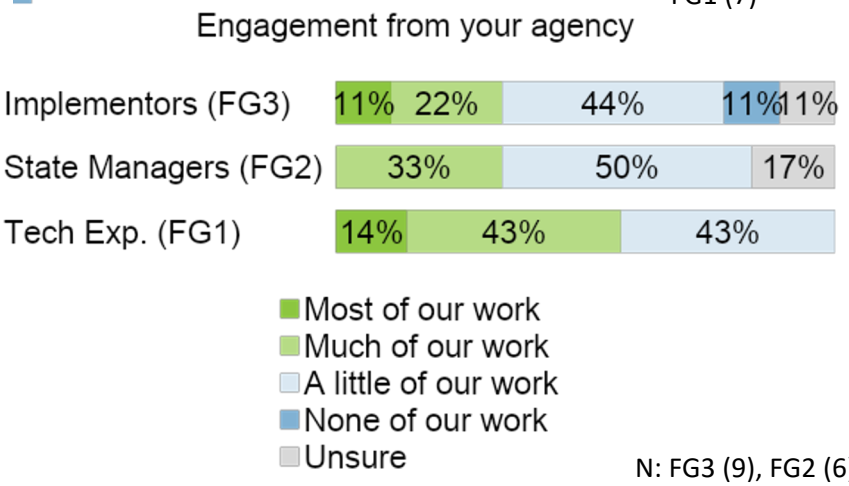
This question was designed to evaluate the degree to which participants had perspectives in engaging in hydrologic restoration. As noted in the report, it was somewhat surprising that a large portion of respondents felt only a little of their work, particularly at the program level, was engaged in this work. These surprising results provide an example of the value brought by the pre-survey.

State managers and technical experts may work within broader programs that do not have as central of a restoration focus, in comparison to implementors who mostly worked in LCDs. This is suggested by the larger portion of respondents from implementation reporting much or most of their work was engaged.

There were only small differences in responses from the program to the agency level.



N: FG3 (9), FG2 (6), FG1 (7)



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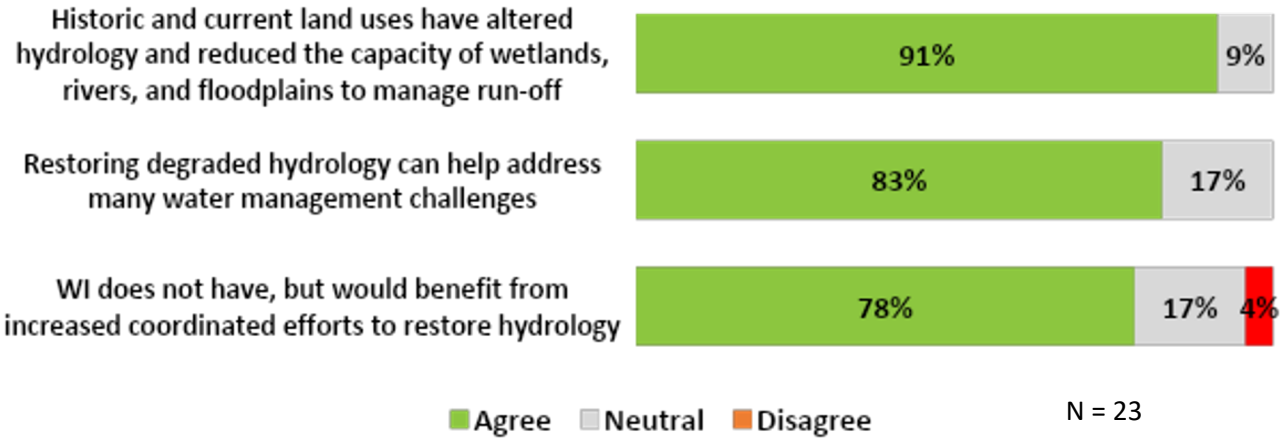
Agreement with core assumptions

Please indicate your level of agreement to the following statements:

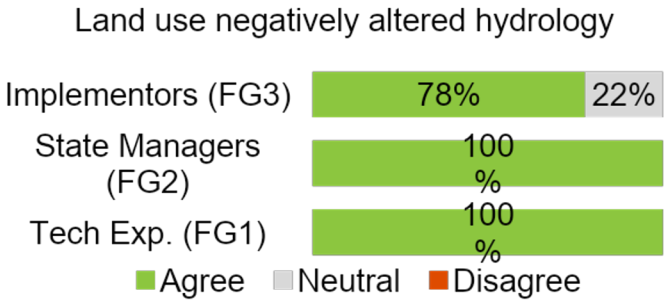


N = 23

This question was designed to test whether participants agreed with our key assumptions on the need and value of hydrologic restoration. The results suggested respondents broadly agreed. If they had not, our focus group conversations would have had more time to discuss these assumptions, rather than discussing how to improve use of hydrologic restoration.

There was more widespread neutrality on whether restoring hydrology can help address many challenges, particularly among state managers, despite overwhelming agreement.

There was also overwhelming agreement on the benefit of increasing coordination for the state, despite this being the only assumption which garnered disagreement.



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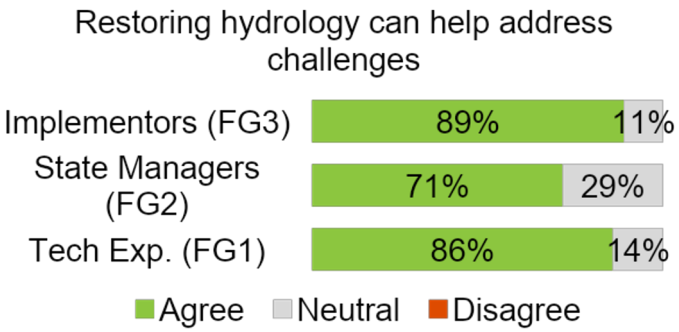

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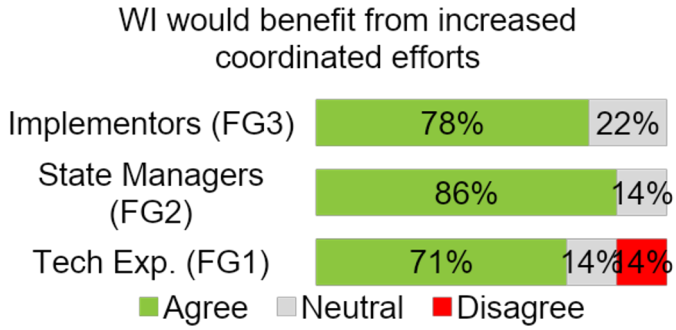
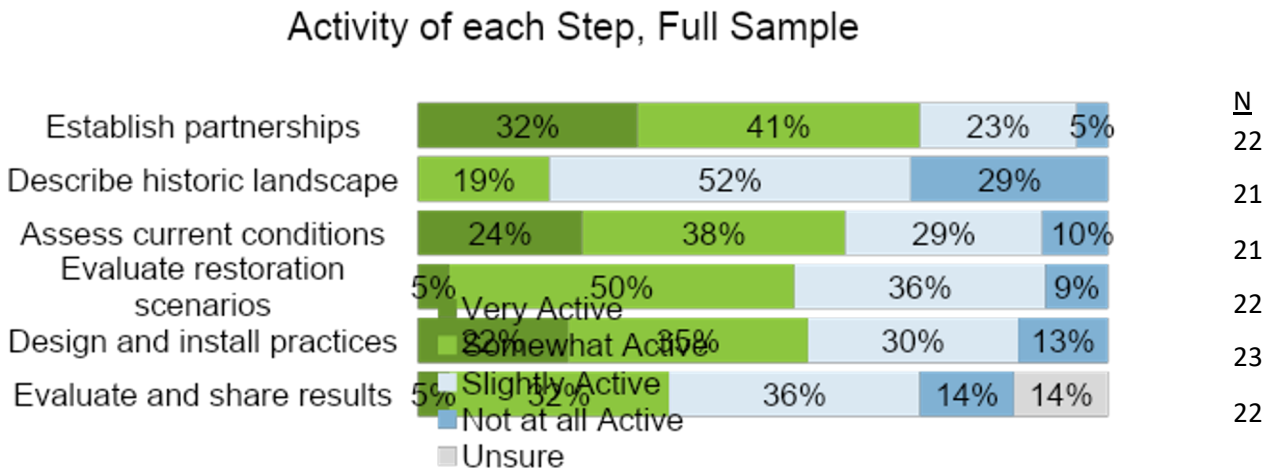
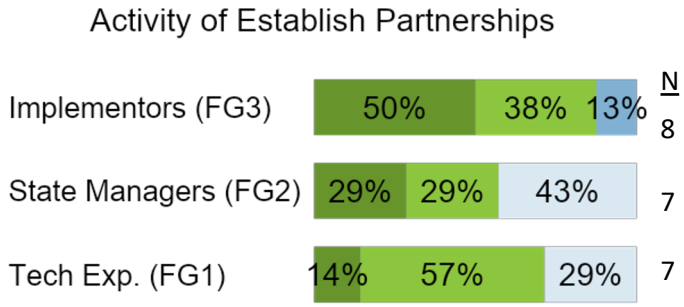
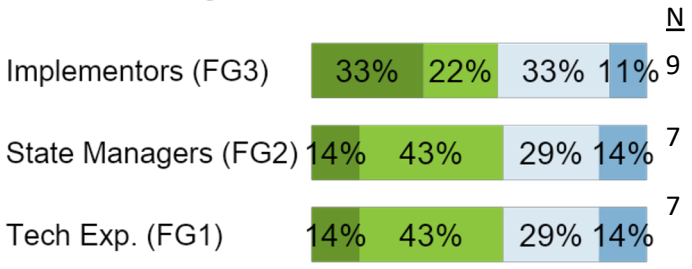


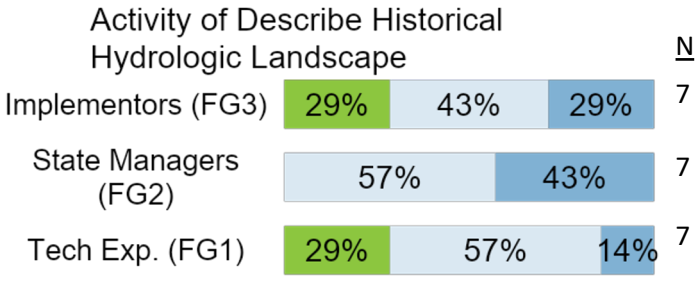
N: FG3 (9), FG2 (7), FG1 (7)

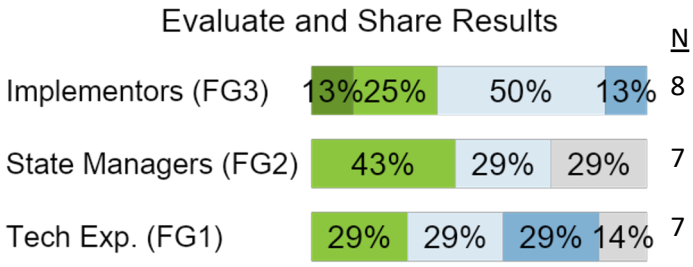
Assessing Activity and Investment Need of Steps

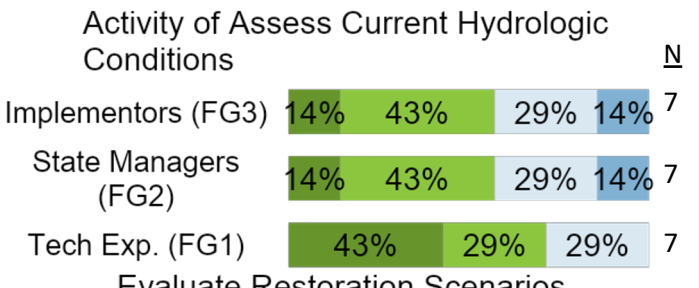


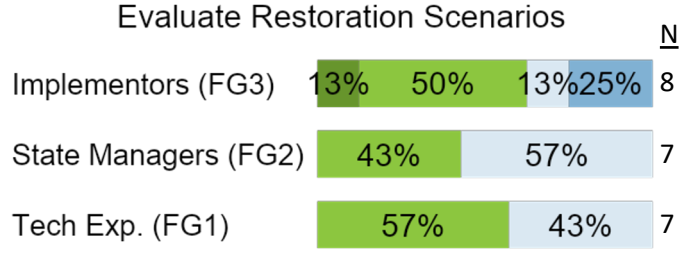








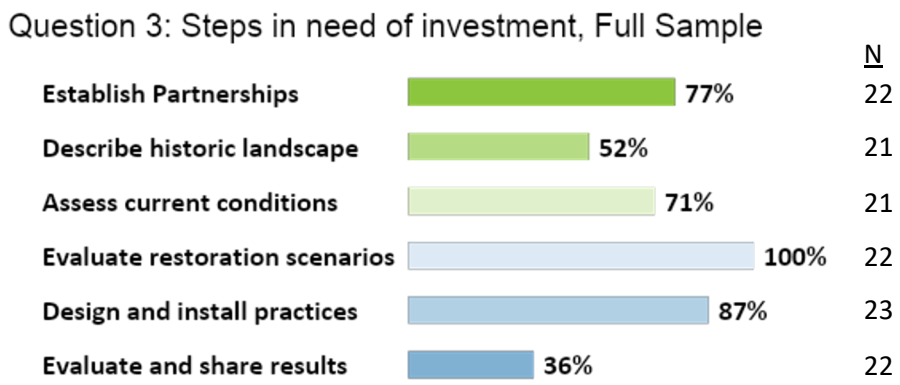




Participants held mixed views on the activity in most of the steps, but overall, the results suggest much room for improved levels of activity, particularly in describing historic landscapes, evaluating restoration scenarios, and evaluating and sharing results. Establish partnerships was most active step, followed by assessing current conditions.

Some responses may have been driven by the perspectives brought by audiences' role, for example implementors perceived more activity in establishing partnerships and designing and installing practices; while technical experts saw more activity in assessing current conditions.

Assessing Activity and Investment Need of Steps

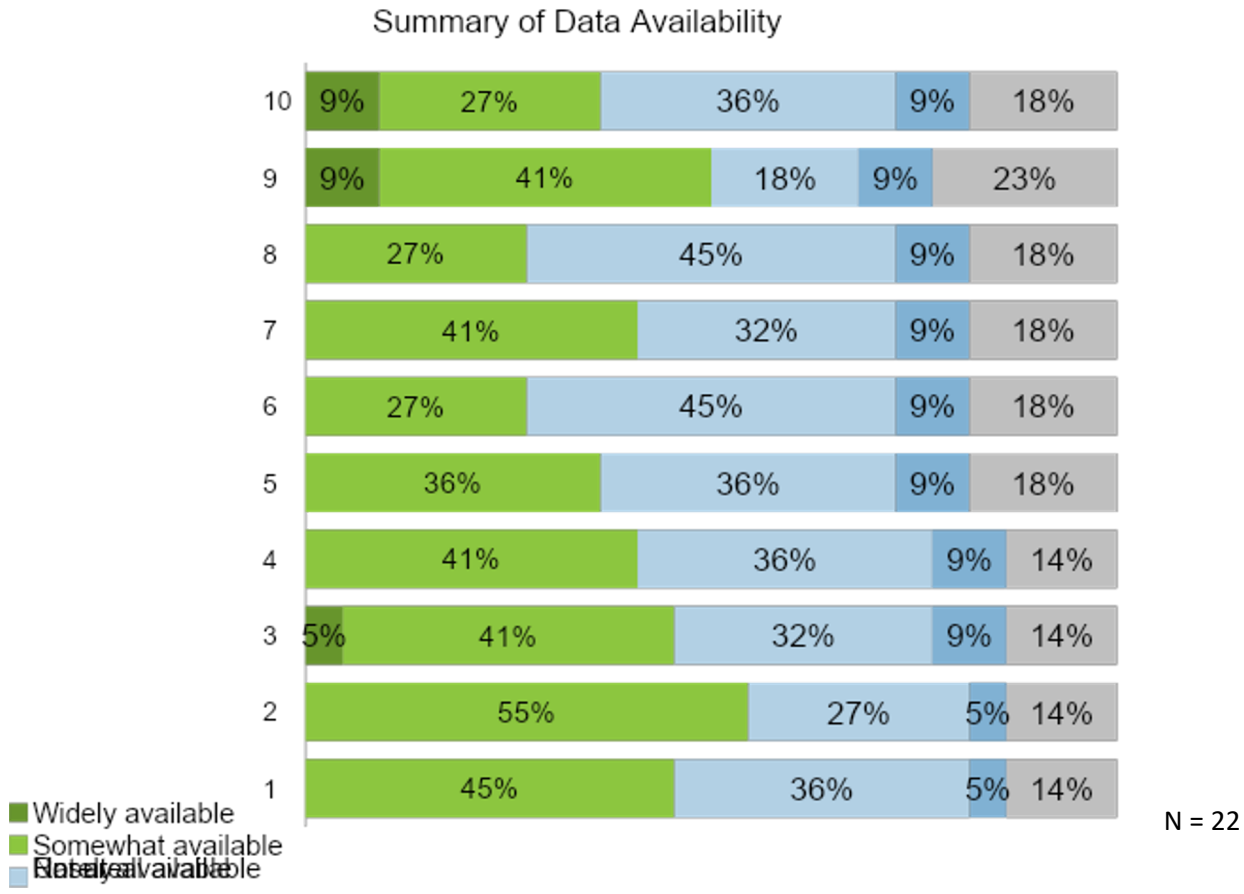


Participants were also asked to select two items they viewed as a priority for investment. This question proved somewhat of a challenge as some participants only completed the response for two items, including for activity, and others who put multiple steps in the investment category. Despite these challenges, the responses demonstrate clear investment priorities in evaluating restoration scenarios and designing and installing practices. Establishing partnerships and assessing current hydrologic conditions were also seen as in need by large portions of respondents. However, evaluate and share results and describe the historic hydrologic landscape were less prioritized for investment.

e. Availability of human practice and natural process data

Natural Process Data
Evidence of natural processes that further restrict or alter water storage and flow *(i.e., stream incision, gullies/ravines, depositional areas, etc.).*

Human Practice Data
The types and locations of human practices that have altered hydrology *(i.e., drain tiles and ditches, stream channelization, road and culvert placement, etc.).*

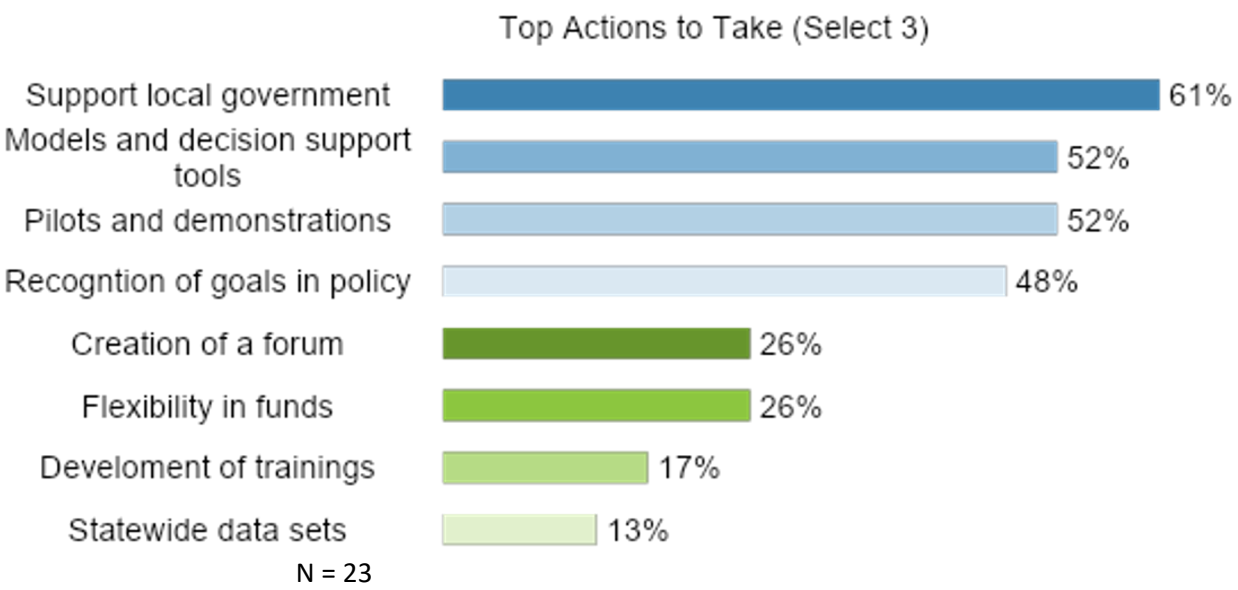


N = 22

Our data question suggested that participants did not find key data to be accessible to them in their work. Raw data, with no or minor adjustment, were differentiated from data sets that may have undergone some form of preparation as well as those which have been interpreted to more readily reveal findings or features. Raw data were seen as a little more available than sets which had undergone more work. Human practice data were slightly more accessible than natural process data, and raw data was slightly more accessible than other types of datasets and support.

Session specific data are not presented for their volume and provision of a somewhat noisy portrait without adding interpretable findings to the above. There were some indications that state managers saw data as less accessible than the technical expert or implementor audiences who may work more frequently with the collection and preparation of data.

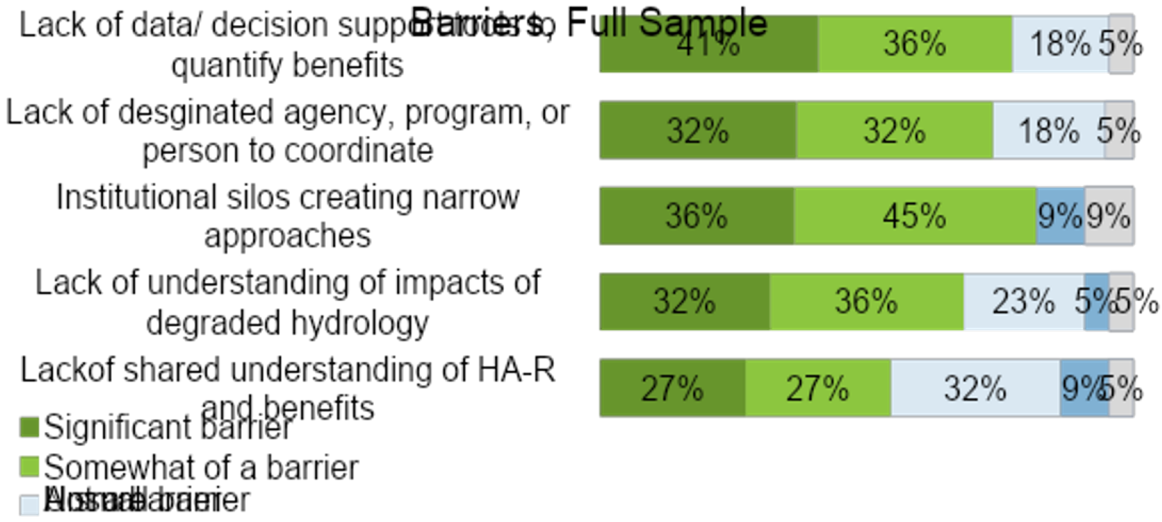
f. Top actions to take

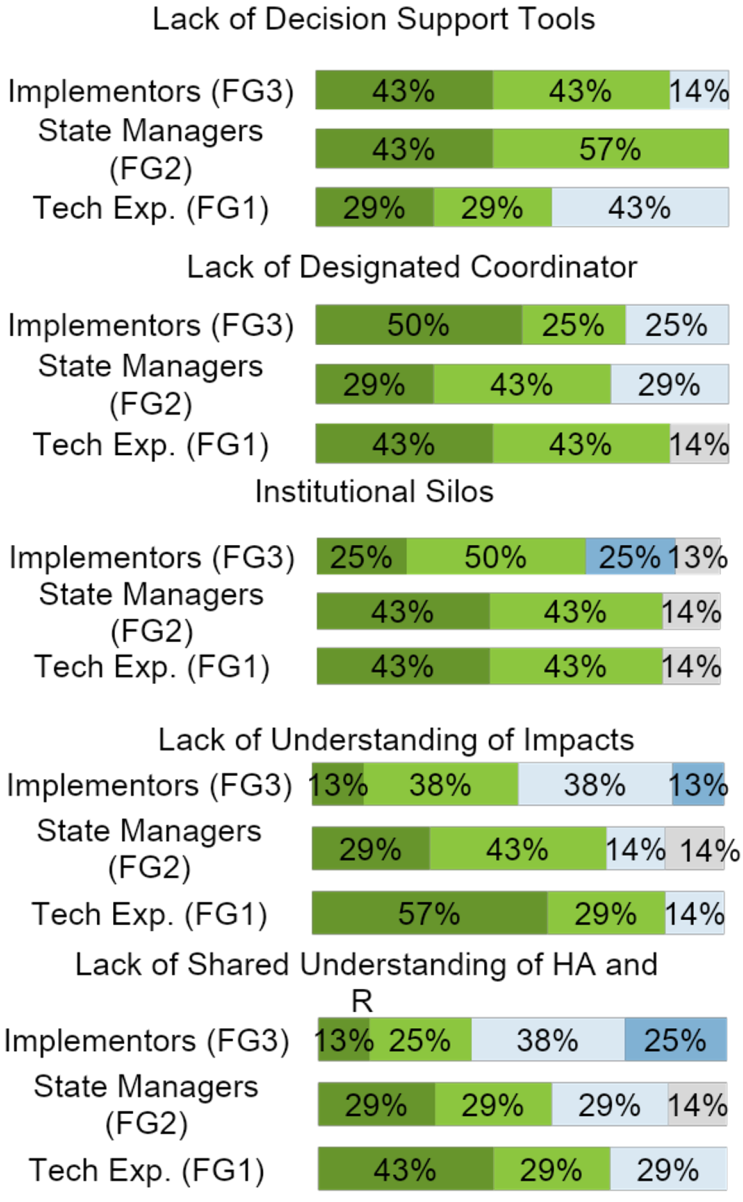


In charting the top actions to move forward with, participants put most support behind supporting local government in planning and funding, with strong support also behind investing in models and decision support tools, pilots and demonstration projects, and better recognizing hydrologic restoration goals in state and local policies. These items were substantially preferred to the other four items.

This question had a large amount of variation in responses across the audiences. The technical expert audience (FG1) was not nearly as supportive of supporting local government and investing in models and decision support tools, but were unique in highlighting flexibility in funds and recognizing goals.

g. Rating of barriers





The barriers question validated the ubiquity of all the options we provided but emphasized silos, a lack of coordination, and data support as most significant, over shortcomings in understanding of the hydrology. However, at least half of the participants felt each item was at least somewhat of a barrier.

Responses varied by audience as well. Technical experts were more likely to identify lack of understanding factors as significant barriers, and much less likely to see decision support tools as such.

State managers found decision support tools to be universally a barrier, but fell along the middle of assessment in many of the other items.

Implementers did not see lack of understanding factors to be significant barriers in general. They highlighted a lack of a designated coordinator as the most significant barrier, followed closely by a lack of decision support tools.

Appendix D: Focus Group Outlines

Focus Group 1 Technical Expert Audience	Focus Group 2 State Manager Audience	Focus Group 3 Implementation Audience
Introduction: What comes to mind when you hear the term hydrologic restoration?	**Introduction: How does hydrologic assessment relate to the goals of your agency?**	**Introduction: how does hydrologic assessment relate to the goals of your agency?**
How much and what kind of restoration do you observe in the state?	**Your audience was more likely to support investment in describing the historic landscape, why did you see this step as in high need?**	**What would be the most useful support you could receive if you could pick one thing?**
We noticed many of the responses indicated low levels of engagement, could you describe barriers or reasons leading to this result?	***Probe* Are there consequences of not looking at the historic hydrology?**	**Could you characterize a little more what the data and decision support tools needs are?**
Describe why you believe we found some steps as more active and others as less:	**The other session brought up the concept of a 'failed project', do you agree with this characterization and assessment of frequency?**	**What could be done to develop broader data sets, larger data sets, and make them accessible?**
More specifically, why was there little emphasis on investing in describing the historic landscape, while we talk now about issues with variability and a shortage of data?	***Probe* are our interventions meeting their objectives?**	**What do you need from a decision tool, what would make it 'complete' or is important for it to have?**
What are the consequences of failing to understand the historic landscape and intervening prior to understanding that?	**How do our current policies and program structures support or inhibit this HR approach? What would be needed to enhance supports for this approach?**	**Are there consequences for proceeding without understanding the hydrology?**
***Probe* about further defining a failed project.**	**What can be done to promote this watershed approach and build those partnerships?**	**Why or how are demonstration projects or pilot projects going to help inform policies and practices?**
Identify a specific data set from each category that is fundamental to our ability to effectively assess and restore hydrology, and a current gap	**How could we have a model for a centralized area for coordination**	***Probe* what are some of the barriers to getting a watershed scale intervention**
Why are these data and supports not currently available or not as available as we'd like them to be?	**What would it look like, who would be responsible for leading and organizing?**	***Probe* What kind of cross-jurisdictional barriers do you encounter**
One of the top actions you reported was "recognition of hydrologic assessment and restoration goals in policy", what motivated your choosing this, or other options?		**What would be the value of a forum to the counties?**
We captured desire in our presurvey to grow coordination in this field. Who's job would it be to oversee that, and what would they be doing?		**What kind of structure should such a forum take? What is the role for the counties?**

Appendix E: Quotes on Coordination

Coordination Examples

Focus group participants described several examples of successful partnerships or collaborations from the past that may provide lessons or examples for coordination around HR moving forward.

"Fox-Wolf Watershed Alliance, [is] working very carefully to develop a very large watershed-based plan that incorporates the Winnebago Lakes chain of lakes. It spans four counties and about 32 HUC 12 watersheds. The counties have a joint lake management plan that addresses the management of those lakes. And they are trying to revise that plan, to look at a more watershed-based strategy right now that reflects the upper Fox-Wolf TMDL, that looks at algal blooms in Lake Winnebago and some of the other chain of lakes up above." DNR coordinator, Session 2

"We have the producer-led watershed protection grant program, so that's about providing funding to local producer-led groups that are working collaboratively, generally with local land conservation departments there." DATCP, Session 2

"[Minnesota] had funding to underwrite this, but they have a 10-year process. It's a little bit focused on water quality, more so than hydrologic restoration, but it's a statewide framework where they say, 'We are going to work and comprehensively assess watersheds around the state, and in a 10-year timeframe, we'll get to them all and we'll have a plan, and we can engage partners that exist. Or if we don't, we'll build partnerships.' So it's just that overarching structure" DNR Water Quality Manager, Session 2

"The current one, the GCC the Groundwater Group. At least there is some inter-agency communication that goes through that. I've had some discussion in regards to trying to open us up to a Surface Water Quality Group to have some of these discussions" DATCP Scientist, Session 1

"The GCC was specifically meant to be the voice to communicate inter agency-wide. And then it was meant to be that overarching body that talked about, recognized, and identified groundwater issues in the state. And then it was that group that was meant to focus and funnel research funding to very specifically targeted groundwater themes that are a priority for the state at that time." DOT Scientist, Session 1