



Functional Assessments in Current Wetland & Floodplain Mapping

USFS Riparian Areas Inventory & Assessment project

*Natural Floodplain Functions Alliance-Wetland Mapping Consortium
Mapping Workshop*

Tuesday, April 10th

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Introduction



- ***“the plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity”*** FH 1909.12-Land Management Planning Handbook, Chapter 20-Land Management Plan.
- In 2015, the Forest Service Watershed, Fish, Wildlife, Air, & Rare Plants (WFWARP) staff and Rangeland Management & Vegetation Ecology (RMVE) staff funded the development and implementation of the Riparian Buffer Delineation Model (RBDM) to obtain a national inventory of variable width riparian areas.
- This product would inform the Agency on national riparian resource conditions in multi-scale approach, and support other landscape tools such as the Terrestrial Condition Assessment and the Watershed Condition Assessment.



Objectives



- Develop a national context inventory of riparian areas and their condition within national forests and rangelands.
- Priorities were set to meet Forest Plan revision schedules and to meet sage grouse management information needs.
- Multi-scale approach to provide a national and regional report map. Create a product for managers to easily understand where to apply the information at various scales.
- Provide a framework and an end product to stakeholders and apply the information into management actions and strategies.
- ensure relevancy to management decisions. Effective monitoring program management are critical to accomplishing the goals of this assessment.
- *We acknowledge that other riparian inventory, classification and assessment work has been performed by partners and in collaboration with the Forest Service. This does not replace that work. The purpose and design of this tool will not meet all needs.*
- *Outreach across FS program areas brought awareness to the project and secured feedback on model parameters. This outreach continues.*



Filtered Objectives



- Size.
- Spatial extent.
- Location.
- Land cover.
- Use available data.
- Cost effective.
- Answer all the above using a multi-scale approach.
- Technology transfer and reaching out to partners.



Data



Input Data	Sources	Type
Streams Watersheds	USGS National Hydrology Dataset (NHD) http://nhd.usgs.gov/	Required
Lakes	USGS National Hydrology Dataset (NHD) http://nhd.usgs.gov/	Optional
National Wetlands Inventory	National Wetlands Inventory (NWI) http://www.fws.gov/wetlands/Data/Data-Download.html	Optional
gSSURGO	Natural Resources Conservation Service (NRCS) http://soildatamart.nrcs.usda.gov/ or http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm	Optional
Elevation 1m, 2m, 3m, & 10m DEMs	The National Map https://viewer.nationalmap.gov/basic/#startUp	Required
Land Cover	National Land Cover Database http://www.mrlc.gov/ Corp land Data Layer http://www.nass.usda.gov/research/Cropland/SARS1a.htm	Optional
50-Year Flood Height	50-year flood height value is calculated using Mason (2007) approach utilizing available USGS water gauges at: https://maps.waterdata.usgs.gov/mapper/index.html	Required



50-Year Flood Height



- The 50-year floodplain is the optimal hydrologic descriptor of a riparian ecotones a long a moving watercourse as determined by Ilhardt et al. (2000).
- In most cases the 50-year flood height intersects the first terrace or other upward sloping surface and supports the same microclimate and geomorphology as the stream channel.
- The 50-year flood plain coincides with measurements that quantify a valley to its stream via two measurements: the entrance ratio (valley width at the first terrace or up slope to stream width at full bank), and the belt width ratio visible on aerial photos or maps.

□ Ilhardt, B.L., E.S. Verry, and B.J. Palik, 2000. Defining riparian areas, *Riparian Management in Forests of the Continental Eastern United States*, (E.S. Verry, J.W. Hornbeck, and C.A. Dolloff, editors). Lewis Publishers, New York, pp. 23–42.



50-Year Flood Height



National Water Information System: Mapper [Help](#) [Info](#)

Sites **Map**

Search

Search by Street Address:

Search by Place Name:

Search by Site Number(s):

Search by State/Territory:

Search by Watershed Region:

- Surface-Water Sites
- Groundwater Sites
- Springs
- Atmospheric Sites
- Other Sites



New Tools

F_1	FLComID_1	STREAMORDE	HUC8	HUC6	HUC4	HUC2	Flood50y	Status	Rec_Years
	22340331	3	02070010	020700	0207	02	0.92	Current	70
	4512772	7	02070008	020700	0207	02	9.14	Current	88
	8423460	4	02070001	020700	0207	02	1.27	Current	75
	5907047	2	02070005	020700	0207	02	1.01	Historic	30
	22337977	3	02070010	020700	0207	02	1.03	Current	80
	5908733	5	02070005	020700	0207	02	3.22	Current	91
	8441257	3	02070006	020700	0207	02	2.24	Current	86
	22338431	3	02070010	020700	0207	02	1.42	Current	88
	5908485	4	02070005	020700	0207	02	2.45	Current	37
	5907167	5	02070005	020700	0207	02	4.16	Current	58
	4533657	3	02070011	020700	0207	02	1.15	Current	46
	5908355	4	02070005	020700	0207	02	3.4	Current	90
	4529063	3	02070011	020700	0207	02	1.17	Current	40
	22337975	4	02070010	020700	0207	02	1.32	Current	80
	5907079	5	02070005	020700	0207	02	3.75	Current	88
	8441291	4	02070006	020700	0207	02	2.54	Current	74
	4530567	3	02070011	020700	0207	02	2.43	Current	34
	5908521	4	02070005	020700	0207	02	1.68	Current	65
	22337979	2	02070010	020700	0207	02	0.85	Historic	31
	5909157	2	02070005	020700	0207	02	0.87	Current	71
	4530917	3	02070011	020700	0207	02	1.51	Current	48
	22340339	3	02070010	020700	0207	02	0.82	Current	57
	14363672	5	02070002	020700	0207	02	2.89	Historic	52
	14364970	3	02070002	020700	0207	02	1.49	Current	90
	5908733	5	02070005	020700	0207	02	3.87	Current	87

Modeling Riparian Zones Utilizing DEMs and Flood Height Data

Sinan A. Abood, Ann L. Maclean, and Lacey A. Mason

USDA Forest Service Watershed, Fish, Wildlife, Air & Rar Plants Program - Rangeland Management & Vegetation Ecology, Washington Office

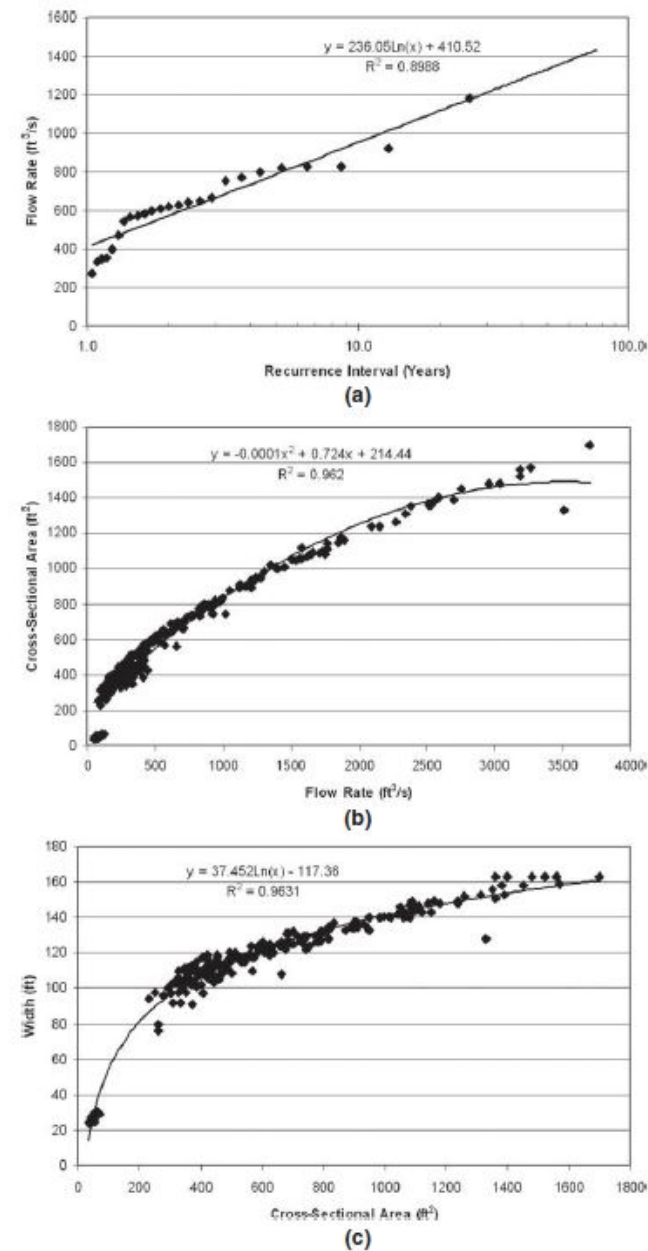







Figure 2. Regression graphs for the hydrologic estimators for determining the approximate 50-year flood height (from Mason, 2007): (a) Recurrence Interval (Years), (b) Flow Rate (ft³/s), and (c) Cross-Sectional Area (ft²).








New Toolboxes Version 5.2



Riparian Solutions

- [-]  RBDMv5.1_Desktop.pyt
 -  Riparian Batch
- [-]  RBDMv5.1_Utilities.tbx
 -  Prepare Riparian Areas Inventory
 -  Prepare Riparian Soil

Riparian Batch: this tool processes the selected watersheds within the targeted study area in a batch format and organize the results in separate FGDBs.






- [-]  RBDMv5.2_PRO.pyt
 -  Riparian Batch
- [-]  RBDMv5.2_Utility.tbx
 -  Prepare Riparian Areas Inventory
 -  Prepare Riparian Soil



New Toolboxes Version 5.2

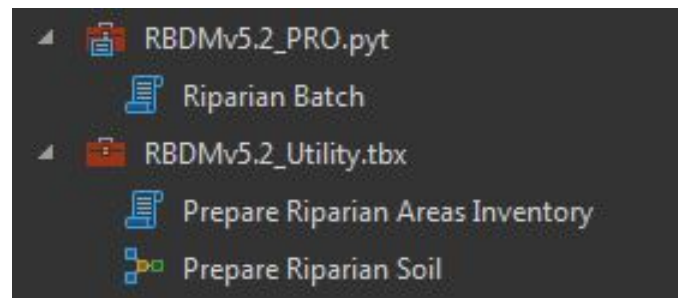


Riparian Solutions

- [-]  RBDMv5.1_Desktop.pyt
 -  Riparian Batch
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 -  Prepare Riparian Areas Inventory
 -  Prepare Riparian Soil

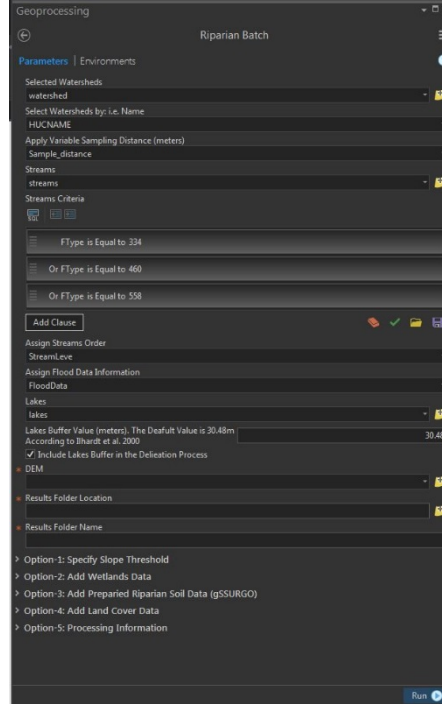
Prepare Riparian Soil: prepares gSSURGO data according to a user defined query.

Prepare Riparian Areas Inventory: responsible for collecting the results from the batch process and produce a seamless riparian areas layer.



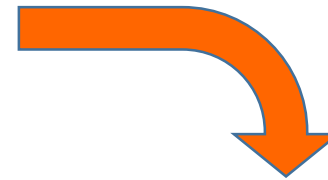


Process

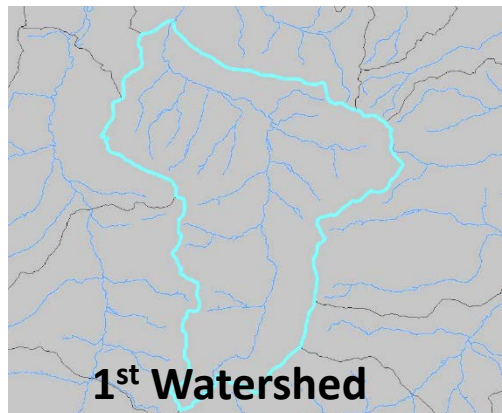


Output Folder

- + AlamosaRiver_1.gdb
- + AlderCreekRioGrande_1.gdb
- + BellowsCreek_1.gdb
- + CarneroCreek_1.gdb
- + ChavezCreekRioChama.gdb
- + CityofAlamosaRioGrande_1.gdb
- + ClearCreek.gdb
- + ClearCreek_1.gdb
- + ConejosRiverHeadwaters_1.gdb
- + DeadmanCreekSanLuisCreek.gdb
- + EmbargoCreek_1.gdb
- + FordCreekSaguacheCreek.gdb
- + GarnerCreekSanLuisCreek.gdb
- + GooseCreek.gdb
- + HeadwatersRioGrande_1.gdb
- + HeadwatersSaguacheCreek_1.gdb
- + HeadwatersSanLuisCreek.gdb
- + KerberCreek.gdb
- + LaGaritaCreek_1.gdb
- + LaJaraCreek.gdb
- + MiddleCreekSaguacheCreek.gdb
- + MinersCreek_1.gdb
- + NavajoRiver.gdb
- + OutletConejosRiver.gdb
- + PinosCreek_1.gdb
- + RedMountainCreek.gdb
- + RiodelLosPinos.gdb
- + RioSanAntonio.gdb
- + RockCreek_1.gdb



- Main.gdb
 - + CDL_2015
 - + dem
 - gsoils
 - lakes
 - streams
 - watershed
 - wetlands



Process loop



Results





Results





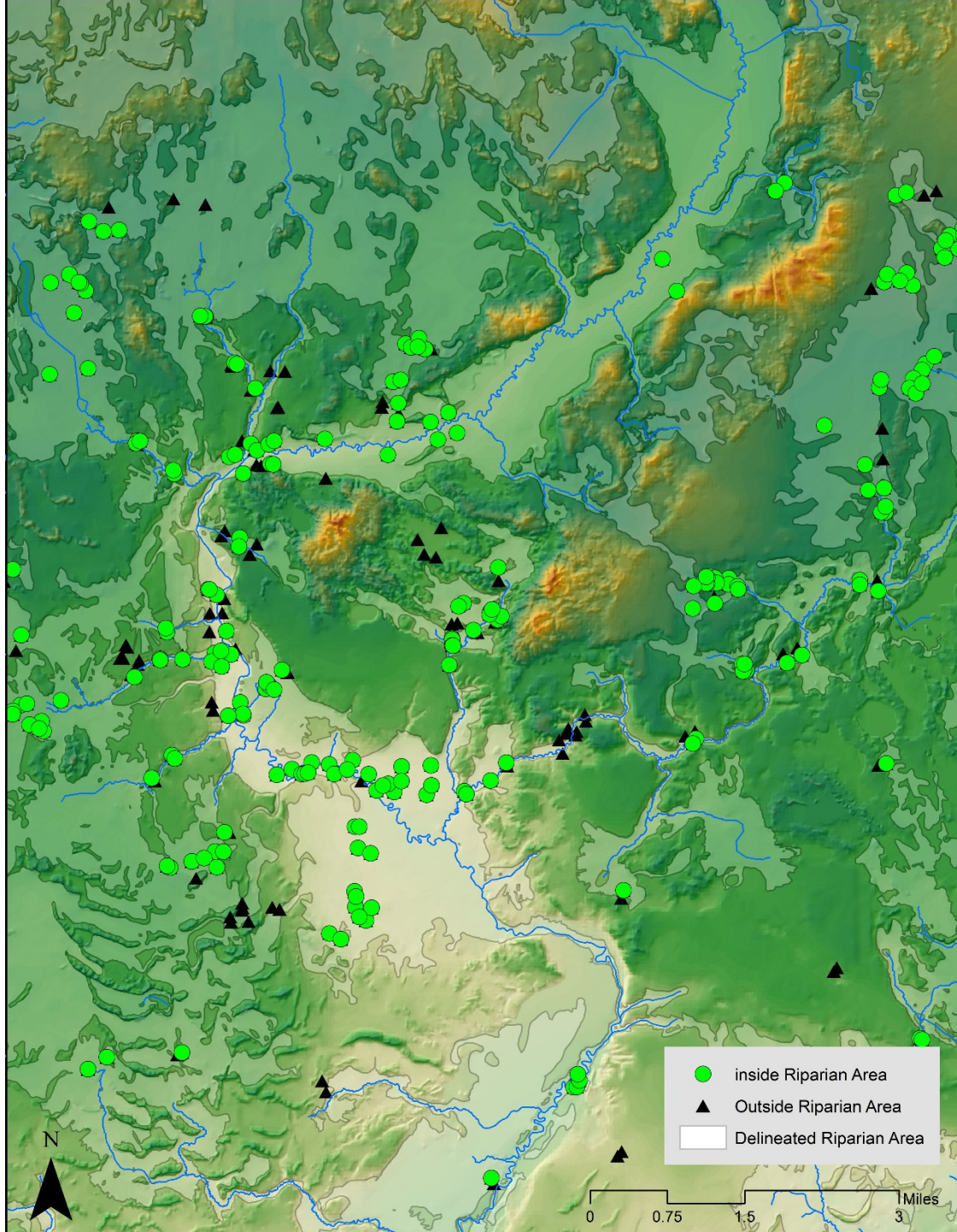
Mapping accuracy

		Reference	
		HNF West	Upland
Map	Riparian	300	6
	Upland	37	15

Total	User %	Commission Error
306	98.04	1.96
52	71.15	28.85

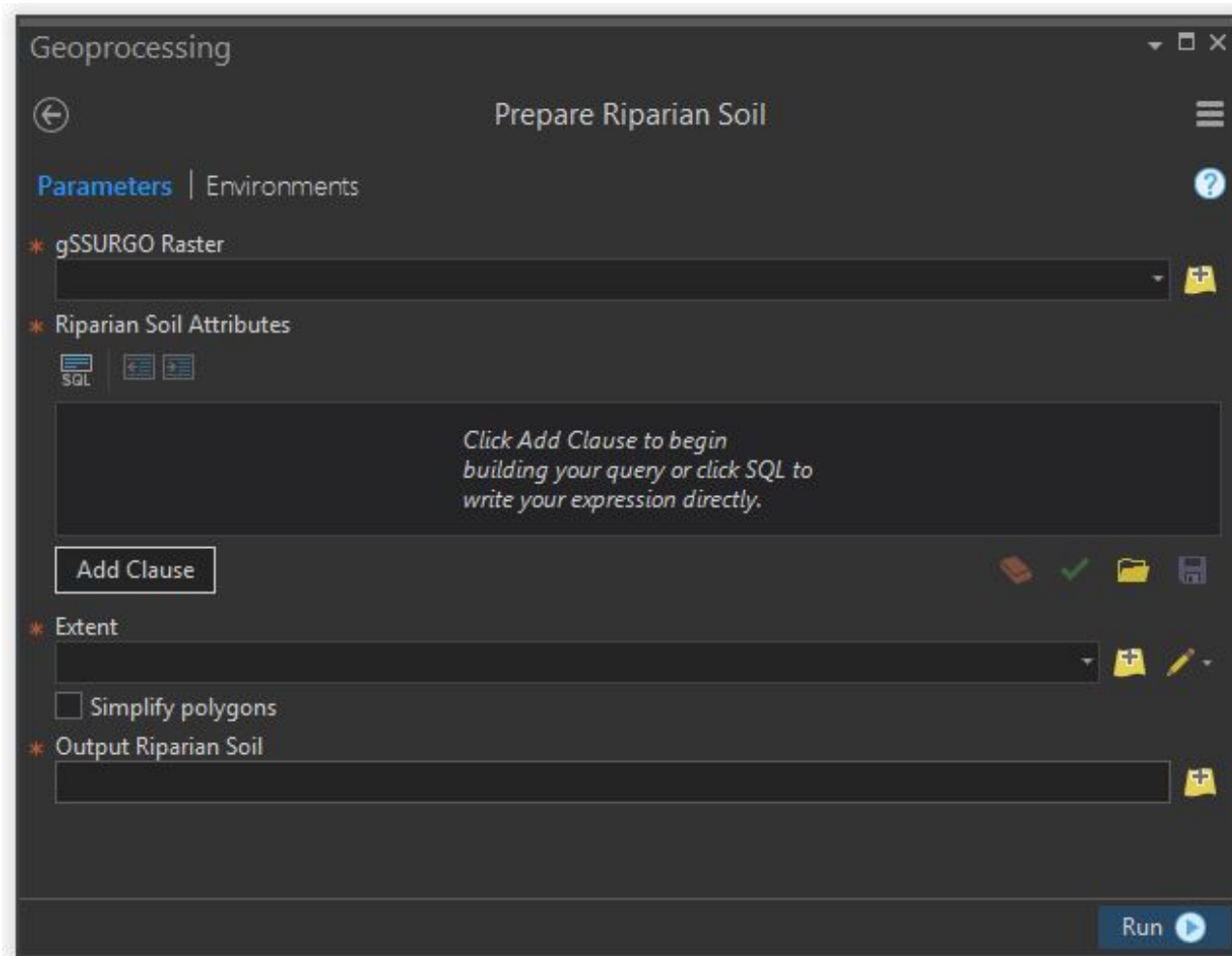
Total	337	21
Producer %	89.02	71.43
omission Error %	10.98	28.57

358	88	Overall accuracy
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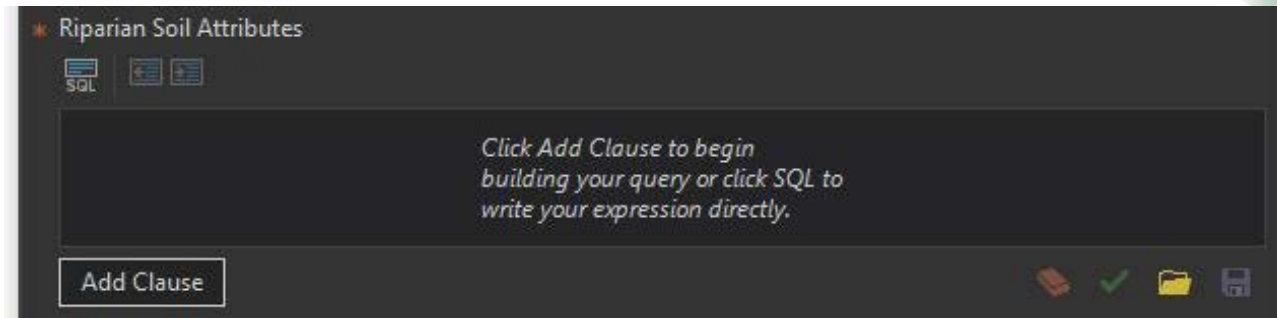


RBDMv5.2_Utilities Toolbox





Select riparian areas soil attributes



There are three queries used to prepare gSSURGO data:

1. Verry et al., (2004) approach: riparian soils are hydric soils.
hydclprs >= '90'

2. Palik et al., (2004): riparian soils have four components; Hydric rating, Drainage Class, Hydrologic soil group, and flood frequency.
“hydclprs >= '90' AND drclassdcd = 'Poorly drained' OR drclassdcd = 'Somewhat poorly drained' OR drclassdcd = 'Very poorly drained' AND hydgrpdc = 'D' OR hydgrpdc = 'C' OR hydgrpdc = 'C/D' OR hydgrpdc = 'B/D' OR hydgrpdc = 'A/D' AND flodfreqdcd = 'Frequent' OR flodfreqdcd = 'Occasional' “

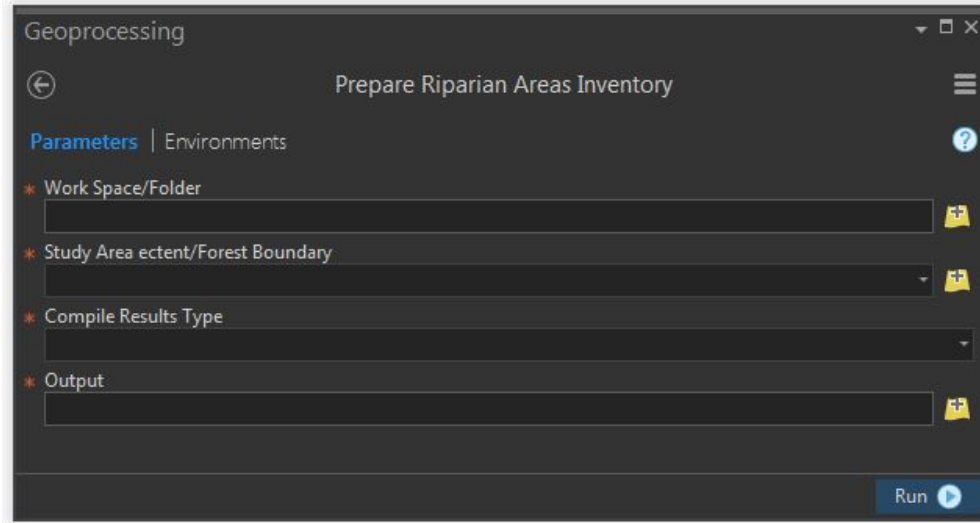
3. User Defined.

- ❑ Verry, E.S., C.A. Dolloff, and M.E. Manning, 2004. Riparian ecotone: A functional definition and delineation for resource assessment, *Water, Air, and Soil Pollution: Focus*, 4:67–94.
- ❑ Palik, B., S.M. Tang, and Q. Chavez, 2004. Estimating riparian area extent and land use in the Midwest, *General Technical Report NC-248*, US Department of Agriculture, Forest Service, North Central Research Station, St. Paul, Minnesota, 28 p.

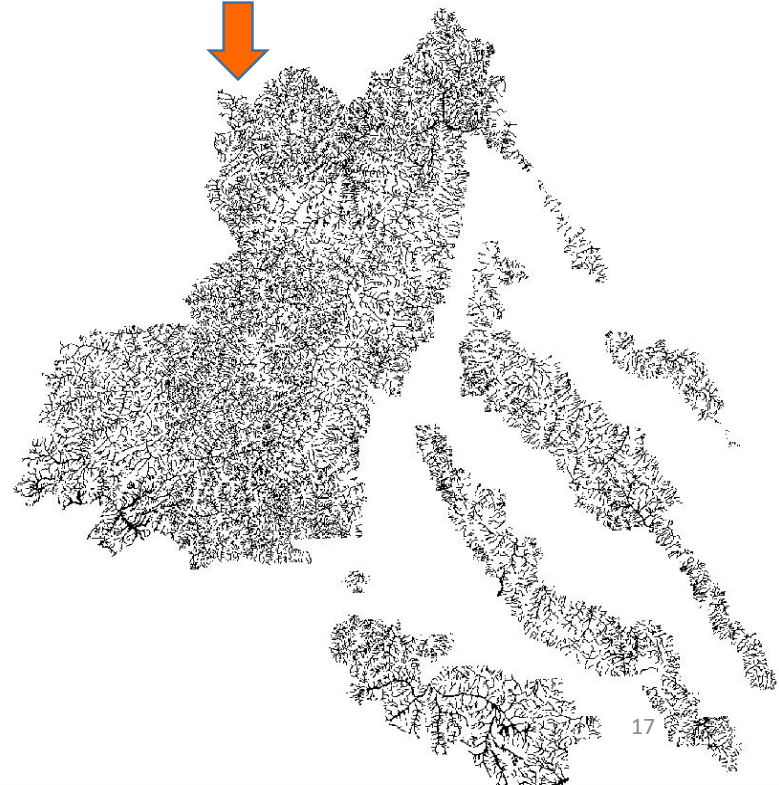


Results

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- + RockCreek_1.gdb



RBDMv5.2_Utilities Toolbox





Applications

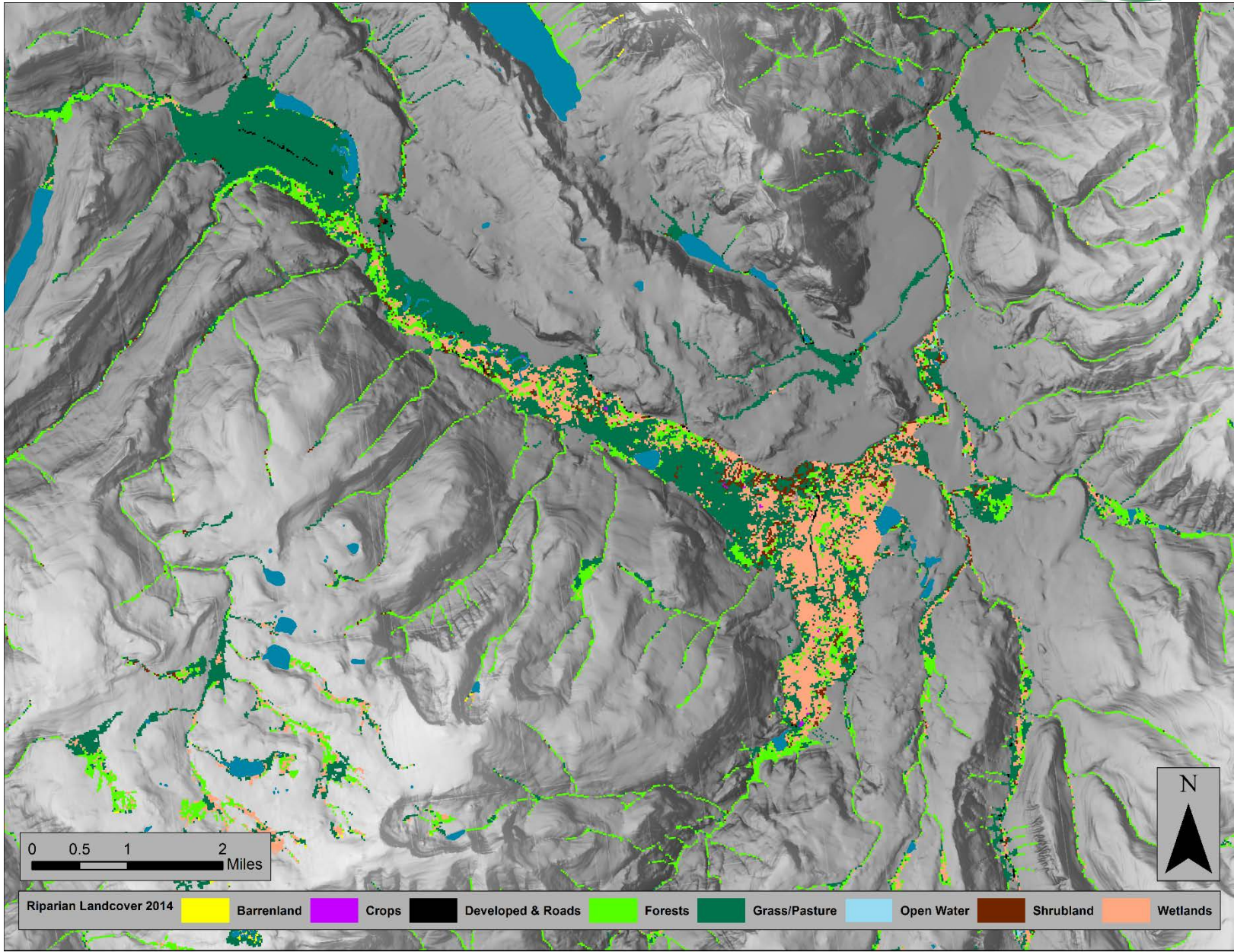
riparian land cover



New land cover classes	Original Land cover classes	Value	Color Map
Crops	Corn, sorghum, soybeans, sunflower, barley, spring wheat, winter wheat, rye, oats, millet, spletz, alfalfa, other hay/non alfalfa, sugar beets, dry beans, potatoes, clover/wildflowers, sod/grass seed, fallow/idle cropland, cherries, apples, grass/pasture, and celery	1	
Developed and Roads	Developed/ open space, developed/low intensity, developed/med intensity, and developed/high intensity	2	
Barren Land	Barren	3	
Natural/Semi Natural (Forests)	Deciduous Forest, Evergreen Forest, and Mixed Forest	4	
Natural/Semi Natural (Shrubland)	Shrubland	5	
Natural/Semi Natural (Wetlands)	Woody wetlands and herbaceous wetlands	6	



Applications reclassified riparian land cover 2014



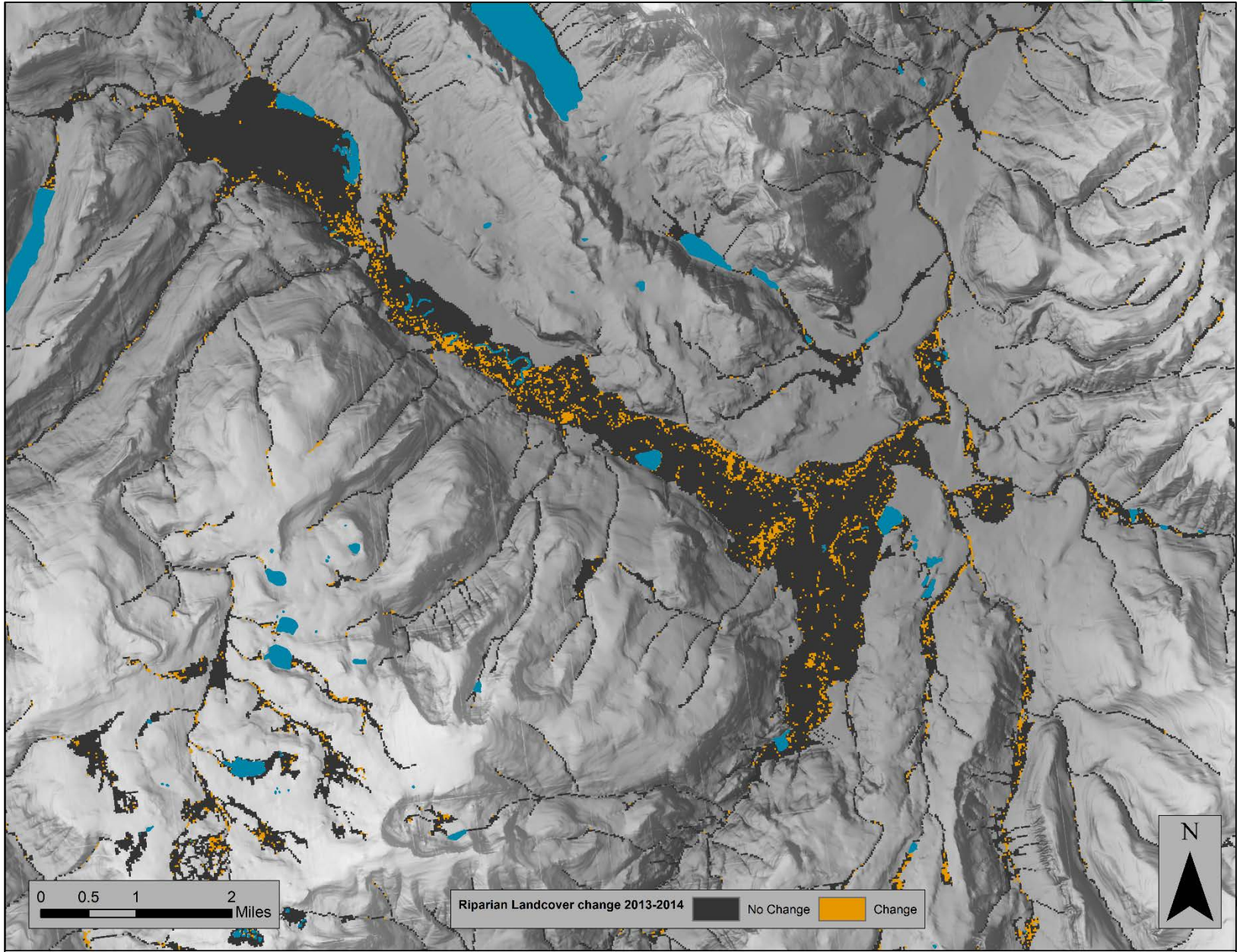
0 0.5 1 2 Miles



Riparian Landcover 2014 Barrenland Crops Developed & Roads Forests Grass/Pasture Open Water Shrubland Wetlands

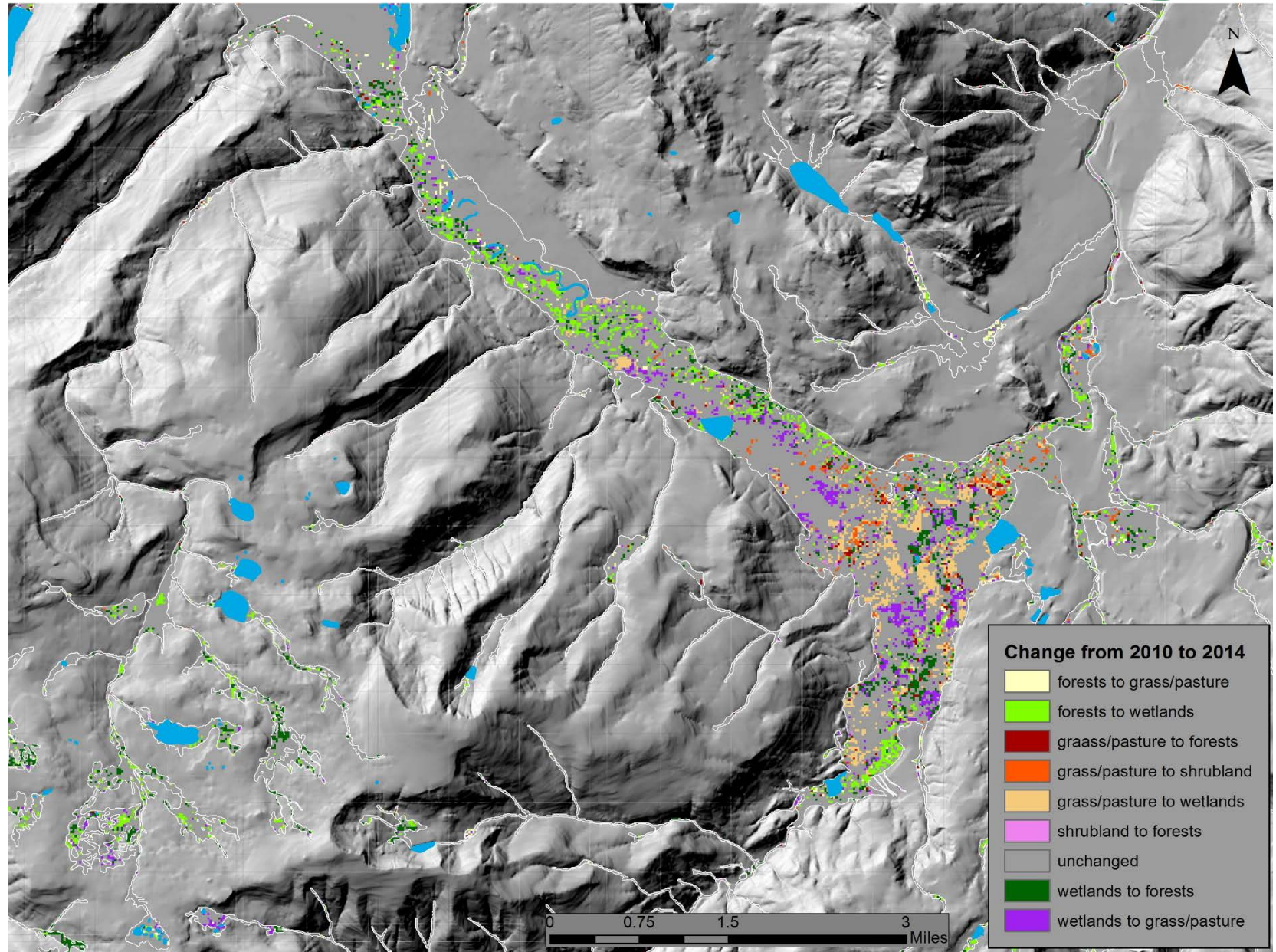


Applications change 2013-2014



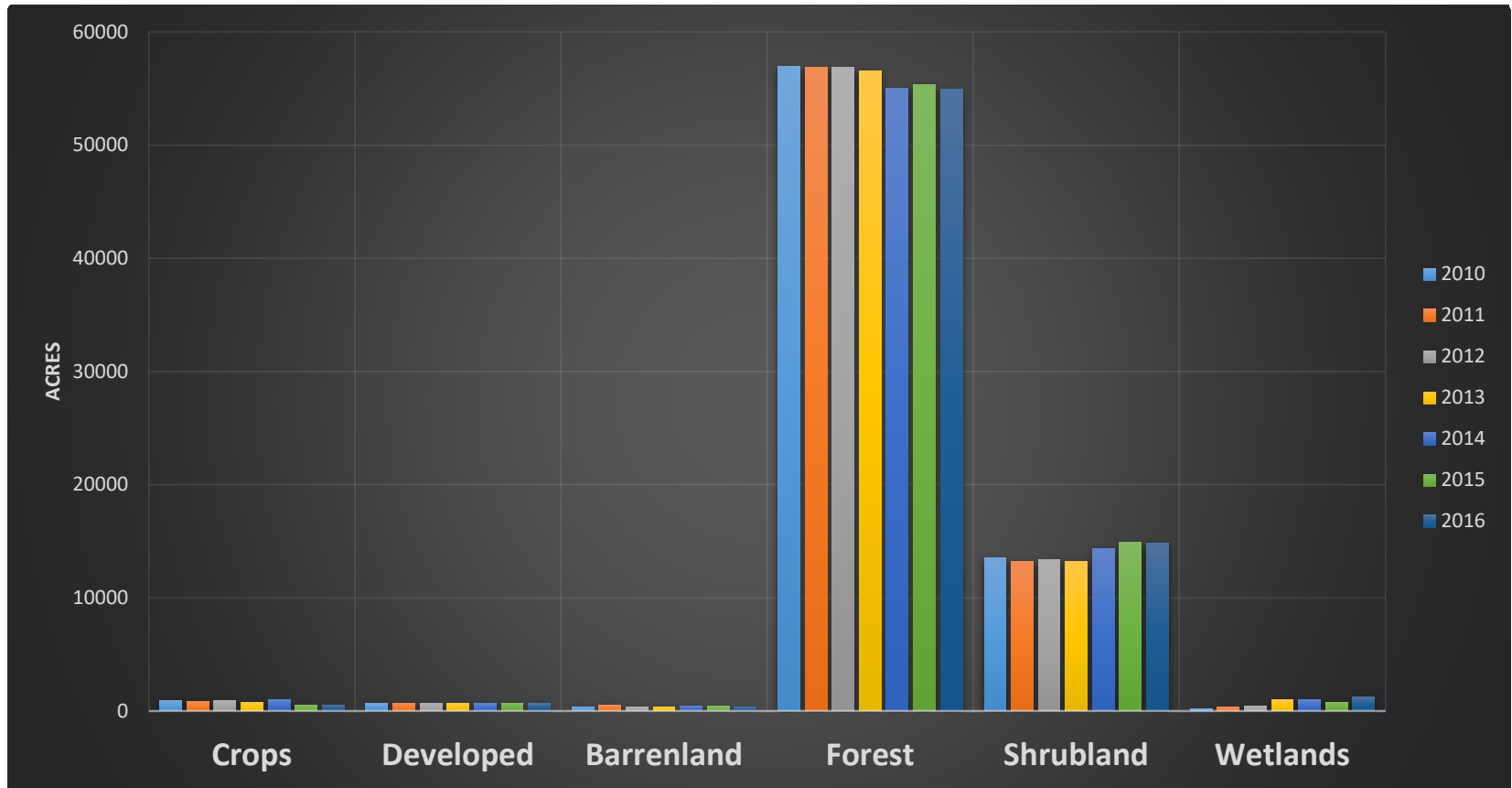


Applications in depth change analysis 2010-2014





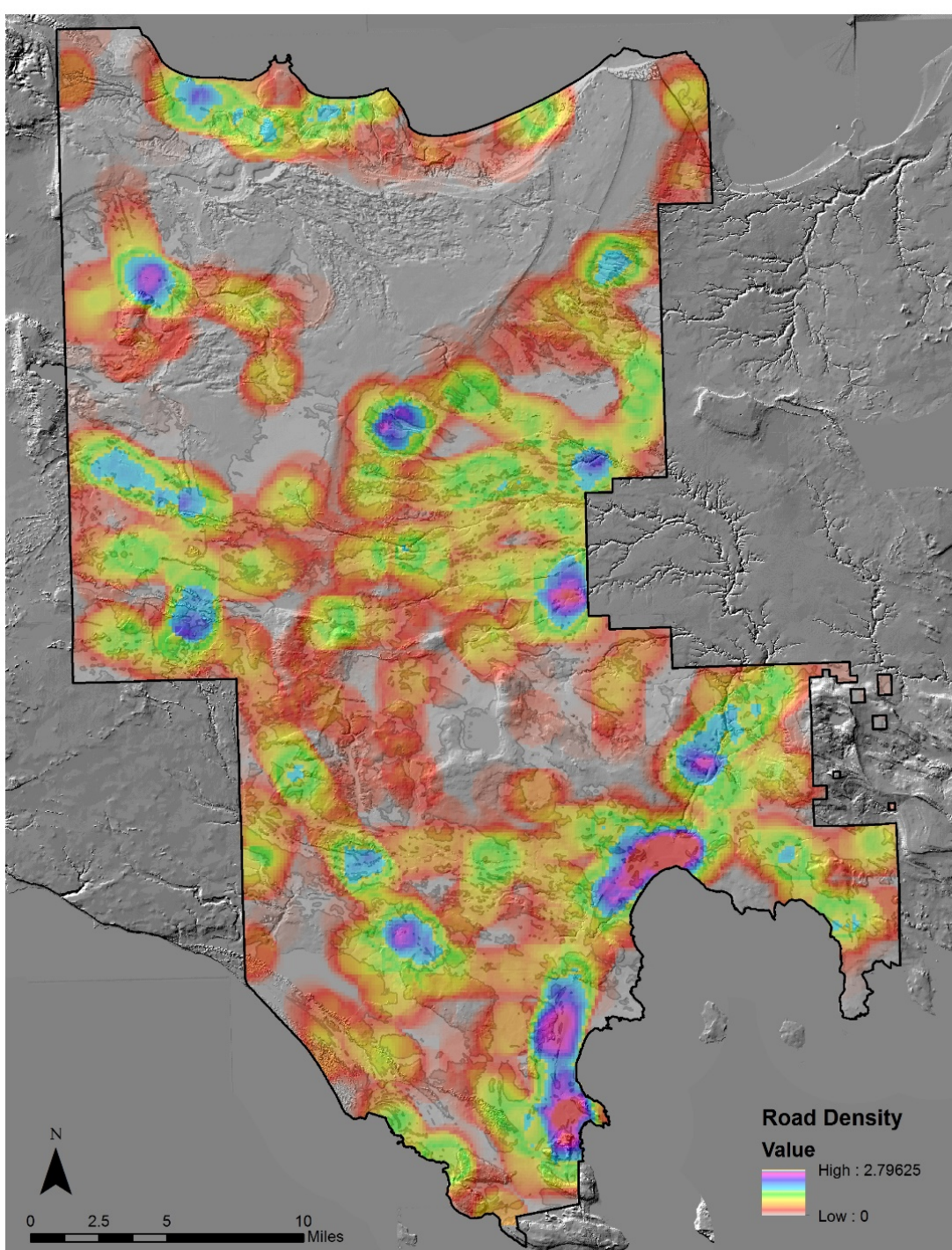
Applications reclassified riparian land cover



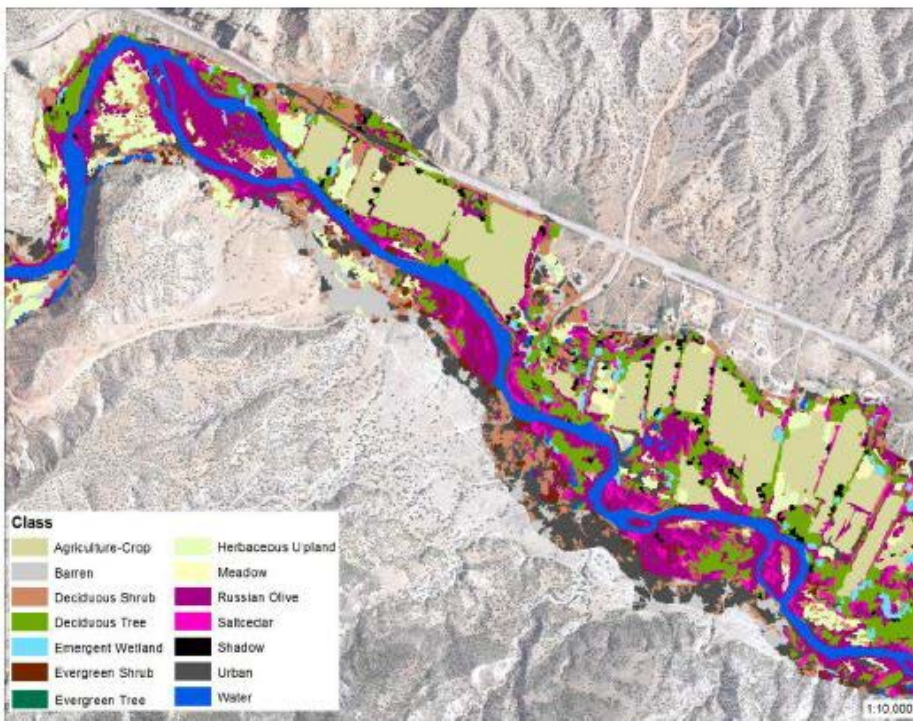
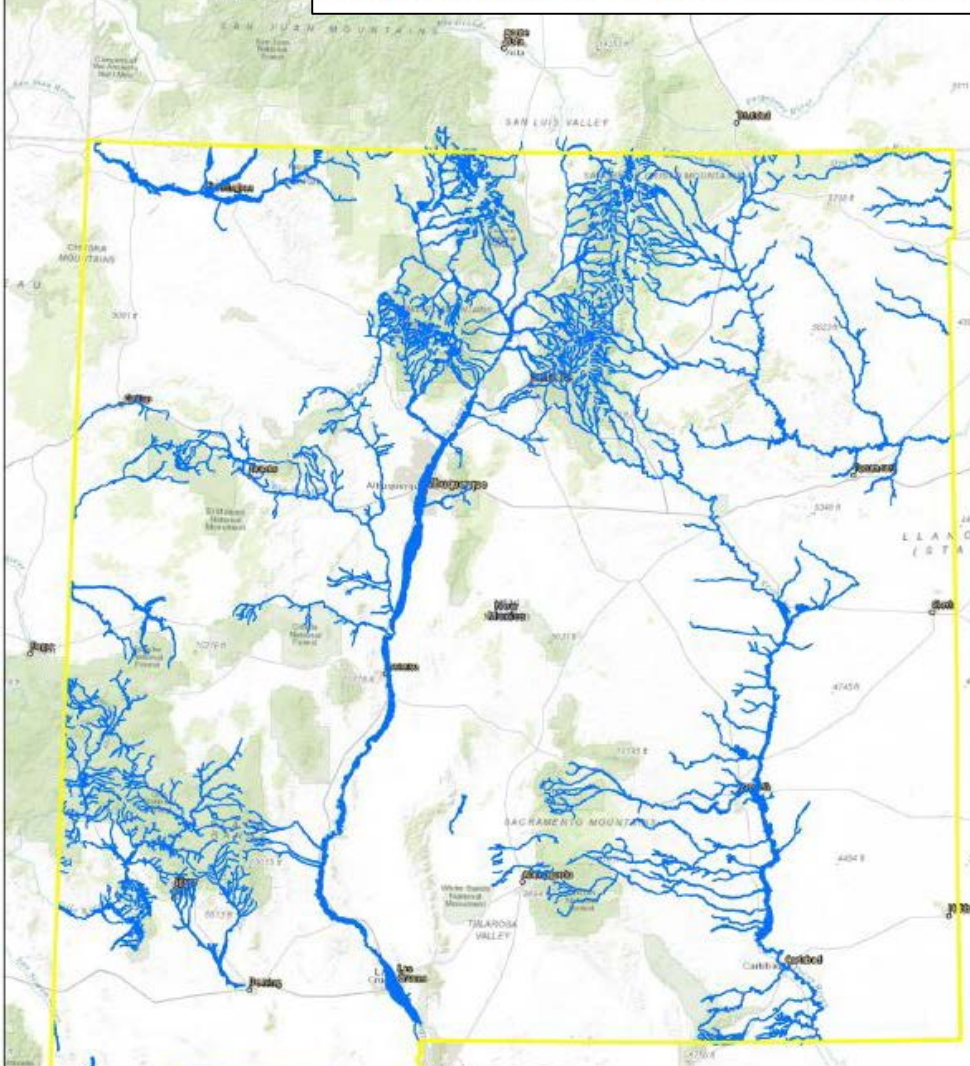
- 97% of riparian land cover is natural or semi natural.
- Between 2010 to 2016 there are:
 - 2030 acres decrease in forests.
 - 1322 acres increase in shrublands.
 - 1087 increase in wetlands.



Applications
riparian
areas road
density



A Riparian and Wetland Wildlife Habitat Map for New Mexico



Final Report – Year 1

May 2017



Figure 5. New Mexico Riparian Corridor Map of perennial streams and rivers with intermittent and ephemeral reach connectors that will serve as the mapping domain for the New Mexico Riparian Wildlife Habitat map. Figure 7. Examples of the base map classification detail along a montane reach (a) and lowland wide floodplain (b) in the Upper Rio Grande-Rio Chama basin.



Local Collaborative Projects



- New Mexico Natural Heritage & University of New Mexico finished mapping Riparian and Wetlands Habitat for parts of New Mexico.
- Currently collaborating with USGS MD DE DC Water Science Center on a two phase project; automating 50-year flood height calculations and mapping variable width riparian areas using USGS NHD mid resolution data.
- Currently collaborating with USFS State & Private to generate National riparian layer using NHDPlus 100K for their Forest to Faucet analysis.
- Two days Tech Transfer workshop presented to Arizona Game & Fish staff in November, 2017. start processing in February, 2018.
- Percent impervious surfaces within riparian areas. (Jessica Morgan, EPA).
- Prioritizing land parcels for protection as a way to protect water quality of drinking water sources. Upstateforever.org. South Carolina.
- Riparian areas ecological classification with NatureServe.
- ***The geographic extent was narrowed from the desired “all lands” extent to only Forest Service lands due to available resources. This underlines the need to work collaboratively with states, other agencies and private partners to complete broad assessments.***



Global Collaborative Projects

















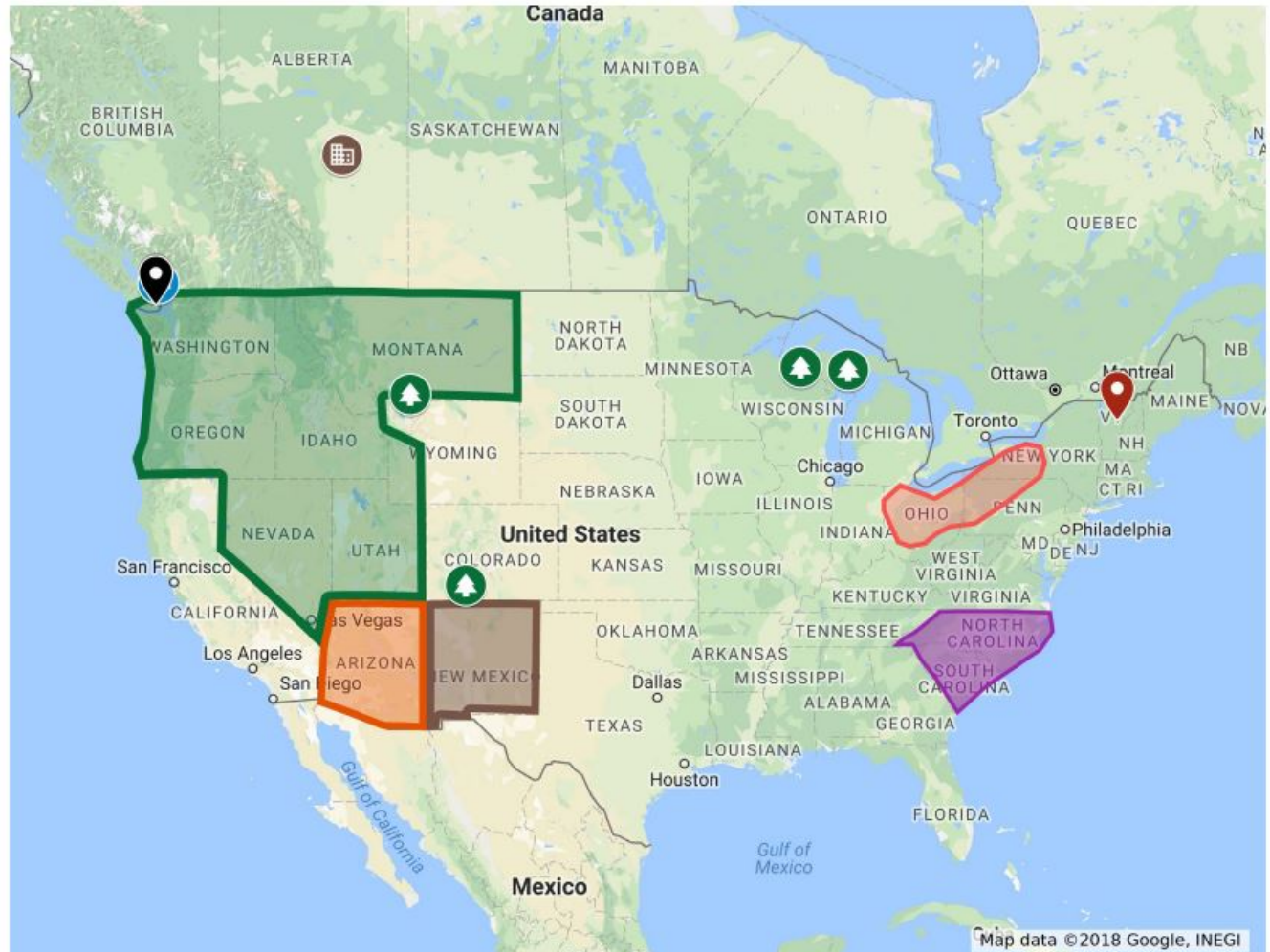
- Riparian areas mapping within United Kingdom habitat. Manuscript published in Journal of Ecohydrology 2017.
- Mapping riparian areas in British Columbia utilizing high resolution data. University of British Columbia, Canada. Results submitted and working on report.
- Riparian health assessment in Alberta, Canada. Fiera Biological Consulting, Canada. In progress.
- Riparian areas mapping in North British Columbia, Canada. British Columbia government.
- CROSSLINK project. Determining aquatic-terrestrial and longitudinal linkages in stream networks on four European catchments. Helmholtz Center for Environmental Research (UFZ). Leipzig, Germany.



USFS Riparian Areas Mapping Activities

Project Locations

-  EPA
-  NatureServe
-  USFS-R4, R1, R6
-  Pilot Project-Hiawatha National Forest
-  Pilot Project-Rio Grande National Forest
-  Pilot Project-Custer Gallatin National Forest
-  TNC-Riparian Planting Project
-  Upstate for Ever
-  The University of British Columbia
-  Fiera Biological Consulting Ltd
-  British Columbia Government
-  Bangor University
-  Helmholtz Center for Environmental Research - UFZ
-  Arizona Game & Fish



USDA Forest Service Watershed, Fish, Wildlife, Air & Rare Plants Program - Rangeland Management & Vegetation Ecology, Washington Office



Next Step



- A joint project with USFS-State & Private. Mapping riparian areas on a National scale using NHD 1:100K data.
- National Riparian base map would be used in Forest to Faucet project analysis.



Questions

www.riparian.solutions

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