

**Final Report
December 2021**

**New Mexico Rapid Assessment Method for Confined Valleys,
and USACE NMRAM Phase 2,
New Mexico**

Assistance Agreement No. CD-00F10901-A (FY 2015)



Confined Valley Riverine Wetlands on Bobcat Creek Northeast of Red River, NM. (Fall, 2020) (photo D. Crosley)

**New Mexico Environment Department
Surface Water Quality Bureau
Wetlands Program**

Project Goals and Objectives

Riverine wetlands in confined valleys are impacted and threatened by flow regulation by dams, mineral extraction, development and urbanization, agricultural nutrients and livestock grazing, major wildfires, non-native invasive species, and roads. The need for an assessment method that measures the consequences of these impacts and stressors in confined valley riverine wetlands was a high priority of the New Mexico Environment Department Surface Water Quality Bureau Wetlands Program as no other similar assessment methods for this subclass of wetlands exists. Confined Valley Riverine Wetlands are those wetlands found along stream and river channels that are cobble, boulder, and/or bedrock controlled and typically constrained within narrow v-shaped valleys (Brinson 1993; Wilder et al. 2012) (Figure 1). Lateral migration of channels is limited, and stream channel morphologies range from cascading to a step-pool configuration with intermixed drops over boulders and extended pools. This subclass typically occurs in mountainous regions but can extend down into ravines that cut through plateaus (e.g., tributaries to the Rio Grande Gorge). Elevations range from 4,500 ft to 9,000 ft. Stream channel gradients are greater than 1% (Figure 1).



Figure 1. Confined Valley Riverine Wetlands on the Rio Guadalupe at Gilman Tunnels, Jemez Mountains NM (photo M. McGraw).

This Project is a continuation of the development of wetlands rapid assessment methods for New Mexico with a focus on confined valley riverine wetlands in montane regions of the state. The project resulted in the development of NMRAM Confined Valley Riverine Wetlands Field Guide Version 1.3 that provides specific protocols for evaluating ten wetland ecological condition metrics using a combination of Geographic Information System (GIS)-based measurement and field surveys. Fillable data collection worksheets were also developed to support efficient data collection. These can be found at SWQB Wetlands Program Rapid Assessment Methods webpage at <https://www.env.nm.gov/surface-water-quality/wetlands-rapid-assessment-methods/>. Of the ten metrics used for evaluating Confined Valley Riverine Wetlands, five are new and exclusive to this subclass.

Another goal was to update and improve the NMRAM Manual to include a description and the rationale for Confined Valley Riverine Wetlands metrics and to include any new or updated metrics and the updated stressor checklist from past NMRAM development. The NMRAM Manual 2.0 is the overarching document that explains the goals and objectives of NMRAM, provides information about the subclasses of wetlands for which NMRAM is currently developed, and explains the approach for NMRAM development. The updated NMRAM Manual Version 2.0 is available on the SWQB Wetlands Program Rapid Assessment Methods webpage.

This Project included the continued enhancements of the SWQB Surface Water Quality Bureau Information Database (SQUID) Temporary Wetlands Database to accept and store NMRAM data. Four in-person New Mexico Wetlands Roundtables, maintained by the SWQB Wetlands Program, were conducted in the spring and fall of 2019 under this project - two in Santa Fe to accommodate the northern part of the state, and two in Las Cruces to accommodate participants from Southern New Mexico.

In addition to the development of NMRAM for Confined Valley Riverine Wetlands, work was conducted on a regulatory version of NMRAM for United States Department of the Army Corps of Engineers' (USACE) use (Phase 2). This work was conducted in conjunction with the Albuquerque District of the Corps of Engineers. Under this grant, a draft NMRAM Riverine Wetlands Regulatory Version 1.2 Field Guide was reviewed by the USACE Engineer Research and Development Center with favorable results and the comments were incorporated into the Field Guide. A field training was conducted in 2019 for both USACE and SWQB staff to test metrics in the field, and a half day training was also conducted for the regulated community. Draft electronic data collection worksheets were developed, and Version 1.3 were updated to increase utility.

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Project Outputs

Through this project nine major outputs were accomplished:

- 1) Data collection, analysis, and validation for the innovative Confined Valley Riverine Wetlands NMRAM including the development of a Field Guide 1.3 and electronic data collection worksheets Version 1.3;
- 2) Update of Version 2.0 of the NMRAM Manual to cover all field guides and metrics developed to date;
- 3) Formation of a Technical Advisory Committee which met two times to provide input to NMRAM Confined Valley Riverine Wetlands metric development;
- 4) A Multi-metric Analysis using geomorphological, vegetation and other field data collected at 35 confined valley riverine wetlands Sample Areas (SAs);
- 5) Updates to NMRAM Riverine Wetlands Regulatory Version 1.3 and draft electronic data collection worksheets Version 1.3;
- 6) Three NMRAM trainings for potential end-users, one using NMRAM Confined Valley Riverine Wetlands and electronic data collection worksheets for a variety of participants, one field training using NMRAM for Riverine Wetlands Regulatory for USACE personnel (Technical Transfer), and one half-day classroom training for the regulated community;
- 7) Vegetation classification of 35 SA floodplains;
- 8) New Mexico Wetlands Roundtables maintained in the northern and southern parts of the state each meeting twice per year for a total of four times under this project - the meetings focused on the objectives established by the group and included co-sponsorship by an NGO organization;
- 9) The development of NMRAM has been shared locally and nationally through presentations, and public events.



Figure 2. Confined Valley Riverine Wetlands of Cabresto Creek, tributary to the Rio Grande.

Project Outcomes

- The SWQB Wetlands Program and partners are providing wetland assessment capability to require better wetlands protection, restoration, and mitigation.
- This project creates a new tool for evaluating the condition of New Mexico's confined valley riverine wetlands in comparison to a level of human disturbance and that is relevant to New Mexico.
- NMRAM is filling a critical piece of an integrated and comprehensive approach to wetlands protection by SWQB and its partners.
- NMRAM will provide the supporting data and information needed to develop water quality standards for subclasses of New Mexico's wetlands resources.
- The NMRAM can be used to identify reference standard wetlands in need of special protection, and to identify those that are particularly impacted and those that can be restored.
- Working collaboratively with USACE in the development of NMRAM Riverine Wetlands Regulatory Version increases the capacity of both agencies to require better and more equitable mitigation and protection of scarce wetland resources in New Mexico.
- As future wetlands subclasses are described and assessed, an iterative monitoring program linked to water quality assessments by watershed will continue to be developed and will increase the capacity and understanding of ecological linkages, natural variability and changes that result from human activities.

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- Through our development of an integrated SQUID database at SWQB, wetlands assessment data will be available for inclusion in CWA Section 305(b) reports, increasing access to stakeholders and decision makers to improve their knowledge and understanding of wetlands issues.
- The oversight of NMRAM wetlands data at NMED will provide the capability to combine wetlands data and results with other SWQB water quality programs that will result in overall improvement to water resources of the State.
- Expanding and maintaining the New Mexico Wetlands Roundtable in Southern and Northern New Mexico including meetings especially located, designed and planned to inform partners relevant to their region, establishes and solidifies new partnerships, increases the capacity of the Wetlands Program to reach a variety of stakeholders with relevant and up-to-date information and data-sharing regarding wetlands in New Mexico.

Project Location

The Reference Domain for NMRAM for Confined Valley Riverine Wetlands development includes montane confined river valleys in tributaries of the upper Rio Grande, confined river valleys in the Jemez Mountains and in the Sandia Mountains, and confined valley wetlands of the upper Canadian River Watershed (Figure 4). The results of this project have statewide application for confined valley riverine wetlands in mountainous regions in New Mexico and throughout the Rocky Mountain region. The NMRAM for Riverine Wetlands Regulatory Version has Statewide application to both Montane and Lowland subclasses of riverine wetlands and can be applied to montane and lowland unconfined river systems in the arid west.



Figure 3. Confined Valley Riverine Wetlands of Manuelas Creek, tributary to the Canadian in Mora County, NM.

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Original Timeframe

The Award for this grant CD #01F10901, includes five projects that originated in October 2015. Federal Assistance was awarded for this project on September 17, 2015, to begin on October 1, 2015, under the FY15/16 Wetland Program Development Grant Opportunity. On January 5, 2018, EPA approved a no-cost grant extension for the Award to September 30, 2020. In September 2019, a no-cost grant extension was requested specifically to accommodate another project in the Award but affected the end date for all projects in the Award and the new end date of April 30, 2021, was approved on October 4, 2019. On October 2020 the Wetlands Program requested a no cost extension to September 30, 2021, because NMED was experiencing critical project delays due to COVID-19. The stated goals and objectives of the project remained the same, as well as the key project Tasks and deliverables.

Partners Involved

UNM Natural Heritage New Mexico was the principal contractor in partnership with SWQB Wetlands Program in developing the Confined Valley Riverine Wetlands NMRAM 1.3 for this Project and for the NMRAM Manual Version 2.0 update. TEKSystems, Inc. is responsible for developing the interactive data collection worksheets for both Confined Valley Riverine Wetlands data collection and for the NMRAM Riverine Wetland Regulatory Version, 1.3 and for enhancements to the SQUID Wetlands Temporary Database to accept NMRAM data. USEPA Region 6 (Sharon Daugherty, Leslie Rauscher, Kyla Chandler, and Sondra McDonald) provided project progress guidance and technical assistance.

SWQB Wetlands Program was involved in every aspect of project and co-authored the Field Guides and NMRAM Manual Version 2.0 along with UNM Natural Heritage New Mexico (co-authors: Esteban Muldavin, Elizabeth Milford, and Maryann McGraw). The Project involved a Technical Advisory Committee whose members are as follows:

Technical Advisory Committee Members

| Name | Organization |
|-----------------|---------------------------------|
| Jerry Clark | FEMA, Denton, Texas |
| Susan Torres | NM Wildlife Foundation |
| Julie Tsatsaros | New Mexico Highlands University |
| Anna Jaramillo | USFS |
| Amy Urbanovski | UNM Nat Her |
| Maceo Martinet | USFWS |
| Malia Volke | NMDGF |
| Joneen Cockman | Bureau of Land Management (AZ) |
| Athena Cholas | NMDA |

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|-------------------------|--|
| Shannon Romeling | Amigos Bravos |
| Paul Knight | Marron and Associates |
| Davena Crosley | NMED/SWQB |
| Deanna Cummings | U.S. Army Corps of Engineers |
| Steve Harris | Rio Grande Restoration |
| Nina Wells | Los Amigos de Valles Caldera |
| Martha Cooper | The Nature Conservancy |
| Jennifer Fullam | NMED/SWQB |
| Anne-Marie Matherne | USGS |
| Dan Guevara | NMED/SWQB |
| Mark Bundy | Private Citizen |
| Craig Sponholz | Watershed Artisans |
| Avery Anderson | Watershed Artisans |
| Wendy Pierard | NMED/SWQB |
| Meg Hennessey | NMED/SWQB |
| Brianna Wadley | EPA Region 6 |
| Ondrea Linderoth Hummel | U.S. Army Corps of Engineers and Tetra Tech |
| Gwen Kolb | US Fish and Wildlife Service – Partners for Fish and Wildlife |
| Karen Menetrey | NMED/SWQB |
| Daniel Landeros | EPA Region 6 |
| Wanda Boyd | EPA Region 6 |
| Meaghan Conway | NMDGF |
| Adam Ringia | Southwest Tribal Fisheries Commission |
| Charlie Cassagnol | Western Ecology |
| Miguel Montoya | NMED/SWQB |
| Yasmeen Najmi | Middle Rio Grande Conservancy District |
| Emile Sawyer | NMED/SWQB |
| Paul Tasjian | US Fish and Wildlife Service |
| Lori Walton | U.S. Bureau of Reclamation |

Independent Reviewers of the NMRAM Field Guides and Data Collection Worksheets:

| | |
|------------------------------------|---|
| Deanna Cummings | U.S. Army Corps of Engineers |
| Bruce A. Pruitt and Development | U.S. Army Corps of Engineers Engineering Research |

Confined Valley Riverine Wetlands NMRAM Technical Team (field site selection, data collection, geodatabase development)

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| | |
|------------------|-------------|
| Hannah Burnham | UNM Nat Her |
| Yvonne Chauvin | UNM Nat Her |
| Davena Crosley | NMED/SWQB |
| Abraham Franklin | NMED/SWQB |
| Emile Sawyer | NMED/SWQB |
| Chris Cudia | NMED/SWQB |
| Amy Urbanovski | UNM Nat Her |

Southern New Mexico Wetlands Roundtable Presenters, March 12, 2019: Southwest Environmental Center, International Boundary Waters Commission, Saint Mary’s University of Minnesota Geospatial Services, New Mexico Department of Transportation, USACE, Center for Biological Diversity, RCS Southwest, US Fish and Wildlife Service, US Bureau of Land Management. Co-Sponsor: New Mexico Native Plant Society.

Northern New Mexico Wetlands Roundtable Presenters, April 1, 2019: Amigos Bravos, New Mexico Highlands, New Mexico Bureau of Geology and Mineral Resources, USACE, New Mexico Department of Transportation, RCS Southwest, UNM Natural Heritage. Co - Sponsor: New Mexico Native Plant Society.

Southern New Mexico Wetlands Roundtable Presenters, November 19, 2019: Center of Excellence in Hazardous Materials Management, Pitchfork Ranch, NMED SWQB, US Bureau of Land Management, Saint Mary’s University of Minnesota Geospatial Services, NM Department of Game and Fish, USACE. Co-Sponsor: Anonymous Donor.

Northern New Mexico Wetlands Roundtable Presenters, December 9, 2019: Ecotone Landscape Planning, Reineke Construction, Hermit’s Peak Watershed Alliance, USEPA Region 6, USFS, USACE. NMDGF, Pueblo of Sandia Environment Department, NMED SWQB. Co-Sponsor: Albuquerque Wildlife Federation

Additional partners who contributed to this project:

Some of the match for the MOA with UNM Natural Heritage Program (NHNM) has been contributed to this project by the University of New Mexico, Natural Heritage New Mexico Museum of Southwestern Biology.

Funding

The original Federal amount was **\$403,117.00** and **\$155,565.00** match. The federal amount was spent and the **final match amount** was **\$207,935.20 (\$52,370.20 overmatched)**. See semi-annual reports for details.

Major Project Highlights and Chronology

- This project was awarded federal assistance by EPA Region 6 on September 17, 2015 for work to begin on October 1, 2015 under the FY15/16 Wetland Program Development Grant Opportunity.
- Maryann McGraw is the Wetlands Program Coordinator (WPC) and Project Officer for this Project.
- Because of their expertise and involvement in other NMRAM development with the Wetlands Program, the WPC initiated an IGA for work with the University of New Mexico Natural Heritage New Mexico (NHNM) to complete some of the tasks associated with this project.
- WPC met with Este Muldavin (NHNM) to discuss and develop a scope of work and timeline for NMRAM development.
- Wetlands Program staff coordinated with SWQB MASS team that is performing the Canadian and Dry Cimarron intensive water quality survey to select common sites. Wetlands Program staff ran a query to identify the confined riverine wetlands sites in the updated National Wetlands Inventory database completed under the “Mapping and Classification for Wetlands Protection, Northeastern New Mexico” wetlands project (CD#00F057-01-0 FY20009) and compare to the MASS sampling plan in order to select confined riverine wetlands Sample Areas (SAs) that have water quality sampling stations nearby.
- Maryann McGraw (Wetlands Program Coordinator (WPC)) attended the Society of Wetland Scientists Rocky Mountain Chapter meeting in Golden, Colorado on April 13, 2016 as match for this project.
- The MOA between NMED and NHNM was signed January 12, 2017, and contract work started.
- The WPC met with NHNM on February 1, 2017 in an introductory planning meeting to start work on the project by discussing the definition of the subclass and development of potential metrics.
- Emile Sawyer (Wetlands Program Project Officer (WPO)) attended a planning meeting for SWQB Water Quality Sampling for the Upper Rio Grande and San Juan Watersheds on February 8, 2017 as match for this project.
- A 4-year contract with TEKsystems to develop data collection worksheets for wetlands data entry into the Surface Water Quality Information Database (SQUID) Wetlands Temporary Database which includes a task for Confined Valleys data collection is under development in March 2017.
- Deanna Cummings of the US Army corps of Engineers provided comments after field testing of draft metrics and draft data collection worksheets for USACE NMRAM Phase 2.

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- The 4-year contract with TEKSystems to develop data collection worksheets for wetlands data entry into the SQUID Wetlands Temporary Database which includes a task for Confined Valley Riverine Wetlands data collection was signed May 18, 2017.
- NHNM and the WPC provided comments after field testing of draft metrics and draft data collection worksheets for USACE NMRAM Phase 2. USACE provided NHNM and the WPC their final report to EPA regarding their 2016 data collection effort.
- NHNM and the WPC prepared a draft list of potential metrics for discussion for their applicability to Confined Valley Riverine Wetlands.
- Emile Sawyer (WPO) attended Habitat Survey training as match for this project.
- Maryann McGraw (WPC) attended and presented a poster at the Society of Wetland Scientists Rocky Mountain Chapter Meeting in Golden Colorado on April 12, 2017 as match for this project.
- WPC met with Kami Gupta (IT Program Manager) to begin development of an amendment for TEKsystems contract to work on NMRAM Regulatory data collection worksheets on May 25, 2017.
- A meeting was conducted on July 28, 2017, at USACE offices to review data collected by the Corps of Engineers to test NMRAM metrics, and to discuss the next steps to complete the development of activated PDF data collection worksheets and NMRAM Regulatory Field Guide Version 1.2.
- NHNM created two maps for site selection for confined valley riverine wetlands SAs using HGM maps developed from other SWQB Wetlands Program mapping and classification WPDG projects. The Reference Domain for the project was also delineated.

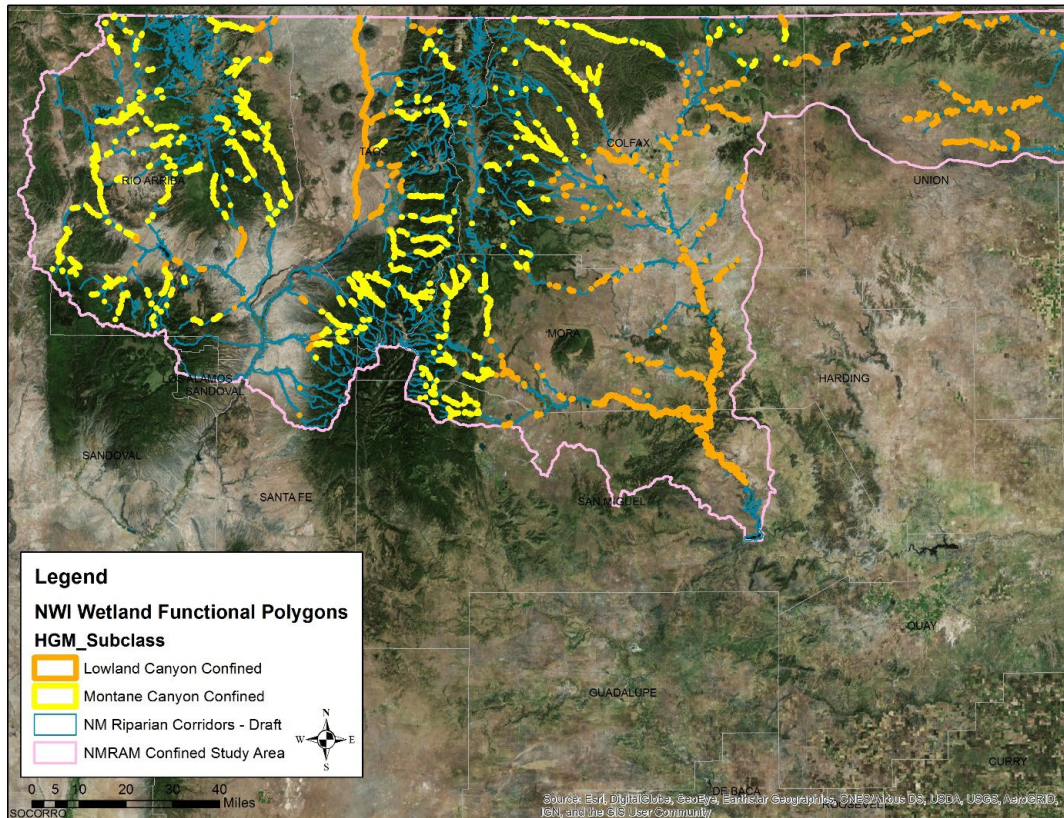


Figure 4. Riparian corridors within confined valleys Wetlands of Interest (WOI) from HGM maps. During the initial phases of NMRAM development for confined valleys, WOIs in lowland positions (below 5000 ft) as well as WOIs in montane corridors were both considered.

- The WPC and NHHM conducted meetings to discuss potential metrics to be used for confined valleys. NHHM made a master list of metrics and provided pro and con notes for each metric. Each metric was then discussed in a series of meetings that are ongoing.
- The WPC and Elizabeth Milford (NHHM) presented at the EPA Tribal Wetland Protection Workshop in Albuquerque, New Mexico, October 24-26, 2017. The WPC lead Wetlands Delineation Training with Kelly Allred of the Corps of Engineers to several tribal member attendees on the second day of the workshop. Elizabeth Milford provided an abbreviated NMRAM presentation to the workshop attendees and field training to a smaller group of attendees also on the second day.
- Amendment #1 for TEKSystems contract to develop data collection worksheets for wetlands data entry into the Surface Water Quality Information Database (SQUID) signed December 6, 2017. This Amendment included the new Task to develop Regulatory NMRAM interactive data collection worksheets.

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- WPC, Deanna Cummings, USACE lead collaborator, and NHHM met to work on development of Regulatory NMRAM. NHHM created two new SA internal metrics for Regulatory NMRAM which are undergoing evaluation and revision.
- TEKSystems developed Version 1.1 of Regulatory NMRAM active data collection worksheets.
- The Regulatory NMRAM Field Guide and data collection worksheets will include metrics for both Montane and Lowland Riverine rapid assessment so that regulators can use them for either subclass of riverine wetlands. Regulatory NMRAM is being developed solely for riverine wetlands at this time.
- The WPC began updating and revising the Regulatory NMRAM Field Guide using updates from other NMRAM Field Guides, including versions of the new metrics and combining Montane and Lowland Riverine metrics.
- The WPC and NHHM conducted meetings on April 9 and May 16, 2018 to discuss potential metrics to be used for confined valley wetlands.
- New edits and figures for Regulatory NMRAM field Guide were sent for review to USACE on April 2, 2018.
- The Pilot Study for this project was conducted at ten different sites in the Canadian and Upper Rio Grande watersheds reference domain on June 28 and 29, 2018. During the Pilot Study, the WPC, Este Muldavin and Elizabeth Milford tested the limits of the Confined Valleys subclass, during visits to confined valleys associated with lowland large rivers (eg. Rio Grande Gorge and Canadian Mainstem) and confined valleys of smaller montane rivers, as well as both narrow alluvial and bedrock confined valleys. In addition, stressor checklists were discussed as potentially changing how stressors are identified and applied to the NMRAM.



Figure 5. Pilot Study. Looking down on a confined reach of Arroyo Hondo in northern New Mexico. Arroyo Hondo is a small perennial stream and tributary to the Rio Grande. The road along this side of the valley contributes sediment and further encroaches on the narrow floodplain of Arroyo Hondo.



Figure 6. Pilot Study. Confined segment of the Rio Grande in Northern New Mexico. Larger rivers such as this have controlled flows from dams and reservoirs above, which impacts the suite of plants and floodplain width due to the paucity of high flow events.

- The QAPP was submitted to EPA for approval in July 2018 and was approved by EPA on August 25, 2018.
- NHHM selected 36 draft SAs as potential locations for the first phase of field data collection. Some of these sites were also used to illustrate features and subclass boundaries for the upcoming Technical Advisory Committee meeting presentation.
- The First Technical Advisory Committee meeting was conducted in Santa Fe on August 22, 2018, with 17 participants in attendance.
- Field Training of the Data Collection Team was conducted on August 27 and 28, 2018.
- Field data was collected from the first nine SAs by the Data Collection Team from August 28 through September 7, 2018, using draft metrics and including intensive hydrologic and botanical data collection. An additional six SAs were evaluated and excluded as not meeting the confined valleys subclass definition.
- A shapefile of the draft SAs was delivered by NHHM to the SWQB Wetlands Program in September 2018.
- Emile Sawyer attended a Botany Booster Training on August 9-10, 2018, as match for this project.
- In October 2018, the WPC met with Esteban Muldavin and Elizabeth Milford (NHHM) to refine the working definition of the Confined Riverine Wetland subclass as a follow-up to the first Technical Advisory Committee meeting.
- State-funded lab data analyses costs from the 2018 Intensive Water Quality Survey for the Upper Rio Grande, Pajarito Plateau (URG) and San Juan was included as match for this project. Water Quality sampling stations located in the Reference Domain for this project were used as a layer in the geodatabase so that some SAs for confined riverine wetlands were located near water quality sampling station sites.
- Data entry into the NHHM database was conducted for Confined Riverine Wetlands SAs data collected from August 27 to September 7, 2018. 2018 cross-section data was entered into Excel spreadsheets for the review meeting on October 23, 2018, for the development of hydrology, roads, and vegetation metrics.
- Data analysis for a hydrologic metric that could evaluate flows and flood events reduced by irrigation or impoundment upstream of the confined valley was reviewed and evaluated by NHHM, WPC and data collection team. In addition, a draft roads metric was developed to evaluate the impacts of roads on confined valley riverine wetlands.
- The first Southern Wetlands Roundtable under this project was conducted in Las Cruces on March 12, 2019, with more than 36 participants.
- The First Northern Wetlands Roundtable under this project was conducted in Santa Fe on April 1, 2019, with more than 64 participants.
- Progress was made on Version 1.2 of the Regulatory NMRAM datasheets to match and update the metrics selected for New Mexico Rapid Assessment Method: Riverine Wetlands Regulatory Field Guide. Work on the development of Confined

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Valleys NMRAM datasheets by TEKsystems, Inc. was then delayed because NMED IT was developing a new Price Agreement for FY20.

- Appendices for New Mexico Rapid Assessment Method: Riverine Wetlands Regulatory Field Guide Version 1.2 were completed in preparation for USACE Engineer Research and Development Center (ERDC) Review.
- NMRAM: Riverine Wetlands Regulatory Field Guide Version 1.2 was sent to ERDC on August 20, 2019.
- Field Training using New Mexico Rapid Assessment Method: Riverine Wetlands Regulatory Field Guide Version 1.2 was conducted for Corps of Engineers personnel on August 21, 2019.



Figure 7. Participants at the August 21, 2019 field training for USACE staff fill in and review datasheets after collecting data from an SA on the Jemez River.

- The New Mexico Rapid Assessment Method: Riverine Wetlands Regulatory Field Guide Version 1.2 was presented to the regulated community in a half day training on August 22, 2019.

17 Metrics for Riverine Wetlands Regulatory

- Landscape Context Metrics (L1-GIS-based)**
 - L1. Buffer Integrity Index
 - L2. Riparian Corridor Connectivity
 - L3. Relative Wetland Size
 - L4. Surrounding Land Use
 - L6. Internal Riparian Corridor Connectivity (Regulatory Only)
 - L7. SA Land Use (Regulatory Only)
- Biotic Metrics (L2 field-based)**
 - B1. Relative Native Plant Community Composition
 - B2. Vegetation Horizontal Patch Structure
 - B3. Vegetation Vertical Structure
 - B4. Native Riparian Tree Regeneration
 - B5. Invasive Exotic Plant Species Cover
- Abiotic Metrics (L2 field-based)**
 - A1. Floodplain Hydrologic Connectivity
 - A2. Physical Patch Complexity
 - A3. Channel Equilibrium (Montane only)
 - A4. Stream Bank Stability and Cover (Montane only)
 - A5. Soil Surface Condition
 - A6. Channel Mobility (Lowland only)

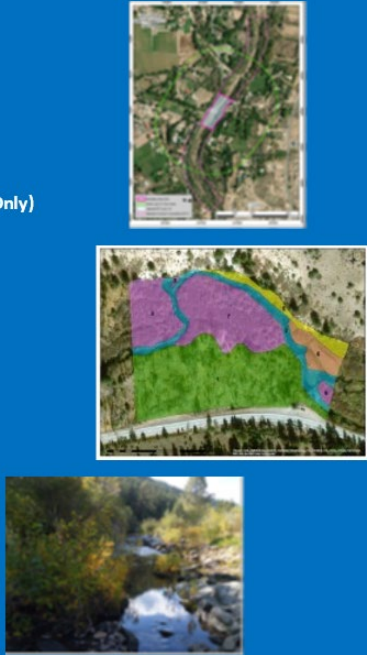



Figure 8. List of Metrics for NMRAM Riverine Wetlands Regulatory Version 1.2 presented to the Regulated Community in a half-day training on August 22, 2019.

Riverine Wetland Regulatory Field Guide Version 1.3 incorporates portions of both the Montane and Lowland Field Guides along with additional methods and metrics specific only for application of the NMRAM within a regulatory framework.



Example SA maps for Riverine Wetlands Regulatory Metric evaluation

Figure 9. NMRAM Riverine Wetland Regulatory uses a combination of metrics from both NMRAM for Montane Riverine Wetlands and Lowland Riverine Wetlands subclasses as well as some metrics specific to regulatory use. The Field Guide provides help to the user to determine the subclass being assessed.

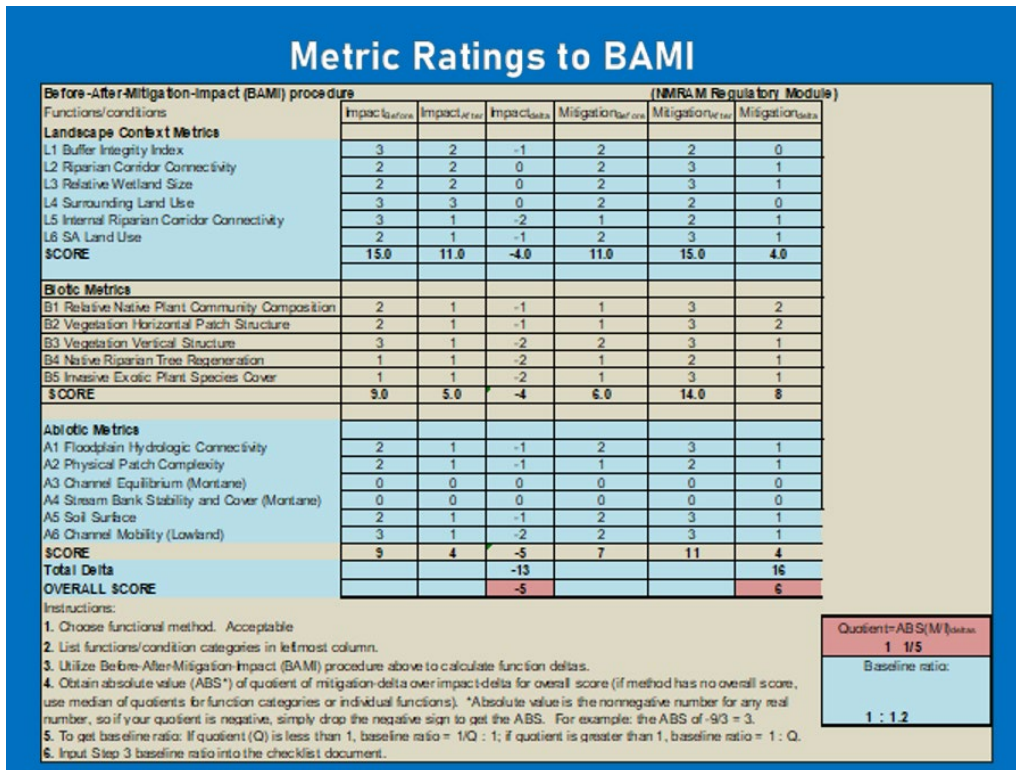


Figure 10. This example USACE Before-After Mitigation Impact Table shows how scores for an SA can be assessed before and after construction, as well as a comparison to potential before and after scores at a mitigation site.

- SAs were selected for additional data collection using updated data collection worksheets for Confined Valleys wetlands for the 2019 Field Season.
- Training for field staff was conducted on September 9, 2019 in preparation for data collection using updated protocols and data collection worksheets.
- Field Teams collected Confined Valleys wetlands data including floristic quality, Rosgen level 2 data and other data for metric development from 10 Sample Areas for Confined Valleys wetlands NMRAM in September 2019.
- A no-cost extension for this project was approved by EPA on October 4, 2019. The grant is extended through April 30, 2021.
- Favorable comments on the draft NMRAM Regulatory Field Guide and data collection worksheets Version 1.2 were provided by the Engineer Research Development Center of the Army Corps of Engineers (ERDC). The Comments were received by the Tarrie Ostrovsky (USACE) on October 8, 2019 and were forwarded to the WPC on November 12, 2019. Some of the comments were incorporated into Version 1.3. Under this Grant work on NMRAM Regulatory Module Phase 2 is complete and work on Phase 3 is continuing under CD #01F46701.
- The second Southern Wetlands Roundtable under this project was conducted in Las Cruces on November 19, 2019 with more than 27 participants.

- The second Northern Wetlands Roundtable under this project was conducted in Santa Fe on December 9, 2019 with more than 66 participants.



Figure 11. Large woody debris (LWD) is an integral component of confined valley wetlands. The data collection team collected data about LWD to help develop a metric for this indicator of condition.

- A new Price Agreement with TEKsystems was approved on January 28, 2020. The Price Agreement requires the development of a new contract with TEKsystems, Inc. for NMRAM datasheet development and SQUID updates for wetlands data.
- On March 13, 2020, NMED moved to teleworking due to the spread of Covid-19 virus. Some activities under this project were affected by the change in workplace and stay-at-home orders.
- The updated QAPP for this project was approved by EPA Region 6 on April 7, 2020 and is assigned QTRAK #20-206.
- The WPC attended the Association of State Wetland Managers Annual State and Tribal Coordination virtual meeting on April 7-9, 2020.
- A new MOA with NHHM developed to extend the project timeline and to collect additional data in 2020 was approved on May 6, 2020.
- Progress was made on multi-metric analyses for confined valley wetlands NMRAM in preparation for the second Technical Advisory Committee meeting.
- The second all-day meeting of the Technical Advisory Committee for the development of NMRAM for Confined Valley Riverine Wetlands was conducted by webinar on June 10, 2020 and hosted more than 16 participants.

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- The TEKsystems Multi-Bureau Contract and Purchase Order was approved on September 16, 2020. NMRAM datasheet development and SQUID updates for wetlands data resumed under the new contract on September 21, 2020.
- Contract work by TEKSystems and UNM Natural Heritage New Mexico has experienced significant delays due to delays in issuing Purchase Orders by NMED and due to Covid -19 restrictions.
- Training of the Data Collection Team for the 2020 NMRAM for Confined Valley Wetlands field season was conducted on September 11, 2020.



Figure 12. Amy Urbanovski (NHNM) and Abe Franklin (SWQB) practice using clinometer to determine slope of riparian area adjacent to stream on Las Huertas Creek during Data Collection Team training for field season on September 11, 2020. The Data Collection Team camped, drove in separate vehicles, and wore protective masks to prevent the spread of Covid-19.

- The NMRAM data collection team collected data from 10 confined valley riverine wetland SAs in late September 2020 and from 6 more SAs in October, 2020. NHNM staff entered floristic data and cross-section data and began entry of other NMRAM data collected in 2020 into the NHNM database for multi-metric analyses.
- A no cost extension of CD #01F10901 was approved by EPA Region 6 on October 20, 2020 and extended the completion time for the five projects under this grant through September 30, 2021.

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Figure 13. Esteban Muldavin (NHNM) and Yvonne Chauvin (NHNM) discuss size and extent of vegetation communities on Las Huertas Creek during training of data collection team September 11, 2020.



Figure 14. Amy Urbanovski (NHNM) and Davena Crosley (SWQB) conduct cross-section measurements for hydrology and riparian zone metric development on September 19, 2020. Orange pin flags are inserted horizontally into the banks to indicate bankful elevation. Tape indicates 2 times bankful elevation from the thalweg.

- The training short course for NMRAM Confined Valley Riverine Wetlands was conducted on August 24-25, 2021 virtually and in person on August 26, 2021 on Las Huertas Creek in the Sandia Mountains.
- NMRAM interactive worksheet development for Confined Riverine Wetlands by TEKSystems is complete.
- All NMRAM Confined Valley Riverine Wetlands data for all NMRAM development data collection SAs have been entered into the updated interactive data collection worksheets by NHHM, QA'd, and delivered to the SWQB Wetlands Program.
- Shapefiles of SA vegetation maps have been delivered to the Wetlands Program from NHHM.
- Final revisions for NMRAM for Confined Valley Riverine Wetlands Field Guide Version 1.3 are complete and available at [Wetlands Rapid Assessment Methods \(nm.gov\)](http://Wetlands Rapid Assessment Methods (nm.gov)).
- Final revisions and updates for NMRAM Manual Version 2.0 were worked on during late 2021 to add confined valley riverine wetlands final metrics. NMRAM Manual Version 2.0 is complete and available at [Wetlands Rapid Assessment Methods \(nm.gov\)](http://Wetlands Rapid Assessment Methods (nm.gov)).

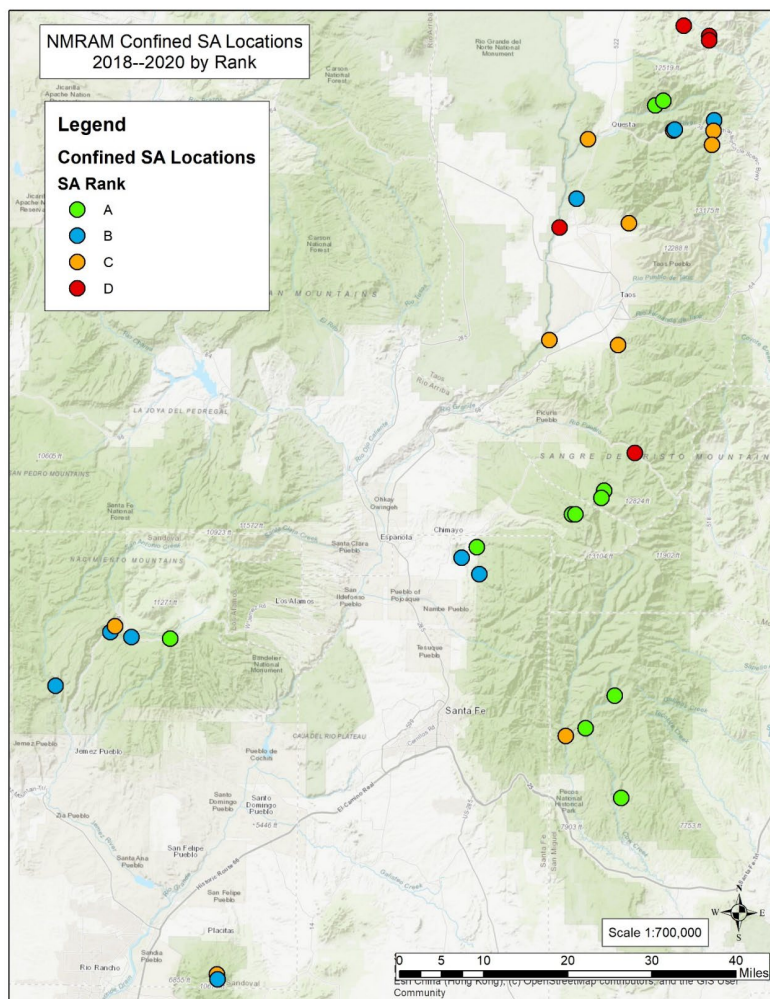


Figure 15. Map of all 35 SAs for Confined Valley Riverine data collection from 2018 through 2020 in Northern New Mexico. Colored dots depict final ranking of each Sample Area.

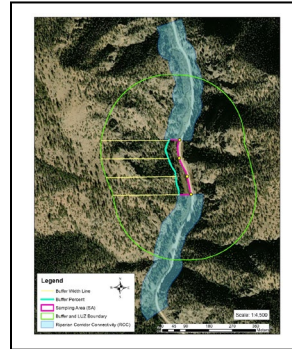
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Confined Valley Riverine Wetlands NMRAM Metric List

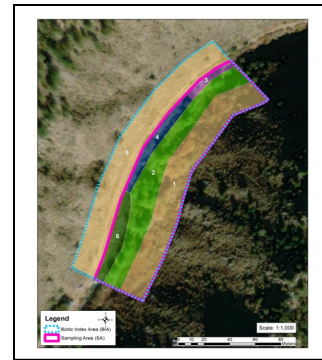
Landscape Context Metrics

- Buffer Integrity Index
- Riparian Corridor Connectivity
- Surrounding Land Use
- Road Proximity (New)



Biotic Metrics

- Invasive Exotic Plant Species Cover
- Riparian Zone Wetland Plant Abundance (New)
- Wetland Vegetation Zone Loss (New)



Abiotic Metrics

- Soil Surface Condition
- Large Woody Debris (New)
- Confined Channel Condition (New)

Figure 16. Final list of metrics for Confined Valley Riverine Wetlands NMRAM. Five of the metrics are new and exclusive to this subclass. Also new is the use of a Biotic Index Area (BIA) that is used for some metric evaluations and includes a 20 m allochthonous zone beyond the regular limits of the SA. See Field Guide for details.



Figure 17. Example of Wetland Vegetation Zone Loss. The channel and adjacent wetland vegetation zone on Cordova Creek have been pushed over due to adjacent road placed in the narrow canyon. Road fill and revetment completely cover riverine wetlands on right side of channel and cause erosion of the left side of the channel and undercutting of vegetation.



Figure 18. Confined Channel Condition metric focuses on specific and recent indicators of aggradation that may follow major watershed-scale disturbance events that accelerate erosion (e.g., catastrophic fires, roads, timber harvest, mining, grazing, and drought (Wohl 1998)).

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SA CODE :

Date : 2022-03-23

SA Name :

Surveyor Initials :

Worksheet 15. Stressor Checklist. Check off stressors by intensity category that may be affecting wetland ecological condition of the SA and WOI. Assign categories using direct evidence where available or your best professional judgement otherwise. If the presence of the stressor is uncertain, mark as "Unknown". Rank Major Stressors in Dominant Stressor column(Pick up to 3)

| Rank | Affect | | | | Stressor Group/Stressor | Comments |
|------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|----------|
| | Major | Minor | Absent | Unknown | | |
| Adverse water management | | | | | | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Extended low flow dam releases | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Timing of flow releases not concordant | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Extended high flow dam releases | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Agriculture/Urban flow diversion upstream | |
| Adverse sediment management | | | | | | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Adverse sediment retention by dams | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Sediment loss by dredging | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Adverse sediment input (roads/development) | |
| Artificial water additions | | | | | | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Sewer treatment effluent | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Point source urban runoff | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Factory, feedlot outfall | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Agricultural irrigation ditch returns | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Mining waste | |
| Ground water pumping | | | | | | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Urban depletions | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Fracking | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Agriculture irrigation wells | |
| Watershed alteration | | | | | | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Extensive recent fires in watershed | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Extensive recent timber harvest | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Extensive open pit mining in watershed | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Livestock/wildlife overgrazing | |
| Local biodiversity impacts | | | | | | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Evidence of excessive grazing (local) | |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Excessive noise affecting wildlife | |
| | 0 | 0 | | 0 | Counts by Intensity | |
| Additional Comments | | | | | | |

Figure 19. The Stressor Checklist for NMRAM for Confined Valley Riverine Wetlands evaluate potential drivers of ecological condition at local to watershed scales and explicitly excludes elements that are already incorporated into NMRAM metrics.



Figure 20. The NMRAM for Confined Valley Riverine Wetlands Assessment Package consists of the Manual, Field Guide, Data Collection Worksheets (Appendix A of the Field Guide) maps and photographs. The worksheets together with maps and photographs becomes the supporting record at a project level and the essentials for data entry into the SQUID Wetlands Temporary Database.

List of Major Deliverables

- New Mexico Rapid Assessment Method, Confined Valley Riverine Wetlands Field Guide Version 1.3 (2021) and electronic data collection worksheets Version 1.3.
- Updated NMRAM Manual Version 2.0
- New Mexico Rapid Assessment Method Riverine Wetlands Regulatory Version 1.2 and data collection worksheets Version 1.2.
- 35 Sample Areas (SAs) vegetation classified floodplains in GIS.
- NMRAM data sheets and site photos for 35 reference sites.
- Agenda and sign-in sheet for NMRAM Riverine Wetlands Regulatory Version one-day field training.
- Agenda and sign-in sheet for NMRAM Riverine Wetlands Regulatory Version half-day training for the regulated community.
- NMRAM Confined Valley Riverine Wetlands Training Materials, presentations, and sign-in sheets.
- New Mexico Wetlands Roundtable agendas and presentations for four Roundtable Meetings.
- NMRAM Confined Valley Riverine Wetlands outreach presentations.
- MOA and IT Contracts and amendments.
- QAPPs and updated QAPP.
- Semi-Annual Reports and Final Report, Match reporting.

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Lessons Learned

This project continued development of NMRAM to include confined valley riverine wetlands. A challenge was finding consistent indicators of bankfull and the riparian zone above bankfull in some confined valley settings and hampered our ability to develop meaningful metrics for those indicators. Also getting around and setting up equipment like laser levels was difficult for the Data Collection Team in steep-sided valleys. Developing a rapid assessment that uses the least amount of technical equipment makes data collection in hazardous conditions more rapid and reliable.

What made the project successful?

After all the changes to the definition of WOTUS in the past 5 years, the NMRAM for Riverine Wetlands Regulatory Version will nevertheless be a useful and appropriate tool for establishing meaningful mitigation ratios. The ERDC comments also were encouraging for the use of this NMRAM by the Corps of Engineers. The use of Regulatory NMRAM evaluates the current condition of the aquatic resource and predicts the ecological integrity of that resource after the proposed permitted action. In addition, it can be used to determine if improvements at the mitigation site will provide functional lift and adequate compensation for losses. The purpose of the Regulatory Version is to have a stand-alone condition assessment methodology for use in impacts and mitigation area assessment associated with Clean Water Act Section 404 permits issued by USACE. The premise of the Regulatory NMRAM is that the current condition for the WOI applies to the permit area, pre-project. NMRAM data are collected using GIS applications surrounding and within an SA that includes the permit area, and data collected on-the-ground within an SA that includes the permit area, so long as the permit area SA is within a minimum size area as specified in the Field Guide. Using an area smaller than minimum may be reflected in lower scores. The NMRAM for Riverine Wetlands Regulatory development and execution by the USACE is continuing under Phase 3 (CD #01F46701).

NMRAM is proving to be a successful tool for identifying the condition of wetlands by subclass in New Mexico, identifying their range and abundance, and evaluating their condition. NMRAM adds a useful and versatile tool for the management of the State's wetland resources.

NMRAM for Confined Valley Riverine Wetlands required innovative thinking for a novel NMRAM. Half of the metrics used for evaluating the condition of confined valley riverine wetlands are new and exclusive to this NMRAM but may be useful for other subclasses and will be tested there in the future.

The expansion of the New Mexico Wetlands Roundtable has been invaluable as a change agent for the way the state views its wetlands. Wetlands are now more valued and work on assessment, restoration and protecting wetlands is more common. Wetlands are recognized as an indispensable resource. It has been inspiring to see how the response to requests for speakers is so positive as well as the offers for Roundtable sponsorship.

The acceptance of SWQB to integrate, expand and maintain wetlands data as part of SQUID database ensures compatibility and integration with other state water quality databases and future EPA databases.

What made the project not so successful?

This project has been overall successful in achieving its goals, even after delays and restrictions due to the Covid pandemic.

Technical Transfer

What information can you pass along to other agencies, cooperators, or local landowners in other watersheds about this project?

Agencies, cooperators, and local stakeholders have been invited to participate on the Technical Advisory Committee and to trainings to promote the understanding and use of NMRAM. The NMRAM for Confined Valley Riverine Wetlands Version 1.3 is available on the SWQB website for others to use NMRAM.

Development of the database compatible with SQUID will eventually have a web-access feature so that others can view the results on-line and enter their own data.

The data generated from the use of NMRAM for Confined Valley Riverine Wetlands can fill a wetland data gap in Wetlands Action Plans developed by watershed groups and other entities and can provide a greater understanding of the resource.

EPA Feedback Loop

What would you suggest that EPA do differently to improve the process in regard to this project?

EPA was very supportive in all aspects of this project during the project period, especially allowing grant period extensions to complete high quality and meaningful work during times of uncertainty and change.

Future Activity Recommendations

- Adoption of NMRAM by the Albuquerque District of the Corps of Engineers will increase and improve meaningful mitigation. Additional trainings and outreach regarding the utility of USACE NMRAM should be conducted for USACE staff as well as the regulated community.
- More data is needed from confined valleys to develop future hydrology and riparian zone metrics that measure the effects of watershed drivers of ecological condition.
- New Mexico is in the process of developing rapid assessment methods (NMRAM) for various wetland subclasses throughout the state. There is a need to continue validation of our landscape and rapid assessment methods using more detailed and intensive methods and indicators, to ensure that NMRAM is providing an accurate picture of wetland condition.
- NMRAM data is providing the basis and justification for development of wetlands water quality standards and designated uses that will enable the state to protect wetlands more comprehensively. NMRAM refines reference standard conditions for each subclass, describes the extent and quantity of the targeted wetland type within a reference domain, and identifies the stressors that are causing wetland decline. These data provide justification for preventing or eliminating stressors that will ultimately lead to increases in wetland quality.
- Timing and requiring wetlands assessment as Waters of the State, with SWQB's rotating basin schedule would ensure the most efficient use of limited resources and integration of wetlands monitoring and results with the monitoring of other State waters.
- Another adaptation will be to consider NMRAM as an iterative tool for long term monitoring of wetlands.



Figure 21. Big Horn Sheep drinking and browsing in the Rio Pueblo de Taos confined valley wetlands.