

**Final Report  
May 2019**

**New Mexico Rapid Assessment for the Canadian, and  
Developing Designated Uses for Montane Riverine Wetlands  
in New Mexico**

**Assistance Agreement No. CD #00F736-01-0B (FY 2014)**



**Mora River, Rio Mora National Wildlife Refuge, December 2017. (Photo by E. Sawyer)**

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

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## **Project Goals and Objectives**

This Project is a continuation of the development of wetlands rapid assessment methods for New Mexico semi-arid land wetlands with a focus on Montane Riverine Wetlands of the Canadian River Basin and Dry Cimarron Watershed in northeastern New Mexico. New Mexico Rapid Assessment Method (NMRAM) metric development data and floristic quality data were collected from 40 montane riverine wetland sites principally in Colfax and Mora Counties, New Mexico in 2016 (36) and 2017 (4). Testing of the 14 selected metrics for NMRAM Montane Riverine Wetlands was also conducted at the 40 Montane Riverine Wetlands Sample Areas (SA) to ensure metric sensitivity and applicability in a rapid assessment scenario.

The Project refined metrics for NMRAM Montane Riverine Wetland subclass requiring assessment and protection as Waters of the State. The stressor checklist was also updated to record processes that may be responsible for wetland site impairment rather than footprint of degradation which was already evaluated using Land Use index metric. An Advisory Committee was established and provided comments and review through two one-day meetings pre-data collection and after final metric analyses. The project also provided one 3-day NMRAM Montane Riverine Wetlands training, and two Botany Booster trainings. Two reports were completed, one on Metrics to Wetland Functions Crosswalk and one providing data on the ranking of potential reference standard sites with selection of the top 10 Reference sites from all Montane Riverine Wetlands NMRAM Data collected by NMED to date. In addition, development work on wetlands standards was conducted as part of this project.

This Project included the continued enhancements of the Surface Water Quality Information Database (SQUID) to accept and store Montane Riverine Wetlands NMRAM data to be integrated with other SWQB water quality data. Four New Mexico Wetlands Roundtables, maintained by the SWQB Wetlands Program, were conducted under this project. These geographically focused Roundtables now occur bi-annually in Santa Fe and Las Cruces, New Mexico; with attendance ranging from about 90 in Santa Fe and up to 30 attendees in Las Cruces.

## **Project Outputs**

Through this project seven major objectives were accomplished:

- 1) Data collection, multi-metric analysis, and metric validation using NMRAM for Montane Riverine Wetlands were completed for the Canadian/Dry Cimarron Watersheds and resulted in an updated Field Guide “NMRAM for Montane Riverine Wetlands, Version 2.4,” and updated fillable PDF data collection worksheets;
- 2) Subclass descriptions and regional models were refined by developing vegetation community maps from imagery and analyzing NMRAM data for wetlands of interest at our data collection sites.
- 3) Draft narrative standards are in development based on NMRAM data and site scores. Reference Standard Wetlands were ranked and identified from NMRAM data previously collected in the Upper Rio Grande Watershed, the Gila Watershed and data collected as part of

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this project in the Canadian Watershed which will aid in water quality standards development for montane riverine wetlands.

4) A Technical Guide cross-walking NMRAM metrics with wetland ecological functions was completed.

5) The New Mexico Wetlands Roundtable was maintained - the Northern Wetlands Roundtable and Southern Wetlands Roundtable each meeting twice per year - the meetings focused on the objectives established by the group.

6) One NMRAM Montane Riverine Wetlands training for potential end-users, and two Botany Booster trainings to enhance NMRAM users' ability to identify wetland/riparian plant species were conducted and well attended by a variety of participants (Technical Transfer);

7) Upgrades and enhancements to the wetlands version of the SQUID database, data collection worksheets were completed by our database contractors and GIS mapping capabilities were refined.

## **Project Outcomes**

- The SWQB Wetlands Program and partners are provided wetland assessment capability to require better wetlands protection, restoration and mitigation.
- This project creates an improved tool for evaluating the condition of New Mexico's Montane Riverine Wetlands that compare human disturbance levels 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 is 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.
- 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.
- 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.
- Maintaining the Wetlands Roundtable to include meetings especially designed and planned for the Northern as well as the Southern parts of New Mexico, 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.

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- The NMRAM Metrics and Wetland Ecological Functions Technical Guide provides information on the capacity and performance of ecological functions by wetlands that maintain and improve environmental quality.



**Figure 1. Pilot Study site representative of Montane Riverine Wetlands on the Canadian May 18, 2019. Photo by M. McGraw.**

## **Project Location**

The project is located from the east side of the Sangre de Cristo Mountains, including the Upper Canadian Basin and the eastern High Plains of Northeastern New Mexico (Figure 4).

## **Original Timeframe**

The Notice of Award on the Cooperative Agreement CD #00F736-01-0B was issued on May 27, 2014. In May 2016 the grant was amended for a no cost extension to May 31, 2019 to complete

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the reviews of the Field Guide and interactive data collection worksheet PDFs, to complete database development work and continue work on Draft Narrative Standards for Montane Riverine Wetlands and the Technical Guide. The stated goals and objectives of the project remained the same, as well as the key project Tasks.



**Figure 2. Elizabeth Milford (left - UNM Natural Heritage (NHNM) sketching a cross section and identifying plants around Coyote Creek during initial data collection in 2016. Hannah Burnham (right - NHNM) measuring flood prone width of the stream cross section and discussing measurement logistics with field team. Photo E. Sawyer.**

## **Partners Involved**

University of New Mexico's Natural Heritage New Mexico Program (NHNM) is the principal contractor in partnership with SWQB Wetlands Program in developing the NMRAM for Montane Riverine Wetlands Field Guide Version 2.4. TEKSystems, Inc. is responsible for developing the enhancements to the SQUID database at SWQB to accept NMRAM data, and for the creation of the interactive data collection worksheets. USEPA (Sondra McDonald, Sharon Daugherty and Leslie Rauscher) provided project progress guidance and technical assistance.

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SWQB Wetlands Program was involved in every aspect of project and co-authored the Field Guides and data collection worksheets along with NHNM (co-authors: Esteban Muldavin, Elizabeth Milford and Maryann McGraw). The Project involved an Advisory Committee whose members are as follows:

***Advisory Team Members***

Name	Organization
John David Blagg	Private citizen
Les Dhaseleer	Vermejo Park Ranch
Rick Smith	Vermejo Park Ranch
Gary Hunt	US Fish & Wildlife
Malia Volke	NMDGF
Connor Landreau	NM Land Conservancy
Kathryn Mahan	NM Forest & Watershed Restoration Institute
Elizabeth Zeiler	NMED/IT
Aaron Miller	US NRCS
Lea Knutson	Hermit's Peak Watershed Alliance
Elizabeth Milford	UNM Natural Heritage Program
Esteban Muldavin	UNM Natural Heritage Program
Amina Sena	NM Forest & Watershed Restoration Institute
Cameron Weber	Stream Dynamics
Colleen Cunningham	NM Instate Stream Commission
David Lemke	Upper Pecos Watershed Association
Shannon Romeling	Amigos Bravos
Aaron Miller	USDA NRCS
Miguel Montoya	NMED/Quality Assurance Program
Corrie Reasner	UNM Natural Heritage Program
Emile Sawyer	NMED/SWQB Wetlands Program
Karen Menetrey	NMED/SWQB Wetlands Program
Maryann McGraw	NMED/SWQB Wetlands Program

***Montane Riverine Wetlands NMRAM Technical Team (Pilot Study, field site selection, data collection, geodatabase development)***

Elizabeth Milford	UNM Natural Heritage Program
Hannah Burnham	UNM Natural Heritage Program
Yvonne Chauvin	UNM Natural Heritage Program
Corrie Reasner	UNM Natural Heritage Program
Maryann McGraw	NMED/SWQB
Emile Sawyer	NMED/SWQB

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Shelly Barnes	NMED/SWQB-USACE
Karen Menetrey	NMED/SWQB
Malia Volke	NMDGF
Dan Gandhi	TEKSystems
Charles Fitch	TEKSystems

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SAMPLING AREAS 2016 AND 2017

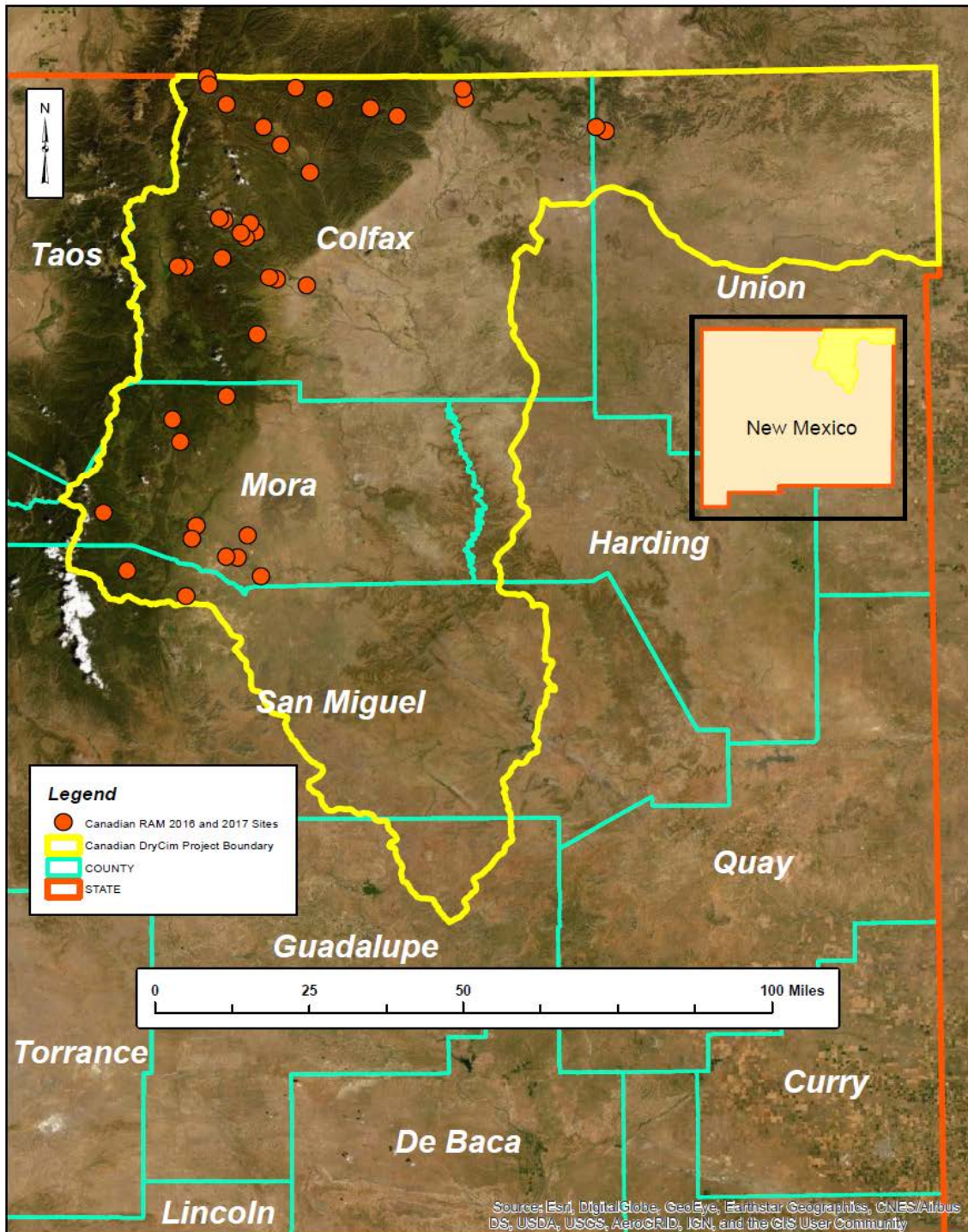


Figure 3. Map of NMRAM Sample Area locations in the Montane Riverine Reference Domain in northeastern New Mexico.



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**Northern Wetlands Roundtable Presenters:** NMED Information Technology Program, USFS Southwest Region, Natural Channel Design, USGS, Valle de Oro National Wildlife Refuge, USACE, USDA NRCS, Santa Clara Pueblo, WildEarth Guardians, NMED Wetlands Program, NM Energy Minerals and Natural Resources Dept. – Forestry Division, Zeedyk Ecological Consulting, Cibola National Forest and Grasslands, US Bureau of Reclamation, City of Albuquerque – Parks, NM Dept. of Game and Fish.

**Southern Wetlands Roundtables Presenters:** US EPA Wetlands Program, NMED Wetlands Program, NMED Information Technology Program, Stream Dynamics, Inc., NHHM, USFS Southwest Region, USDA NRCS, USACE, NM Water Resource Research Institute, SWQB Watershed Protection Section, Playa Lakes Joint Venture.

**Sponsors for Wetlands Roundtables and Meetings**

Society of Wetland Scientists, Rocky Mountain Chapter sponsored the April 27, 2017 Northern, and May 16, 2017 Southern Wetlands Roundtables. The Upper Pecos Watershed Association, Santa Fe Fly Fishing School and River Bend Ranch, sponsored the January 18, 2018 Northern and January 23, 2018 Southern Wetlands Roundtables. Additional sponsors included Michael and Julie Bain for the April 27, 2017 Northern Roundtable and Stream Dynamics for the May 16, 2017 Southern Wetlands Roundtable.

**Funding**

The original Federal amount was **\$408,499.00** and **\$153,835.00** match. The final federal amount spent was **\$394,573.52**, and the **final match amount** was **\$229,207.70 (\$47,347.26 overmatched)**. See semi-annual reports for details.

**Major Project Highlights and Chronology**

- SWQB Wetlands Program was awarded federal assistance for this project. Signatures on the Cooperative Agreement between NMED and EPA were completed on May 27, 2014.
- Karen Menetrey (Wetlands Program Project Officer (WPO)) was the initial Project Officer for this project.
- NMED initiated an IGA with NHHM to help perform tasks 2, 3, and 5-15 of this project.
- The WPO met with the Surface Water Quality Bureau Monitoring, Assessment and Sampling Section team for the Canadian Basin to discuss the potential for coordinating water quality sampling and rapid assessment sites for montane riverine wetlands.

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**Figure 4. Some of the Pilot Study Team looking at Coyote Creek upstream of Coyote Creek State Park near Guadalupita, NM. May 2016. Left to right: Esteban Muldavin, NHNM, Malia Volke, NMGF, Elizabeth Milford, NHNM, Maryann McGraw, NMED, Shelly Barnes, USACE. Photo by Y. Chauvin.**

- The WPO and WPC participated in Association of Clean Water Administrators - Water Quality Standards conference calls on October 14, 2014 and November 18, 2014.
- The WPO reviewed the SWQB Watershed Intensive Water Quality survey team's Canadian/Dry Cimarron sampling plan to begin to identify NMRAM locations for 2016.
- The WPO and WPC participated in Association of Clean Water Administrators - Water Quality Standards conference calls on January 19, 2015 and February 10, 2015.
- The WPO and WPC also participated in a conference call on February 3, 2015 regarding wetlands water quality standards with Richard Prather and Russell Nelson of EPA. The most important concept discussed during the conference call is that the wetland standard should describe the reference condition of the wetlands subclass in terms of its characteristics and functions.
- Karen Menetrey (Wetlands Program Project Officer (WPO)) is the Project Officer for this project from June 2014 to October 2015. Emile Sawyer became WPO shortly after being hired to replace Shelly Barnes, now with USACE.

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- The IGA with NHHM was signed on September 29, 2015.
- Emile Sawyer (WPO) met with NHHM to review project tasks, prepare for AA Team meeting and pilot study on December 16, 2015. The group also discussed Field Training of Technical Teams and to discuss the Narrative Standards Development and Designated Uses task, task deliveries, and plan for standards development.
- The WPO met with the Surface Water Quality Bureau Monitoring, Assessment and Standards Section (MASS) team for the Canadian Basin to discuss the potential for coordinating water quality sampling and rapid assessment sites for montane riverine wetlands on December 14, 2015. In order to select common sites within the survey area, the WPO ran a GIS query to identify the montane 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), compare it to the sampling plan, and verify the feasibility of collecting wetlands data at the identified sites.
- The WPO met with NMNH on February 2, 2016 to discuss subclass boundary and plan for defining it during the Pilot Study.



**Figure 5. Pilot Study Team taking notes on the Rio Mora in Mora, New Mexico. Left to right: Maryann McGraw, NMED, Elizabeth Milford, NHHM, Malia Volke, NMGF, Yvonne Chauvin, NHHM, Esteban Muldavin, NHHM, Shelly Barnes, USACE. Photo by E. Sawyer.**

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- The WPO exchanged email with several agency personnel and stakeholders in the Canadian/Dry Cimarron Watershed Reference Domain in order to identify members of the Advisory Committee. In the process, the WPO also identified potential data collection sites from discussions with landowners and agency personnel. NNNM is using this information to contact landowners to help determine the Sampling Areas (SA) for data collection this summer.
- The first Advisory and Assessment (AA) Team meeting was held in Las Vegas, NM on March 9, 2016 with 12 participants from State and Federal agencies and the invited public.
- Analysis layers including surface hydrology, watersheds, NWI, land use, digital elevation model, and publicly available infrastructure data have been compiled into a geodatabase for the reference domain, potential SAs have been identified and permission to enter is ongoing. GIS shapefile of initial draft SAs was delivered by NNNM to WPO.
- The Pilot Study was conducted May 17-19, 2016 to determine the upper and lower elevation boundaries of the reference domain, determine the division between montane and lowland riverine subclasses at questionable sites, and correctly differentiate between riverine floodplains and slope wetland floodplains.



**Figure 6. Emile Sawyer holding photo point sign at mid-cross section of site 04Chicori04.8 documenting beaver pond inundation along Chirorica Creek within Sugaree State Park. Photo by C. Reasoner**

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- The WPO participated in laboratory safety training (April 6, 2016) and a basic CPR (May 23, 2016), and Habitat Survey training with MASS team (May 23, 2016 - office; May 27, 2016 – field). The WPO will assist the MASS team under state funding to collect additional water quality data for the Canadian WQ Survey as match for this project.
- The PQAPP was submitted to EPA on June 22, 2016 for EPA approval.
- The WPO attended Applied Fluvial Geomorphology Training in Seeley Lake, Montana on June 6-10, 2016 under the training task for this project.
- The PQAPP was approved by EPA on July 26, 2016.
- NHNM developed 75 potential sample area shapefiles and maps with itineraries for five data collection trips.
- The Field Guide and data collection worksheets were reviewed for further updates for the Montane Riverine Wetland subclass.
- Field training for data collection teams was conducted on July 25, 2016.
- Field Data Collection Team collected data from 36 Sample Areas during five data collection trips starting in late July and ending on September 19, 2016.
- Data were collected on activated PDF worksheets using ruggedized tablets for most of the Sample Areas (SAs). All data from 36 SAs were entered onto the activated PDFs, checked for Quality Assurance and delivered to NMED Wetlands Program on November 27, 2016.
- NHNM modified its NMRAM Access database to accommodate NMRAM data sets from all NMRAM data to date. All NMRAM Montane Riverine Wetland data were updated and rescored into the 2.1 version of NMRAM datasheets.
- An IT Contract with TEKSystems was signed on May 18, 2017 and work has begun on data collection worksheet updates and a data export template for Montane Riverine Wetlands data.
- A Classification for Wetlands of Interest Vegetation maps corresponding to each Sample Area visited was delivered to NMED for review in June 2017.
- The Northern and Southern New Mexico Wetlands Roundtables were successfully conducted on April 27, 2017 in Santa Fe and on May 16, 2017 in Las Cruces, respectively. A total of 79 participants attended the Roundtables including EPA Region 6 staff.
- Thank you notes were sent to cooperating landowners for access to their land during 2016 data collection.
- Work began on a contract extension for NHNM which is scheduled to expire November 28, 2017. A Draft Memorandum of Agreement (MOA) with the NHNM will focus on project task completion.
- Emile Sawyer (WPO) attended Rosgen 2 training in Bend, Oregon, July 8 - 18 2017.
- On September 14, 2017, Maryann McGraw (Wetlands Program Coordinator) and Arlene Gaines (EPA Project Officer) conduct a review of several Canadian NMRAM Sample Areas (SAs) to review current metrics, the Field Guide and to compare the condition of the site with the data collected at that site. For each site, the WPC and Arlene reviewed each metric and either surveyed the site from close by or walked the site. The maps and data sheets from the site visit were provided to EPA.

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- An additional field data collection trip was organized for September 15-17, 2017 targeting under-sampled areas (SAs) in the Reference Domain. Nine potential SAs were identified, and data were collected from four of those by the NHHM field crew and the WPO. The WPO purchased Silvey Stakes for conducting cross-section surveys as part of the NMRAM Montane Riverine Floodplain Hydrologic Connectivity metric. In addition, the WPO worked with NMED IT Staff to upload the interactive data collection worksheets on the Wetlands Program ruggedized tablets for data collection in the field.
- The WPO participated in the Rio Mora National Wildlife Refuge Wetlands Review on December 5-7, 2017.
- Version 2.2 of the interactive data collection worksheets was developed by TEKSystems, Inc. Included is a plant species dropdown for worksheet 6 that has more than 800 species likely to be dominants on a montane floodplain.
- New MOA for completion of project tasks with NHHM was signed on February 26, 2018. Logistics for the Botany Booster and Montane Riverine NMRAM Trainings are in preparation.
- The Northern and Southern New Mexico Wetlands Roundtables were successfully conducted on January 18 in Santa Fe and on January 23 in Las Cruces, 2018, respectively.



**Figure 7. Bill Zeedyk discusses river restoration efforts with participants along the Mora River at the Mora NWR Wetlands Review, December 6, 2017. The Mora River wetlands are within the Montane Riverine Wetlands subclass. Photo by E. Sawyer.**

- Two Botany Booster Trainings were completed with the assistance of NHHM and RCS Southwest – July 17 and 18, 2018; and August 9 and 10, 2018, respectively. Because the first Botany Booster Training was so popular and there was a waiting list, the second Botany

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Booster Training was organized and funded with a small purchase agreement with RCS Southwest. Thirty-one (31) participants total attended the Botany Booster Trainings.

- One Montane Riverine NMRAM Training was completed at the Rio Mora National Wildlife Refuge from July 24 through July 26, 2018. An updated draft version of NMRAM Montane Riverine Wetlands Version 2.3 was distributed to the attendees.
- NHNM Director, Esteban Muldavin, presented a poster at the International Association of Vegetation Science 2018 Symposium in Bozeman, Montana July 22-27, 2018 as outreach for this project. The presentation entitled, “Integrating Vegetation Data into Rapid Ecological Assessment: A map-based approach for wetlands and riparian areas” is a product of the work by NHNM on NMRAM, Vegetation IBI and other studies. Travel to give the presentation was billed to other NHNM sources.
- A Final AA-team meeting was conducted in Santa Fe, March 29, 2019. A review of the Multi-metric Analyses and the spread in scores for each metric as well as Field Guide changes were presented to the 11 participants.



**Figure 8. Field site for Botany Booster Field trainings near San Ysidro, New Mexico on BLM land.  
Photo by M. McGraw**

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- A total of 97 Montane Riverine SAs from previous NMRAM Montane Riverine sites and the current 40 sites under this project were analyzed for reference standard potential (sites scoring an A or high B). Twenty-nine of these sites were determined to meet reference standard condition, while an additional 15 have potential to serve as reference standard in a limited capacity. An excel spreadsheet of all sites considered with relevant NMRAM scores, a short report on the reference selection process and a geodatabase containing a feature class of reference standard sites were delivered by NHHM to the WPO on May 31, 2019.
- The WPC, WPO and several members of the ad hoc water quality standards for wetlands group (which includes NMED SWQB staff from the Monitoring, Assessment and Standards Section, and has been meeting since 2016) held two meetings to review State wetlands water quality standards and devise a plan for next steps in their development. Discussions included using watershed boundaries for new designated Assessment Units; Triennial Scoping for wetlands; and naming conventions for NMED SQUID to conform with database architecture. NM State water quality standards for wetlands, wetland uses and ecological functions were also reviewed with the intent of devising targeted water quality standards for specific wetlands subclasses. These meetings occurred on April 3, and May 7, 2019.



**Figure 9. Participants identify wetland plants during Botany Booster field training at San Ysidro wetlands.  
Photo by M. McGraw.**



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- The WPC, WPO and several members of the ad hoc water quality standards for wetlands group (which includes NMED SWQB staff from the Monitoring, Assessment and Standards.
- A Grant Amendment 00F736-01-2 was approved by EPA to purchase NMRAM equipment. Supplies were purchased for data collection and development.
- A Multi-Metric Analyses report was submitted to the SWQB Wetlands Program that covered an analysis of NMRAM Lowland Riverine Wetlands data and NMRAM Montane Riverine Wetlands data and was funded under both this project and “NMRAM for Lowland Riverine Wetlands, Rio Grande/Lower Pecos and Regulatory Module for USACE” (CD #00F736-01-0A).
- All data from this data collection effort and prior NMRAM Montane Riverine Wetlands data from 57 Sample Areas were converted to Version 2.2 of the data collection worksheet activated PDFs for upload to the wetlands development version of SQUID. Converted SA NMRAM scores were also incorporated into various geodatabase deliverables listed below.
  - NMRAM\_Montane\_Canadian\_WOI\_VegMap\_20190531
  - NMRAM\_Montane\_All\_Ver2\_ReferenceSites\_20190531



**Figure 10. Cross-section measurement on the Rio Mora on final day of Montane Riverine Wetlands NMRAM Training at King Ranch. Participants (L to R): Jordan Martinez, Denver Zoo; Hannah Burnam, NHHM; Mark Bundy, Upper Gila Watershed Alliance; Shannon Romeling, Amigos Bravos. Photo by E. Sawyer.**

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- In November 2018 WPC created an Amendment #2 for the TEKSystems contract to extend the end date to May 2019 and to add funds for 80 hours of additional Montane work to incorporate the remaining Montane Riverine metrics and stressor checklist revisions to the Montane datasheets. Because of Financial Staff shortages and changes in NMED administration, the Amendment #2 was not approved by the end of this grant. The Montane Riverine datasheets are provided with the main revisions incorporated but some minor edits remaining.

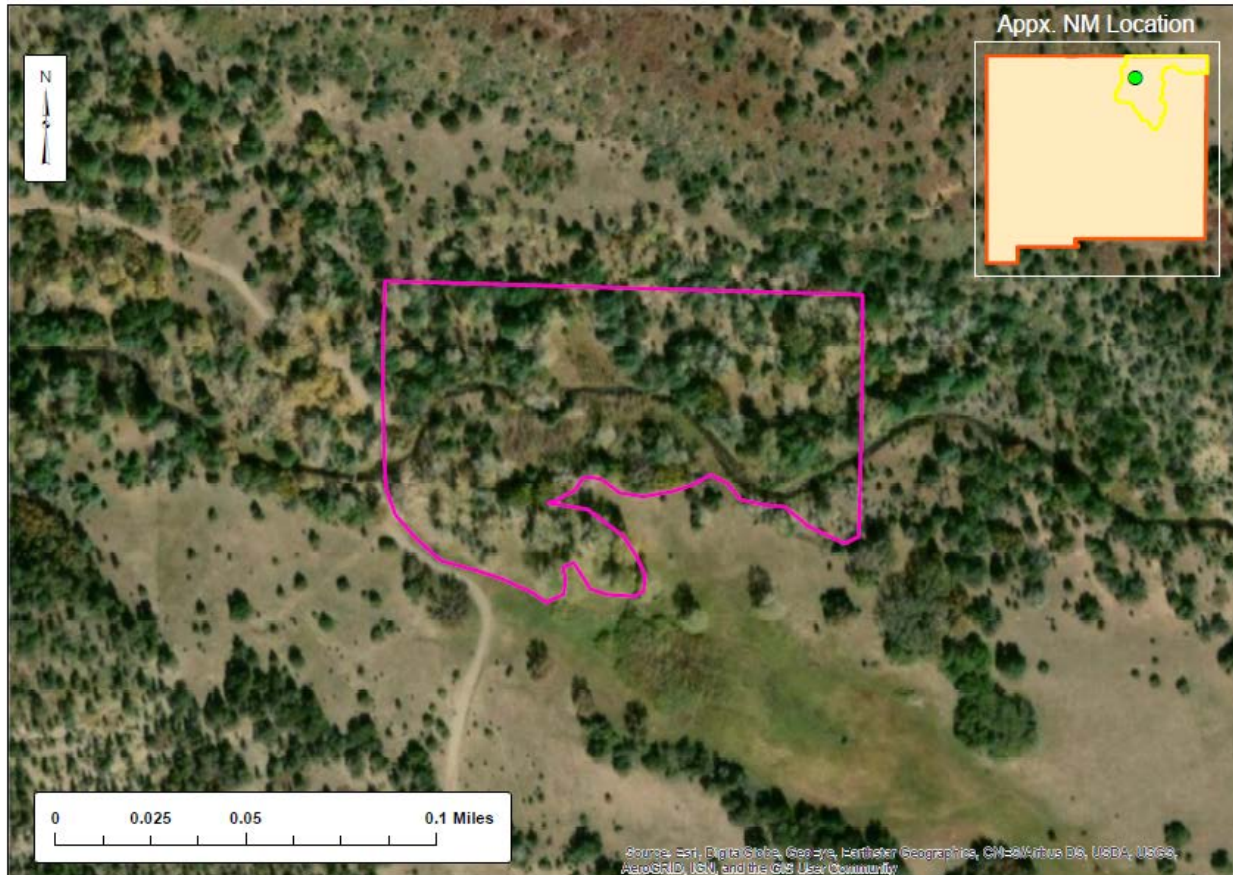
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Reference Site 50Glorie000.7 Ranked #1



**Figure 11. Map of Montane Riverine Wetland Sample Area that scored high enough (A) to be considered Reference Standard. Note level of disturbance to the landscape, vegetation and hydrology is minimal.**

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Reference Site 05Rayado039.4 Ranked #5



**Figure 12. Another example of Montane Riverine Wetlands Sample Area considered Reference Standard.**

- Appendix A in the Field Guide Version 2.4 incorporates the final datasheet changes but only in the paper version.
- Revisions to Buffer and Riparian Corridor Connectivity metrics based on the multi-metric analysis were incorporated into the Final NMRAM Montane Riverine Field Guide Version 2.4
- NHNM correlated all the current NMRAM montane metrics with SWQB-identified wetland functions to be used to determine designated uses for Montane Riverine Wetlands Water Quality Standards. The crosswalk entitled, “Wetland Functions and NMRAM Metrics Report”, Muldavin et al., 2019 was delivered as a report to WPO from NHNM in May 2019.

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**Figure 13. Post measurement discussion and field data entry review on final day of Montane Riverine Wetlands NMRAM Training at King Ranch along the Rio Mora. Participants (L to R): Rachel Jankowitz, NMED; Yvonne Chuavin, NHHM; Elizabeth Milford, NHHM; Colleen Cunningham, NMISC; Mike Freeling, NHHM; David Lemke, Upper Pecos Watershed Assoc.; Hannah Burnam, NHHM; Heidi Strickfaden, Denver Zoo; Jordan Martinez, Denver Zoo; Mark Bundy, Upper Gila Watershed Alliance; Shannon Romeling, Amigos Bravos. Photo by E. Sawyer.**

- The Manual for NMRAM Version 2.0 has been delivered to EPA under a separate project (CD #00F736-01-0A). The Manual covers all NMRAM subclasses to date including this one. The final deliverable of NMRAM Montane Riverine Field Guide Version 2.4 is available on NMED website:  
<https://www.env.nm.gov/surface-water-quality/wetlands-rapid-assessment-methods/>  
and is attached to this Final Report.
- A Geodatabase containing all Montane Riverine Wetlands NMRAM data, feature class layers and all Wetlands of Interest Vegetation maps was delivered to NMED on May 31, 2019.

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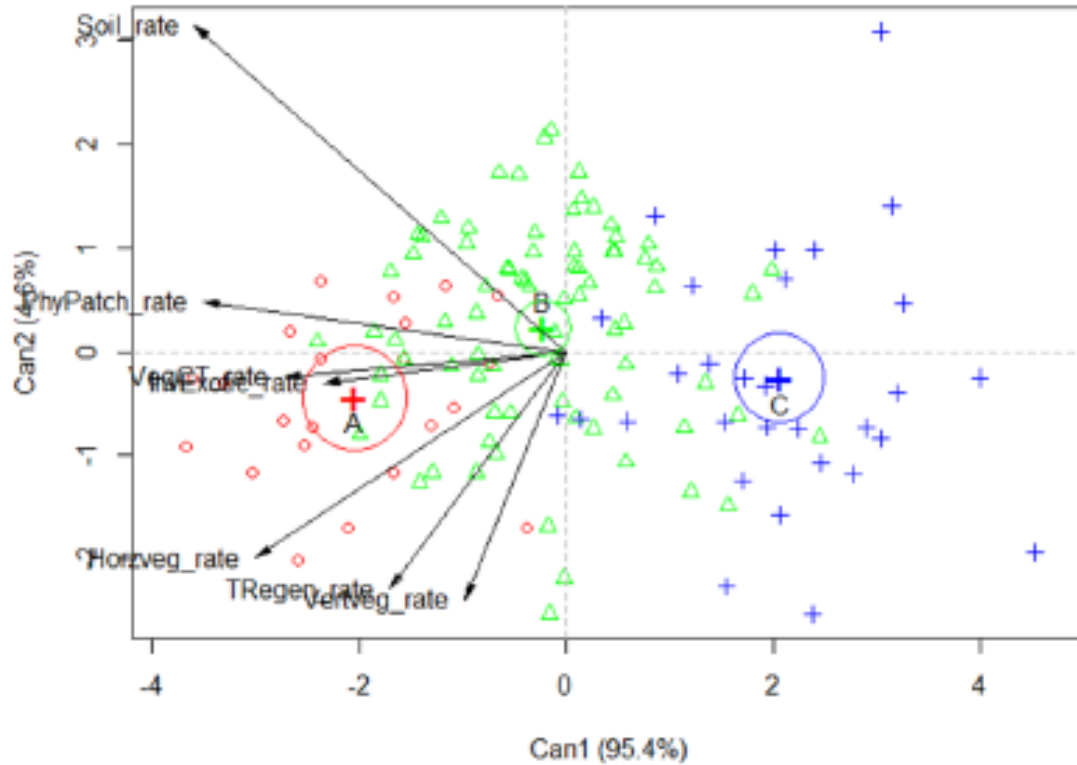
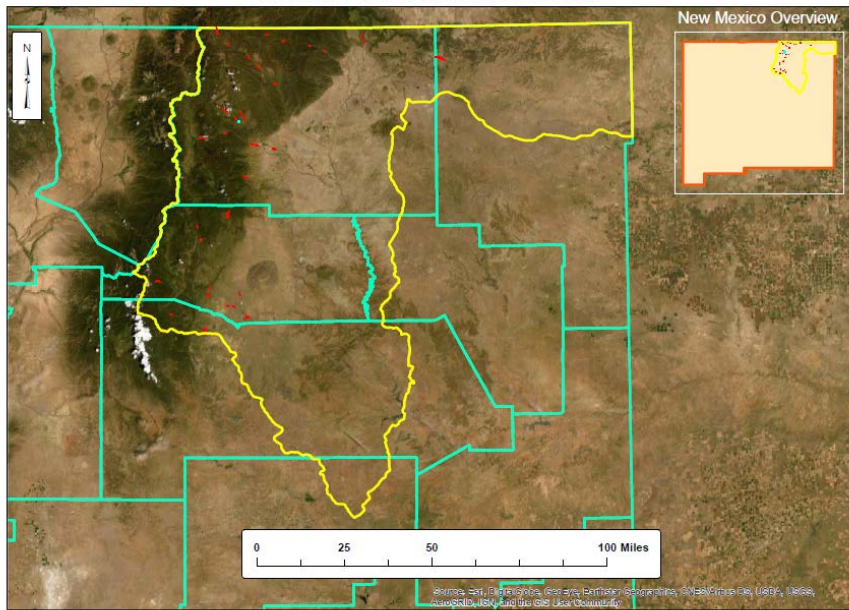


Figure 10. Montane and Lowland site SA CDA scores and centroids (+) by A, B, and C condition rank groups based on five biotic and two abiotic metric scores (see Box 52).

Figure 14. Figure taken from Multi-metric Analyses (Muldivin et al. 2019) showing score spread using select metrics. A summary explanation of findings is provided in the report.

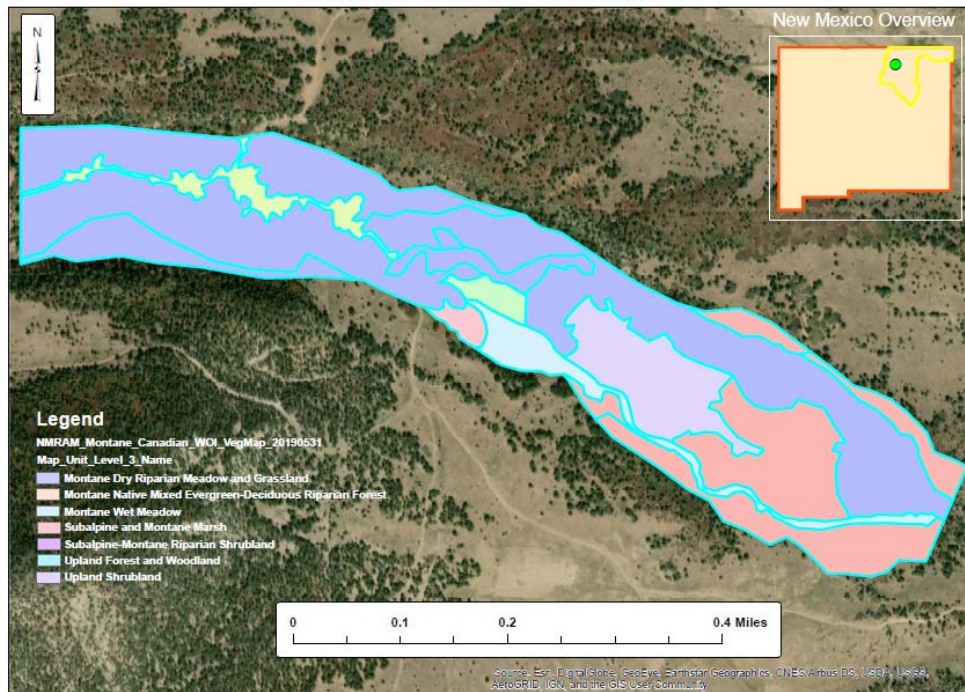
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WETLANDS OF INTEREST OVERVIEW MAP



**Figure 15. Wetland of Interest overview map for the Canadian/Dry Cimarron Montane Riverine Wetlands Reference Domain.**

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WETLANDS OF INTEREST 05Rayado039.4



**Figure 16. Example of WOI Vegetation Maps extrapolated from Sample Area vegetation mapping and applied to the extent of the Wetland of Interest.**

## Field Guide Summary

**Metrics.** The NMRAM for Montane Riverine Wetlands Field Guide Version 2.4 can be accessed at <https://www.env.nm.gov/surface-water-quality/wetlands-rapid-assessment-methods/>. NMRAM for Montane Riverine Wetlands includes fourteen metrics. *Buffer Integrity Index*, *Riparian Corridor Connectivity* and *Floodplain Hydrologic Connectivity* metrics were updated with field data obtained for this project in 2016 and 2017. A multi-metric analysis was performed that assisted with further revision and refinement of the metrics. These include:

### **Landscape Context Metrics**

There are four Landscape Context metrics designed to measure the conditions surrounding the SA using a GIS or paper maps:

- L1. The ***Buffer Integrity Index*** is composed of two sub-metrics, Buffer Percent and Buffer Width, which are measured in a buffer zone that extends out 250m from the SA perimeter (Figure 3).
- L2. ***Riparian Corridor Connectivity*** is measured in a riparian corridor zone that extends upstream and downstream 500 m and 100 m across.
- L3. ***Relative Wetland Size*** is measured across the entire floodplain, current and historic.
- L4. ***Surrounding Land Use*** evaluates conditions within an area (the Land Use Zone (LUZ)) that extends out 250 m from the SA perimeter (overlapping the buffer zone).

### **Biotic Metrics**

There are five Biotic metrics that are designed to measure key biological attributes within a wetland that reflect ecosystem integrity:

- B1. ***Relative Native Plant Community Composition*** is an index of the abundance of native- versus exotic-dominated vegetation communities.
- B2. ***Vegetation Horizontal Patch Structure*** is an assessment of general vegetation patch diversity and complexity of the patch pattern modified from CRAM 2006.
- B3. ***Vegetation Vertical Structure*** is an assessment of the overall vertical structural complexity of the vegetation canopy layers and uses a modified version of 1984 Hink and Ohmart vegetation classification for New Mexico riparian areas.
- B4. ***Native Riparian Tree Regeneration*** assesses the abundance and spatial distribution of riparian tree reproduction.
- B5. ***Invasive Exotic Plant Species Cover*** is a measure of the total percent cover of invasive plant species based on the New Mexico list of noxious weeds.

Biotic metric measurements are based on the mapping of vegetation community patches (polygons) on the SA Biotic Map with its aerial imagery base. A draft of the vegetation community patch map may be prepared via GIS prior to the field survey and then field-verified. Alternatively, the vegetation patches can be directly drawn in the field on the SA Biotic Map as part of the survey walkthrough.

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**Abiotic Metrics**

There are five Abiotic metrics that reflect the physical status of a wetland:

**A1. Floodplain Hydrologic Connectivity** is an assessment of the ability of water to flow into or out of the wetland.

**A2. Physical Patch Complexity** is a measure of the physical ecological complexity of a site.

**A3. Channel Equilibrium** is the assessment of the degree of channel aggradation or degradation relative to reference equilibrium conditions.

**A4. Steam Bank Stability and Cover** is a measure of stream bank soil/substrate stability and erosion potential that reflect overall stream bank stability.

**A5. Soil Surface Condition** reflects anthropogenic soil disturbance impacts within the SA.

**Stressor Checklist.** The stressor checklist has been refined is now found in Section V of the NMRAM Montane Riverine Wetlands Field Guide Version 2.4. The Stressor Checklist provides a guide for evaluating potential drivers of ecological condition at local to watershed scales that can inform management. The checklist is not used directly in scoring or ranking the condition of the wetland and accordingly explicitly excludes elements that are already incorporated in NMRAM metrics themselves (e.g., Surrounding Land Use). On the checklist, stressors have been grouped into major categories by their potential role in driving declines in wetland condition: 1) adverse water management, 2) adverse sediment management, 3) artificial water additions, 4) ground water pumping, 5) watershed alteration, and 6) local biodiversity impacts (See the NMRAM Manual Version 2.0 for rationales behind these groups). Note that these drivers may be acting at a watershed scale and may require some research, evidence or local knowledge before collecting field data.

**Data Collection Worksheets.** PDF versions of the interactive data collection worksheets can be downloaded at: <https://www.env.nm.gov/surface-water-quality/wetlands-rapid-assessment-methods/> Currently to obtain copies of activated data collection worksheets requires contacting the SWQB Wetlands Program. Data sheets can also be found in hard copy in the Field Guide Appendix A. Interactive PDF computes some of the metric scores and auto-fills the SA Rank Summary Worksheet and headers.

**Manual.** The NMRAM Manual justifies condition scoring and ranking based on analyses using the NMRAM GIS and field data. The NMRAM Manual Version 2.0 for all the current NMRAM subclasses is available at:

<https://www.env.nm.gov/surface-water-quality/wetlands-rapid-assessment-methods/>

## List of Major Deliverables

- Workplan and Example Wetlands Standards from ACWA Conference Calls
- Canadian/Dry Cimarron Sampling Plan
- Frameworks for Narrative Wetland Standards
- Wetland WQS Draft Templates



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- Notes from February 2, 2015 Conference Call with EPA
- IGA with UNM-NHNM
- NHNM Quarterly Reports
- Approved QAPP
- AA Team agenda, sign-in sheet, notes and presentations
- Pilot Study Notes and photos
- Training Agenda for Rosgen I
- Data Collection Team sites list
- Field Team schedules
- List of Personnel that Signed PQAPP Acknowledgments
- Sample data collection field packet
- Sample Locations Map
- Vegetation Classification for Wetlands of Interest
- Thank you letter sample
- IT contracts with TEKSystems
- Signed MOA with NHNM
- Botany Booster and NMRAM Montane Riverine Wetlands Training invitations and RSVP list
- Northern and Southern Wetlands Roundtable presentations, sign in sheets and agendas
- Botany Booster trainings agendas, sign-in sheets, handouts and presentation.
- NMRAM Montane Riverine Wetlands training agenda, sign-in sheets, and presentation.
- NMRAM Montane Riverine Wetlands Field Guide Version 2.3 Draft
- Poster and presentation materials from the International Association of Vegetation Science 2018 Symposium in Bozeman Montana July 22-27, 2018
- Final AA-team meeting sign in sheet, agenda, presentation
- Wetland Functions and NMRAM Metrics Report, Muldavin et al., 2019
- New Mexico Rapid Assessment Method (NMRAM) Multi-metric Analysis, Muldavin et al., 2019
- Printed maps and Legend from NMRAM \_Montane \_Canadian \_WOI\_VegMap\_20190531
- Reference Standard Wetland Sites Lists
- Top ten ranked Reference Standard Wetland Maps
- NMRAM Montane Riverine Wetlands Field Guide Version 2.4 with Appendices

## **Lessons Learned**

This project is a continuation of NMRAM development for montane riverine wetlands, providing refinement of metrics and overall analyses of site scores from different parts of the state. Issues that required considerable discussion and research were individual metric scores and metric sensitivity, and conducting the rapid assessment in varying hydrologic conditions and ecological settings from different parts of New Mexico. Data collection from this NMRAM in the northeastern part of the state and comparing results and montane riverine wetland parameters from Southeastern and Northcentral NM resulted in an expanded reference domain where NMRAM for Montane Riverine Wetlands can be used. Future data collection targeting urban

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settings, and other mountainous and plateau regions in the state will support metric evaluation and refinement.

*What made the project successful?*

This project is a significant success in the effort to improve montane riverine wetlands subclass metrics for the NMRAM. With enough data to perform metric analyses, fillable pdfs for data collection, an updated SQUID version for wetlands, additional trainees for future NMRAM data gathering events (ie All Hands), and reference sites, the evolution of NMRAM continues to move forward in a positive framework for the next steps in development.

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.

Interactive data collection worksheets have been further developed for NMRAM for Montane Riverine Wetlands. The interactive data collection worksheets have new features including a drop-down list of common wetland and riparian plants that will be encountered in New Mexico riverine wetland settings. The datasheets also automatically provide scores for most metrics that scores can be computed and ranks metrics and overall attributes as data is entered for each metric. The database also stores key photographs and is in preparation for access with other regional water quality data stored in SQUID.

The expansion of the New Mexico Wetlands Roundtable to meetings in Southern New Mexico 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.

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.

SWQB Wetlands Program has made progress in Wetlands Water Quality Standards development with the development of some key reports, including the crosswalk of NMRAM data with wetland functions for montane riverine wetlands, the identification of reference standard wetlands that can serve as the model for wetlands standards attainment for montane riverine wetlands, and a protocol for assigning wetland assessment units statewide.

*What made the project not so successful?*

This project has been overall successful in achieving its goals.

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## **Technical Transfer**

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

One 3-day NMRAM Montane Riverine training and two Botany Booster trainings were provided to Agencies, Cooperators and local stakeholders to promote the understanding and use of NMRAM. Engaging an advisory committee to help NMRAM development also provides insight to land managers and wetland experts about the process we are using to develop NMRAM. The Multi-Metric Analysis and a NMRAM Metrics to Wetlands Functions crosswalk will be available on the SWQB Wetlands Program website for those interested in NMRAM development.



**Figure 17. Bison grazing on Rio Mora NWR at Loma Parda along the Rio Mora floodplain during Montane Riverine Training. Pojoaque Pueblo manages approximately 30 adult bison on the Refuge in cooperation with the USFWS and Denver Zoo. Photo by E. Sawyer**

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NMRAM development was presented at the International Association of Vegetation Science 2018 Symposium in Bozeman, Montana July 22-27, 2018. The poster presentation entitled, “Integrating Vegetation Data into Rapid Ecological Assessment: A map-based approach for wetlands and riparian areas,” by Esteban Muldavin, Elizabeth Milford, Maryann McGraw and Yvonne Chauvin, provides an international community of experts, information about our approach and validation of our methods.

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

### **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.

### **Future Activity Recommendations**

- Additional refreshers, botany boosters and trainings will be conducted in NMRAM to engage others in collecting needed wetlands data. 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.
- SWQB Wetlands Program is developing a demonstration of “All Hands” data collection efforts where we provide direct help to teams that want to use NMRAM for their purposes. Several training attendees indicated that they would participate in this effort.
- Additional data collection activities will be completed in urban settings to clarify the statistics related to poor quality sites and provide additional definition to the value of specific metrics via future multi-metric analyses.

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**Figure 18. Northern Crayfish (*Orconectes virilis*) sit at the bottom of a pool within the Sapello River. Photo by E. Sawyer.**