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Streams, Springs, and Fens! Assessing riparian and groundwater-dependent ecosystems for forest plan revision and beyond

The rivers that flow through National Forest System (NFS) lands provide invaluable ecosystem services. For over 60 million people, they are sources of water for downstream municipalities. Wildlife depends upon their riparian ecosystems for habitat and migration corridors. And rivers also provide recreational opportunities and tourism revenue.

Riparian areas aren't the only water-adjacent habitats on National Forests, though. Groundwater-dependent ecosystems (GDEs), such as springs, karst, and fens, have a smaller footprint, but they too are important. GDEs provide critical habitat for wildlife; for example, many species of aquatic springsnails are adapted to specific springs. When connected to stream ecosystems, GDEs are a critical water source during the summer months to maintain streamflow and cool temperatures.

The high-elevation, glaciated valleys of the Uinta Mountains, in the Ashley and Uinta-Wasatch-Cache National Forests, have the greatest extent of potential fens among the areas assessed in Region 4. Streams flowing out from the mountains also support some of the region's largest expanses of riparian vegetation. USDA Forest Service photo.

While the 2012 Planning Rule doesn't specifically reference GDEs, they are included in the broad category of riparian ecosystems that National Forests are required to assess during the forest plan revision process and monitor following adoption of the forest plan. When writing the assessment, forests are "to rapidly identify and evaluate existing information relevant to the plan area to understand and assess existing and potential future conditions on NFS lands in the context of the broader landscape. These assessments also include a review of relevant information from other governmental or nongovernmental assessments, plans, reports, and studies."

Which is where things get complicated.

As their name suggests, GDEs are fed by the groundwater that flows through porous bedrock, unconsolidated material, or

SUMMARY

Under the 2012 Planning Rule, an assessment is the first phase of forest plan revision. In 2015, the USDA Forest Service's Intermountain Region (Region 4) asked researchers with the Rocky Mountain Research Station to complete assessments for its 12 forests, specifically focusing on riparian and wetland ecosystems.

At that time there was no template for writing an assessment that met the Planning Rule requirements, or for how to source the data needed for analyses. For stream ecosystems, robust datasets on flow regime, stream temperature, connectivity, and vegetation composition are likely available. In comparison, groundwater-dependent ecosystems (GDE), such as springs and fens, have few, if any, available datasets.

Over the course of working with the forests in Region 4, RMRS researchers developed a methodology for data synthesis and a template for the assessment. They brought their approach to Regions 5 and 6 at the invitation of the Northwest Forest Planning Team and have since completed assessments for several National Forests within the Northwest Forest Plan area. With the agency now standing up regional planning centers, RMRS's methodology will be a helpful tool for forest plan revisions going forward.

A benefit of having a dedicated team write riparian and GDE assessments for a region is their large-scale view of the stressors and management implications that can inform decisions. For example, many forests in Region 4 share the stressors of roads and livestock grazing, and more mapping and monitoring of GDEs are needed since these provide critical wildlife habitat. Assessments identify areas where beaver-based restoration projects may improve the ecological integrity of the riparian ecosystem

soil. "Groundwater-dependent ecosystems are kind of rare and less understood than riparian ecosystems," explains David (Max) Smith, an ecologist with the Rocky Mountain Research Station (RMRS). "Groundwater is the big driver of these ecosystems, which means a lot of what happens goes on underground and they're harder to monitor."

Additionally, Katelyn (Katey) Driscoll, a research ecologist with RMRS, describes GDEs and riparian ecosystems as not clearly falling within the purview of a specific resource area, such as fisheries or hydrology. "There's kind of a gap," she says. "Hydrologists and fisheries biologists working on units may not have a lot of expertise specific to riparian ecology. That's what's complicated about riparian assessments."

This is a contributing reason why, in 2015, the Forest Service's Intermountain Regional staff reached out to Deborah Finch, an emeritus scientist with RMRS. (The Intermountain Region, or Region 4, covers southern Idaho, Nevada, Utah, and western Wyoming.) They asked if RMRS could develop a region-wide assessment of riparian and GDE ecosystems for later use during the assessment

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– Katey Driscoll, Research Ecologist, USDA Forest Service

phase of forest plan revision. The inspiration came from the Rocky Mountain Region (Region 2), who had commissioned a region-wide assessment covering 17 National Forests and 7 National Grasslands.

The diversity of landscapes in Region 4, from the sagebrush steppe ecosystems to the Greater Yellowstone Rockies, didn't lend itself well to writing a single region-wide assessment. The consensus was to write assessments for individual forests or several forests within a geographic area. "We got inspiration from what was done in Region 2 but made it our own," Smith says.

The team divided up how they would approach conducting the assessment. With Smith's background in wildlife biology and plant ecology, he would analyze the composition and structure of vegetation as it pertained to wildlife habitat for the riparian ecosystems and GDEs. Kate Dwire, also a research ecologist with RMRS,

shared her experience studying GDEs and methods for quantifying and assessing their condition. Driscoll brought experience in ecological processes and analyzed the groundwater fluctuations and surface water fluctuations, and water quality of riparian ecosystems and GDEs. Finch kept the assessment moving along and did quality control of the analyses. Steven Warren, an emeritus scientist with RMRS, reviewed literature and used his knowledge of the region to summarize known human impacts on stream ecosystems and GDEs.

The regional office decided the assessments would be conducted in order of when forest plans were written: the oldest going first, which meant the Ashley and Manti-La Sal National Forests, both in Utah, would be the first to test this new approach.

How Best to Assess

Though the 2012 Planning Rule directed the forests to conduct an assessment during the forest revision process, it didn't specify how to conduct the assessment.

Which is where things got complicated, again.

"A lot of established assessment methods rely on collecting new data," Driscoll says. "The Planning Rule has specific language about using existing data. The agency specially wrote that because they didn't want forests thinking they needed to spend time generating new data before they could even do the assessment."

This requirement meant that currently used ecosystem assessment methods weren't applicable for two reasons: (1) methods focused on evaluating ecosystem services instead of the broader ecological integrity as required by the 2012 Planning Rule; and (2) new data would need to be collected.

Driscoll, Smith, and Dwire designed an approach that used a combination of international-, national-, and local-level field data, an approach Driscoll is unaware of ever being used to assess riparian ecosystems before. This method would ensure that their results would meet the requirements of the 2012 Forest Planning Rule. "We had to figure out how to take data that already exist and pull it together to give a good estimate of the current conditions in a format that's useful for the forest," she explains.

Getting Started With Utah Forests

The first step of conducting the assessment was to kickoff in-person meetings at the Ashley and Manti-La Sal National Forests. These meetings, which included field visits, enabled the RMRS researchers and forest staff to discuss specific management concerns the forest wanted the assessment to address. The staff attending these meetings represented different resource areas on the forest including fisheries, hydrology, wildlife, and forest planning.

During these discussions, they identified the key ecosystem characteristics (KECs) of the riparian areas and GDEs located on the forest. KECs describe an ecosystem's structure, function, composition, and connectivity and are to be used to assess its ecological integrity. As defined by the 2012 Planning Rule, ecological integrity is "the quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence."

Integral to the assessment are data. For riparian ecosystems, there are robust national and local datasets. As per the Multiple-Use, Sustained Yield Act of 1960, the Forest Service is required to manage watersheds for fish, which means data collection to monitor changes. In contrast, recognition of GDEs as a resource to be managed has only occurred in the last two decades. It wasn't until the 2000s, Smith says, that "their importance was highlighted by researchers in the Southwest."

Many of the original forest plans don't even mention GDEs. "These systems have flown under the radar for so long that if a forest had even a good inventory of where they're located, that's a pretty good start compared to a lot of places," explains Driscoll.

GDEs are what Smith describes as "spotty" or rare on the landscape, but there are ways to infer their locations. "Some forest units have certain geologies that encourage the formation of fens while other units have geologies that encourage the formation of karst ecosystems and springs," he explains.

Using a combination of both geographic spatial data and vegetation-based mapping, they inventoried, mapped, and calculated percent cover of riparian ecosystems and GDEs for each defined forest unit.

"That's one of the more helpful things we're doing in the assessment is showing how forests can predict the presence of these GDEs by looking at geologic features of various units," Smith says, adding, "knowing where they are on the landscape can help forests prioritize protection of these areas and change any management activities that could threaten the function of these resources on the landscape."

Next came the evaluation of the KEC's ecological integrity, which included water quality, channel and floodplain dynamics, and surface water and groundwater patterns.

The agency had GDE protocols for assessing the condition of springs and wetlands; however, these were site specific rather than forest-wide. To evaluate the stressors and drivers that could affect ecological integrity of riparian ecosystems and GDEs, Smith and Driscoll reviewed scientific literature, published reports, and applicable datasets. In Region 4, for both riparian ecosystems and GDEs, the significant drivers are climate, geology, topography, and beaver activity, while stressors include roads, dams, diversions, grazing, high-severity wildfire, and drought.

The Canyon Mountains of the Fishlake National Forest lack the processes needed for the development of fens, but their limestone deposits have formed extensive karst systems and springs. These water bodies are habitat for springsnails and other unique species. USDA Forest Service photo by Max Smith.

For each stressor, they calculated the level of stress that the forest unit or watershed containing the riparian ecosystems or GDEs was subject to. In many instances, it wasn't just one stressor but multiple. As an example, grazing could exacerbate the effects of drought, and areas where grazing occurs may have a higher density of roads.

Based upon how each KEC responded to an assigned level of stress, Driscoll and Smith described it as functioning within the natural range of variation (NRV), moderately altered from NRV, or functioning outside NRV. "By looking at natural range of variability you can make that more applicable to the larger landscape and be more consistent on the forests," explains Smith.

These three categories would help managers decide whether the ecological integrity of KECs could be improved. For example, those KECs functioning outside NRV may not be improved due to stressors being outside of the forest's management, while those functioning as moderately altered may be restored in the future. To further aid managers, the NRV status was mapped across the forest.

Since the finished assessment would be published as a General Technical Report that would be cited during the forest plan revision, Smith and Driscoll worked with managers at both the regional and forest levels to incorporate edits and ensure that all the management concerns were addressed in the document.

Once finished with the Ashley and Manti-La Sal National Forests, they moved to the Salmon-Challis National Forest, followed by the Dixie and Fishlake National Forests, and the Bridger-Teton National Forest.

The Northwest Forest Plan Effort

News of RMRS teams' assessment approach didn't stay confined to Region 4. Scott Peets, a member of the strategic planning group for the Northwest Forest Plan, heard of their work around 2020. At this time, five forests subject to the Northwest Forest Plan in Regions 5 and 6 were beginning the assessment phase for their management plan revision process.

"On the forests where I worked previously, we had never completed an assessment, so we needed help," Peets explains. "We needed some guidance and what they did for Region 4 served as a guide."

A call to Driscoll resulted in agreement to help the strategic planning group. While the assessment process was the same as had been done previously, what proved more challenging was conducting the assessment for all five forests at once, not just one or two. Smith and Driscoll selected datasets that could be applied across all five forests to ensure a consistency in the analyses, which were supplemented with forest-level data where applicable. "We put them through the wringer," Peets admits. "They were very accom-

A road paralleling Colson Creek in the Salmon-Challis National Forest is eroding into the channel, disrupting natural channel migration and contributing sediment to the channel. USDA Forest Service photo by Max Smith.

MANAGEMENT IMPLICATIONS

- Riparian ecosystems provide critical habitat for many species—including threatened and endangered plants and animals—and are essential migration corridors throughout the West.
- Waterways and their associated riparian ecosystems cross administrative and biophysical boundaries. Management of these ecosystems can therefore influence water resources on National Forests and non-forest lands.
- GDEs and intermittent streams are less obvious across a landscape, which makes them difficult to manage. Degradation of these systems can result simply due to lack of knowledge on their location or condition. Mapping and monitoring of these resources are important for protecting them from future changes in climate and land use.
- Strong relationships with local forest staff that include face-to-face meetings have improved the success of partnerships between scientists and the forest staff. These meetings and regular contact between managers and scientists encourage sharing of data and information, improve the quality and utility of the final products, and increase likelihood that assessment information will be integrated into forest plans and subsequent project plans.

Data, Data, Data Everywhere

Finding datasets for the assessment process was akin to a treasure hunt. Smith and Driscoll found national datasets developed by the Forest Service that they were unaware of. Some forests had hard copies of field data in file drawers, while others had electronic spreadsheets of plot data that hadn't been analyzed before. In some cases, this was the first time the data were formally referenced, and the forests were happy to see the information be published.

"What data the forests had really varied by forests," Smith added. "For instance, the Ashley had a huge database of plot surveys where they went out and took a lot of photos of vegetation in different places that was helpful for us to get an idea of what is out there. Other forests had some older datasets where they didn't have as many photos, but they had plot data taken along different streams."

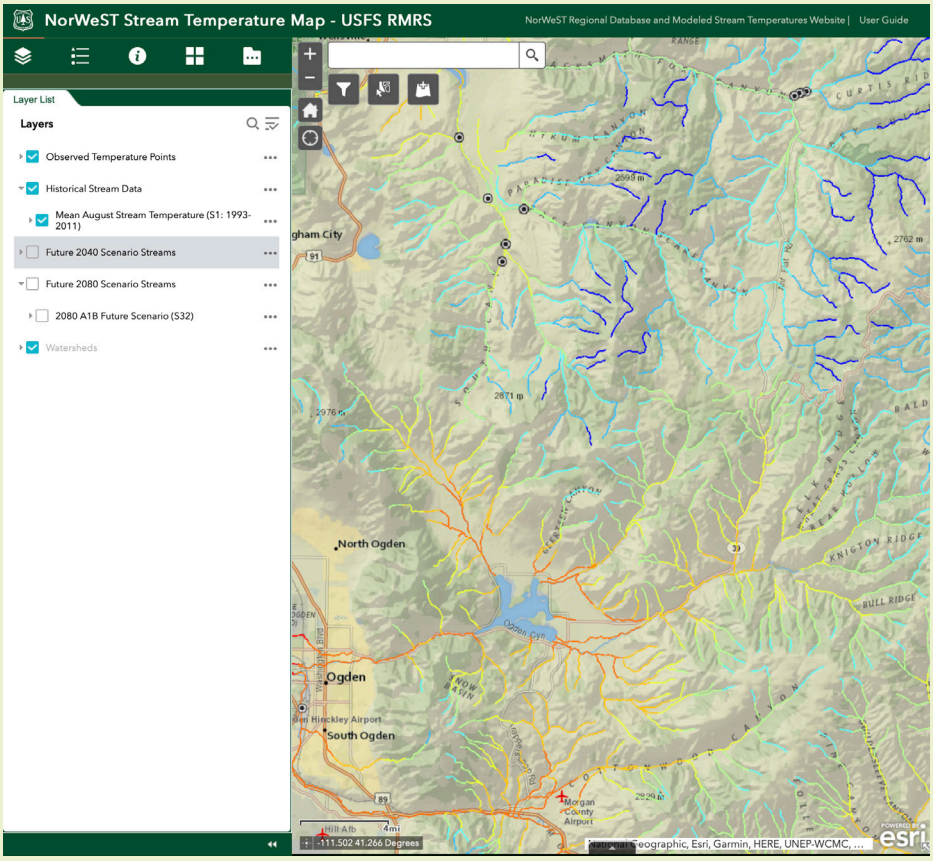
Here are some of what Driscoll calls the "amazing tools" that the team used to write the assessments.

NorWeSt Stream Temperature

This dataset gives modeled stream temperatures going back to 1993 through 2015 and projects temperatures to 2040 and 2080. Over 50 federal, state, and county agencies, Tribal Nations, universities and colleges, and other contributors made this dataset possible.

NorWeSt Stream Temperature proved especially useful for the assessments of the Northwest Forest Plan forests since managing for salmon and steelhead is a priority, and staff needed to know the future climate projections for stream temperatures and what future fish habitat would look like.

https://www.fs.usda.gov/rm/boise/AWAE/projects/NorWeST.html



Screen capture from the NorWeSt Stream Temperature dataset website, showing an area in the Wasatch Mountains of Utah.

Western Flow Metrics

Developed by RMRS scientist Charles Luce and his team, this interactive map depicts modeled flow metrics in the western United States for historical (1977–2006) and future (2030–2059 and 2070–2099) climate change scenarios, and the absolute and percent change between them.

Forests in northern California and southern Oregon have been particularly interested in these future predictions to determine which stream systems will have significant changes in streamflow patterns and those that are more resilient under climate change.

https://www.fs.usda.gov/research/rmrs/products/dataandtools/interactivemaps/western-flow-metrics

Fen Mapping

The Colorado Natural Heritage Program is producing maps of potential fens throughout the West. The basis of these maps are aerial photographs combined with National Wetland Inventory data. These maps are used by NFS staff to prioritize field visits for confirming the presence of these valuable wetlands.

https://cnhp.colostate.edu/cwic/wetlandtypes/fen-mapping/

Data, Data, Data Everywhere (continued)

Level II Riparian Inventory Data

In Utah, several National Forests created datasets of Level II riparian inventory data. Level II riparian inventory data are described as "an extensive stream channel, riparian vegetation, aquatic habitat condition and biotic inventory on a watershed-wide scale and is to be used to determine the 'pulse' or condition of a system during low flow conditions." According to NFS staff, these datasets had been underutilized previous to writing the assessments.

Riparian Condition Assessment Toolbox

Originally designed for the Colorado Plateau Ecoregion and Utah, the suite of stream network assessment tools now covers the Interior Columbia River Basin. These tools are designed to delineate valley bottoms, assess riparian vegetation, evaluate floodplain condition, and estimate recovery potential of riparian areas.

https://rcat.riverscapes.net/

Beaver Restoration Assessment Tool

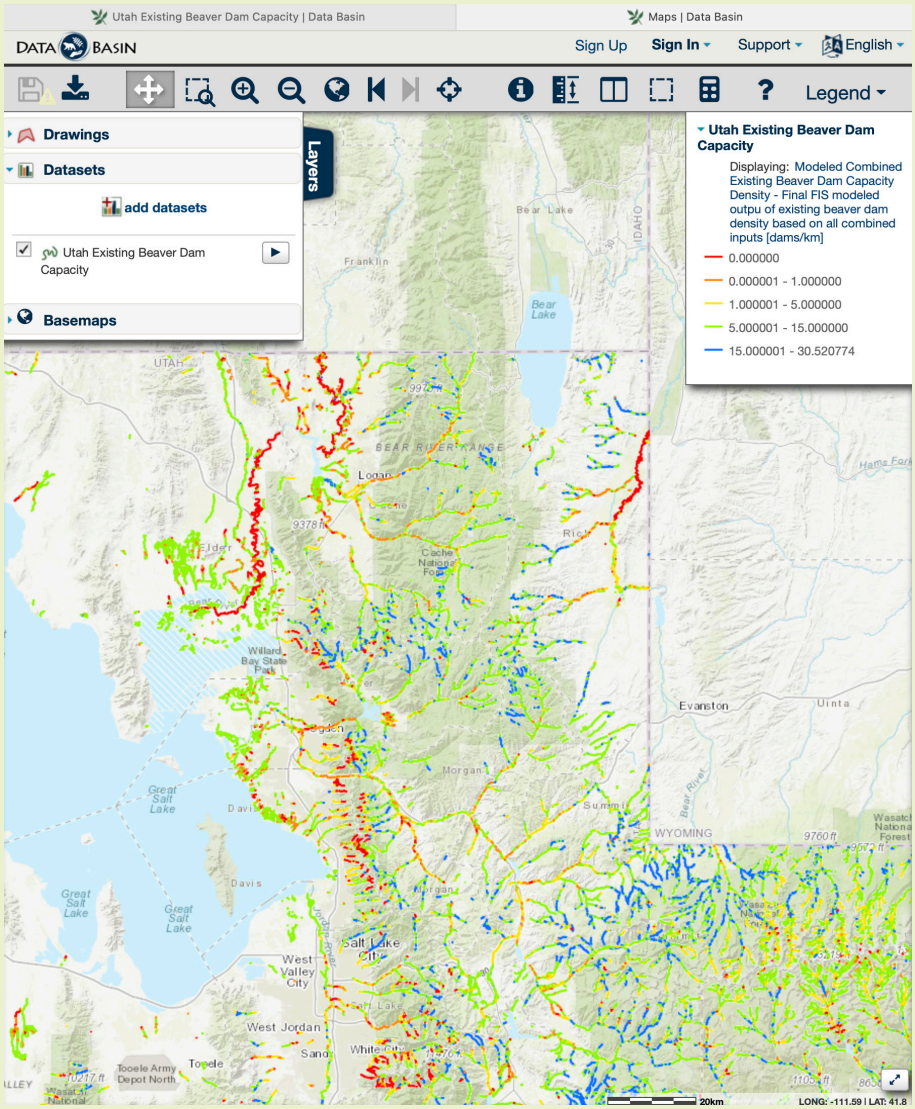
Beavers are increasingly being seen as a cost-effective management tool to mitigate the effects of climate change upon riparian ecosystems. The Beaver Restoration Assessment Tool is a resource that managers can use to estimate beaver capacity and stream and riparian restoration potential. Although the tool is designed for use in Utah, the underlying science is applicable elsewhere.

https://brat.riverscapes.net/

Spring Stewardship Institute Springs Online Database

Springs Online was developed in 2010 to store quality data related to spring ecosystems. It offers methods for assessing the condition of springs, as well as how to enter, retrieve, and analyze spring inventory data. According to Driscoll, "We have used this database for most forests. It was particularly valuable for the Humboldt-Toiyabe assessment, which is in-prep. It often provides the only available information on spring condition."

https://springstewardshipinstitute.org/about-the-database



Screen capture from the Beaver Restoration Assessment Tool showing part of northern Utah.

KEY RESEARCH FINDINGS

- Existing information and data related to GDEs, such as springs and fens, are uneven and often lacking. Other common information gaps identified across most National Forests include condition of intermittent streams and spatial distribution of beaver activity.
- The condition of western riparian, aquatic, and groundwater-dependent ecosystems varies widely, which is likely a result of physical settings, differing management histories, and interactions between natural and anthropogenic disturbances.
- Many riparian areas have been altered since Euro-American settlement. Roads and livestock grazing are major stressors across many forests. Additionally, large or high-severity wildfires are increasingly affecting large sections of riparian ecosystems. Other common stressors include dams and diversions, recreation, and invasive species, which tend to have more localized effects.
- The effect of some stressors can be mitigated by managers. Along many streams, beaver dams promote resilience to stressors. In some areas, changes to grazing practices have improved site conditions.

modating to our requests, for which we are grateful, and the published volumes to date have exceeded our expectations."

This assessment, published in early 2024, is the second-longest General Technical Report ever produced by RMRS." All volumes for that report are published and available on treesearch.

Integrating Best Available Science Into Forest Plans

The reaction to the assessment process and the published General Technical Reports has been overwhelmingly positive. It's a testament to the upfront investment of in-person kickoff meetings and field visits to ensure that staffs' management questions and concerns were addressed in the assessment. And it's also a testament to Smith and Driscoll for translating their scientific expertise in riparian and GDE ecosystems into a useful management tool that addresses the holistic, all-lands approach the agency is taking to manage NFS lands.

"Oftentimes, we don't have either the capacity or the expertise in-house to do this level of work," explained Clint Sestrich, a fisheries biologist and acting aquatic program manager on the Bridger-Teton. "Smith and Driscoll did an excellent accounting where these ecosystems occurred across the forest, what their distribution is, and what their percent contribution is."

James Wilder, a forest wildlife biologist, had a similar reaction after reviewing the Bridger-Teton's assessment; he joined the Forest in March 2020 as the forest plan revision was beginning. "One of the biologists alerted me to the assessment, and it was obviously tailor-made to what we were trying to get at," he says.

Bridger-Teton's riparian systems provide the cold, clean water that is needed by wildlife and communities downstream. Although these ecosystems only make up 2 percent of Wyoming's land area, 80 percent of wildlife species rely on them. "Ecological diversity in these riparian areas is off the charts compared to the rest of Wyoming," Wilder explains. "This assessment will inform the foundation of a lot of important land management decisions going forward on the forest."

The Bridger-Teton is updating its forest plan, which Wilder described as "probably the most important thing any of us are going to work on." Although Driscoll and Smith finished the assessment and have moved to new assessments, they remain available to consult. Driscoll and Smith have spoken frequently with Wilder, providing additional resources and analyses that they learned about while conducting assessments in Regions 5 and 6 to inform the forest plan revision process.

That the assessment method can be successfully deployed across different forests caught the attention of staff involved in standing up regional planning centers to assist in updating forest management plans.

Sabine Mellmann-Brown is the group lead for the ecology team

with the Mountain Planning Service Group. During the Lolo National Forest's plan revision process, she was involved in writing the assessment. Early in the process, Mellmann-Brown wished that an assessment written by Smith and Driscoll was available. Instead, she used the Bridger-Teton assessment. Particularly, "for how to phrase the issues, how to phrase some of the key indicators, and how to present discussion on ecological integrity," she explains.

Drawing upon their experience writing assessments for the five forests in Regions 5 and 6, "we have a framework in place that the Mountain Service Planning group can use for assessing multiple forests within a landscape as rapidly as possible so they can help get the assessment process underway and wrapped up for the revision teams," says Smith.

For next steps, Mellmann-Brown says they are still looking at several approaches for how best to conduct the assessments. As for the riparian ecosystems and GDEs assessment written by Smith and Driscoll, she considers them "one of our main legs to stand on for scientific information."

Exploring Drivers, Stressors, and Management

The decision to write individual assessments rather than a region-wide assessment was due to the geographic diversity within Region 4, which was revealed in the diversity of riparian and GDEs that Smith and Driscoll analyzed.

"Something interesting we found is that there's a lot of variation, both among forests and within forests, of which GDEs or riparian features are very important for maintaining of resilience during climate change and other stressors," Smith explains. For example, forest riparian areas in the lower elevations were crucial for maintaining cold stream temperatures and wildlife habitat, while at high elevations, springs provided habitat.

However, over the course of writing the assessments, Smith and Driscoll recognized shared stressors and drivers common across the region. Drivers were geology, climate, topography, and beaver activity, while stressors were roads, grazing, invasive species, water diversions, dams, and high-severity wildfire.

Depending upon the circumstance, forests may be able to mitigate the effects of these drivers and stressors.

Just as GDEs have received increased attention within the last decade,

In some areas, such as the Wasatch Plateau of the Manti-La Sal National Forest (left), springs occur in relatively undisturbed settings. In other areas, such as the Canyon Mountains of the Fishlake National Forest (right), springs have been excavated, impounded, and affected by heavy livestock use. USDA Forest Service photos by Max Smith.

so too has the role of beavers in maintaining or improving the functionality of riparian ecosystems. Beavers alter the hydrology of an area through their dam building; this can result in areas not drying out during the summer to enable fry to survive until the fall.

"That's one thing we've seen change over the course of our assessments," Driscoll says. "On the first forest we worked on, I don't remember beavers coming up at all. Now it's a major topic of conversation. There's usually a lot of questions about beaver restoration and beaver populations on the forest, both current and historical, which is another spot where there's a pretty big data gap."

In the assessments, Driscoll and Smith identified areas where beaver-based restoration projects may improve the ecological integrity of the riparian ecosystem.

Given that much of Region 4 is suitable as livestock range, grazing is another stressor, both due to historic and ongoing grazing. Depending upon the pattern of use, the severity may vary among the different units within a forest, and this too was reflected in the assessments.

"One of the most useful aspects of these assessments is showing how the forests can manage to protect aquatic and riparian ecosystems in response to both climate change and other anthropogenic changes on the landscape," Smith says.

Once they transition from writing the assessments, Driscoll and Smith already have their next research goal: further examining regional patterns to see what else emerges. Specifically, Wilder and Driscoll are collaborating to assess riparian ecosystems and develop a tool for prioritizing restoration across the Greater Yellowstone Ecosystem.

Tall willow and wet meadow communities are maintained by a series of beaver dams in North Horse Creek in the Bridger-Teton National Forest. These extensive riparian areas are used by a variety of wildlife species. USDA Forest Service photo by Max Smith.

FURTHER READING

D. Max Smith, Laurel F. Martinez, Cynthia King, Taylor L. Pearson, Katelyn P. Driscoll. 2022. Riparian, aquatic, and groundwater-dependent ecosystems in southern Oregon and northern California: An assessment of ecological integrity to inform forest plan revision. Vol. 1: Introduction and summary of findings

Driscoll, Katelyn P.; Smith, D. Max. 2021. Development of riparian and groundwater-dependent ecosystem assessments for National Forests in the western U.S.

Smith, D. Max; Driscoll, Katelyn P.; Warren, Steven D.; Finch, Deborah M. 2020. Riparian and groundwater-dependent ecosystems of the Bridger-Teton National Forest: An assessment of resources and current conditions.

Smith, D. Max; Driscoll, Katelyn P.; Warren, Steven D.; Finch, Deborah M. 2020. Riparian and groundwater-dependent ecosystems of the Dixie and Fishlake National Forests: An assessment of resources and current conditions.

Driscoll, Katelyn P.; Smith, D. Max; Finch, Deborah M. 2019. Riparian ecosystems of the Manti-La Sal National Forest: An assessment of current conditions in relation to natural range of variability.

Smith, D. Max; Driscoll, Katelyn P.; Finch, Deborah M. 2018. Riparian and wetland ecosystems of the Ashley National Forest: An assessment of current conditions in relation to natural range of variation.

RESEARCHER PROFILES

The following individuals were instrumental in the creation of this Bulletin.

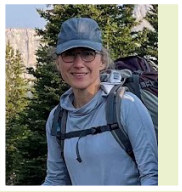
KATELYN P. DRISCOLL is a research ecologist with the USDA Forest Service, Rocky Mountain Research Station, in Albuquerque, New Mexico. Katelyn is currently working on projects that assess the condition of riparian areas and groundwater-dependent ecosystems to support National Forest Land Management Plan revision, evaluate the effectiveness of stream and riparian restoration treatments, and study the impacts of disturbance on riparian, wetland, and groundwater-dependent ecosystems.

D. MAX SMITH is an ecologist with the USDA Forest Service, Rocky Mountain Research Station, in Albuquerque, New Mexico. Max studies the dynamics of stream ecosystems in the western United States. Among his research projects is a long-term study of riparian-nesting birds along the Middle Rio Grande in New Mexico.

JAMES WILDER is the forest wildlife biologist with the USDA Forest Service on the Bridger-Teton National Forest. He has also worked for the U.S. Fish and Wildlife Service and National Park Service as a wildlife biologist.

CLINT SESTRICH is a fisheries biologist with the USDA Forest Service on the Custer Gallatin National Forest. Clint manages the aquatics program on the 1.7-million-acre Absaroka Beartooth Zone with focal areas including native Yellowstone cutthroat trout restoration, process-based stream restoration, and aquatic invasive species prevention.

SCOTT PEETS serves as the Northwest Forest Plan Amendment Project Lead, Pacific Planning Service Group, Region 5.



SABINE MELLMANN-BROWN serves as the Ecology Group Lead for the Mountain Planning Service Group for Regions 1-4.

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R4 RO: Mark Bethke, Jeff Bruggink, Gina Lampman, Cynthia Tate, Mark Muir

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SALMON-CHALLIS NF: Bart Gammet, Dave Deschaine, Jeremy Back, Mary Friberg

BRIDGER-TETON NF: Jim Wilder

DIXIE NF: Brooke Shakespeare, Rich Jaros, Mark Madsen

FISHLAKE NF: Adam Solt, Dan Child, Stan Anderson

NWFP TEAM: Steve Bachmann, Scott Peets, Mary Friberg

COLORADO NATURAL HERITAGE PROGRAM: Gabrielle Smith

RMRS: Kate Dwire and Steven Warren

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