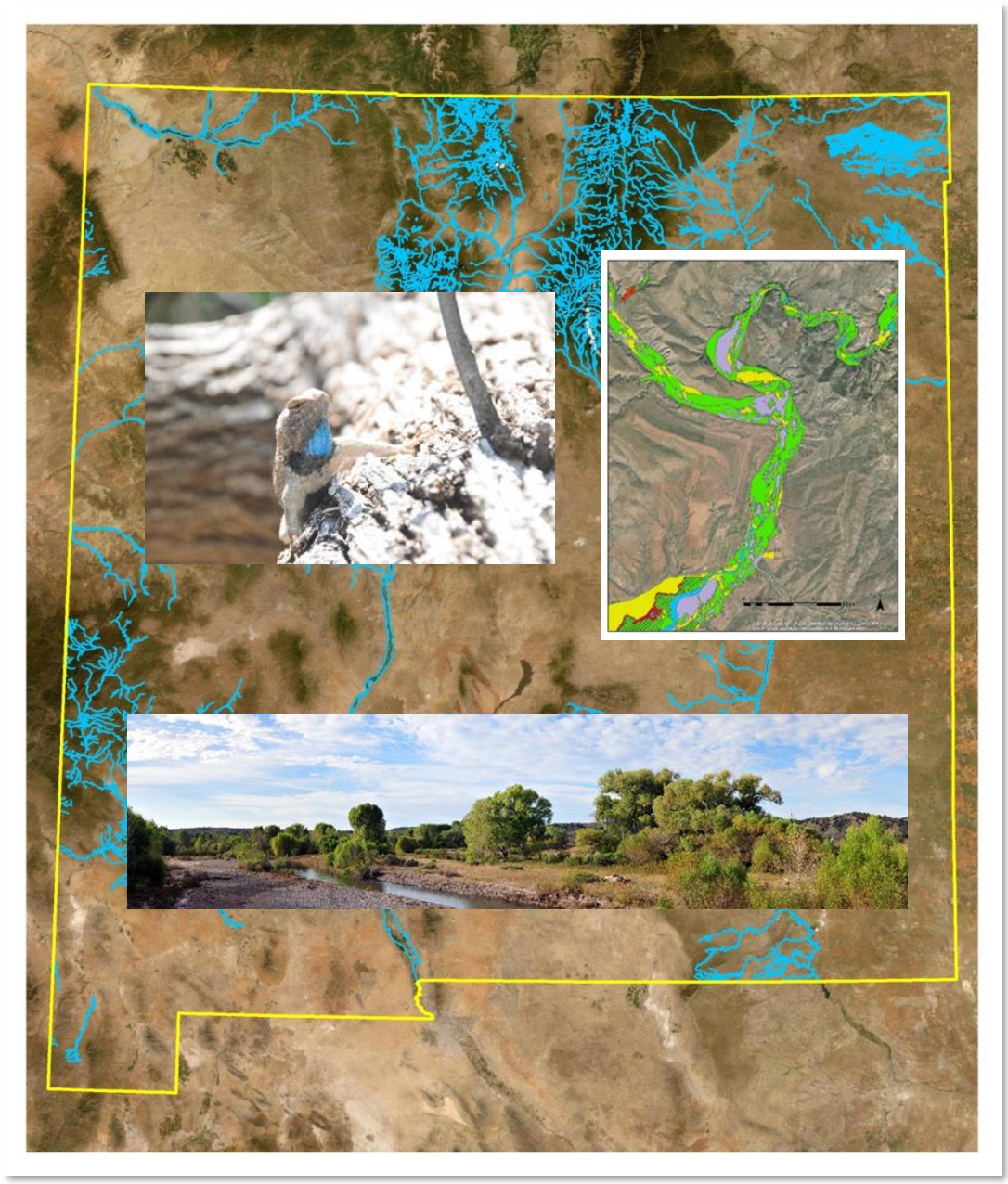
New Mexico Riparian Habitat Map

NMRipMap

Version 2.0 Plus

User Guide



New Mexico Riparian Habitat Map Version 2.0 Plus

(NMRipMap) User Guide

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Introduction

The New Mexico Riparian Habitat Map (NMRipMap) is a publicly available map resource that provides a comprehensive, fine-scale spatial view of the composition, cover, and structure of riparian and wetland vegetation along New Mexico's perennial streams and rivers. NMRipMap is designed to serve a wide variety of applications in wildlife habitat management, wetland and riparian conservation and restoration planning, riparian monitoring, and more. Products include a comprehensive riparian corridor map for the state and riparian habitat maps for each major basin that can be viewed and downloaded at https://nhnm.unm.edu/riparian/NMRipMap. This guide provides an overview of the development and content of the map, and how to use it.

Background

NMRipMap is a collaborative project between Natural Heritage New Mexico (NHNM), with the support of the New Mexico Department of Game and Fish (NMDGF) and the U.S. Forest Service (USFS), Region 3[3]. In 2017, an in-common map legend, mapping domain, and mapping protocol was agreed upon among the partners and the project initiated in the Upper Rio Grande Basin (Figure 1). The USFS mapped their lands with the assistance of the USFS Geospatial Technology and Applications Center (GTAC), and NHNM was responsible for the reminder with the help of Missouri Resource Assessment Partnership (MoRAP) at the University of Missouri. In subsequent years, each basin was mapped and posted as Version 1.0 on a NHNM website. In 2022-23, the entire map was reviewed and differences in content and themes reconciled across all years based on 2020 imagery resulting in Version 2.0 Plus.

NMRipMap has also been integrated into the New Mexico Conservation Information System (NM-CIS), which was developed by NHNM in collaboration with state and federal agencies. As part of the NM-CIS, NMRipMap is linked to other applications that include the NM State Wildlife Action Plan (SWAP), New Mexico Environmental Review Tool (ERT), New Mexico Crucial Habitat Assessment Tool (NMCHAT), and Riparian Conservation Opportunity Areas. It is also a core spatial resource in U.S. Forest Service riparian planning and management activities.

[1] Natural Heritage New Mexico, Museum of Southwestern Biology, University of New Mexico
[2] U.S. Forest Service, Region 3, Albuquerque NM
[3] NMRipMap was funded by the New Mexico Department of Game and Fish (NMDGF), U.S. Forest Service (USFS) Region 3, and the University of New Mexico (Natural Heritage New Mexico, Museum of Southwestern Biology).

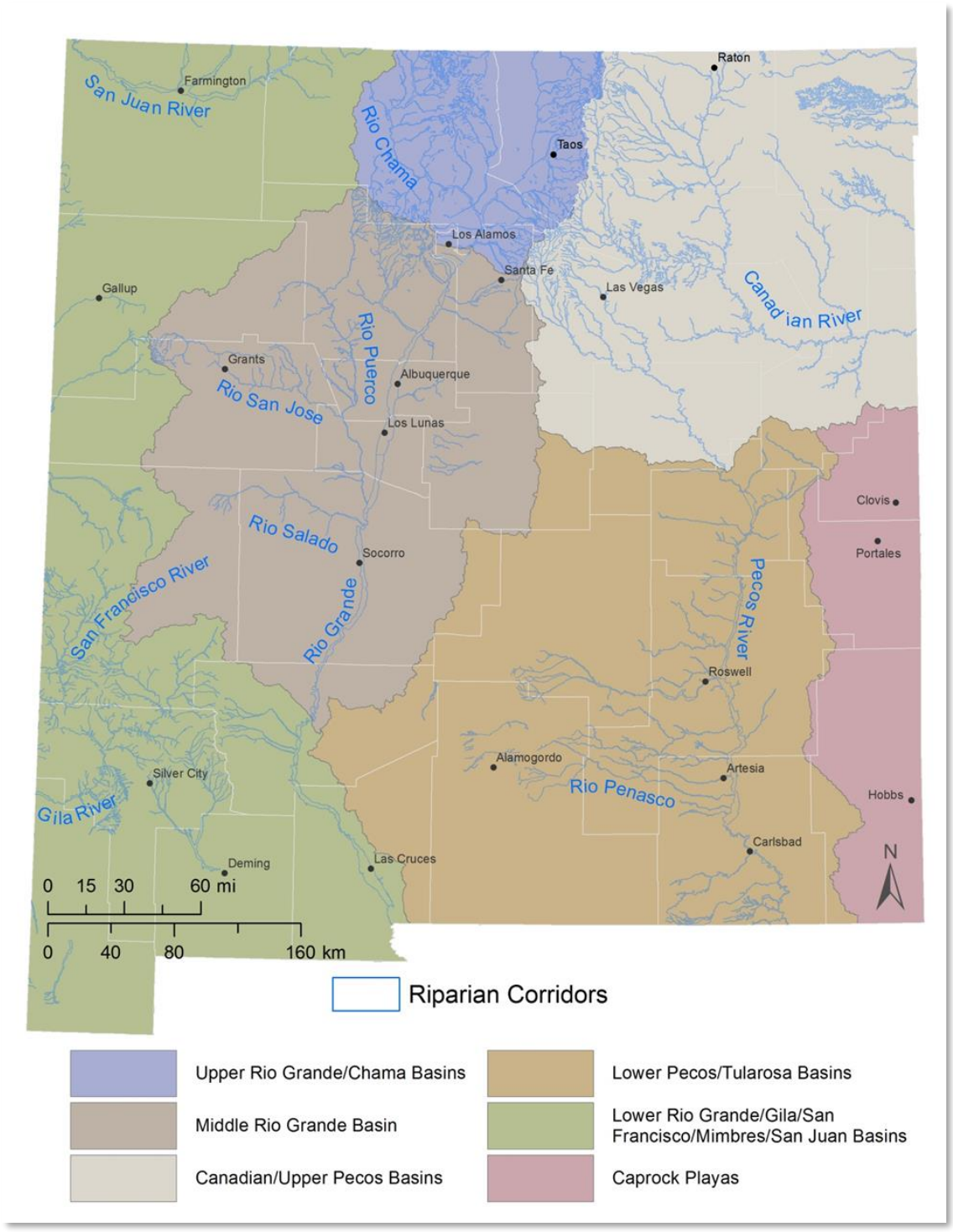

Figure 1. New Mexico Riparian Habitat Map project basins that were mapped progressively between 2017 and 2023. Work started in the Upper Rio Grande and then progressed through the Middle Rio Grande, the Canadian and Upper Pecos watersheds, the Gila, Mimbres, Lower Rio Grande below Elephant Butte reservoir and the San Juan watersheds, and finally the lower Pecos River basin. The Caprock Playas were not mapped for this project.

Mapping Domain

For the mapping domain, we created a New Mexico Riparian Corridor Map that includes all perennial river and streams along with intermittent stretches that connect the perennial reaches to create continuous riparian corridors in all basins (see Figure 1). The corridor covers the full floodplain extent along all perennial streams regardless of current land use. The corridor therefore includes not only the remaining natural riparian areas and associated wetlands, but also agricultural and urban areas that were located in the historic floodplain (ancient terraces clearly out of the current and historic floodplains were excluded).

The corridor map was developed using the National Hydrology Dataset (NHD), the USFS Riparian Buffer Delineation Model V3.0 (Abood and Maclean 2012), soils maps from NRCS (2017), digital elevation models (10-m DEMs), and aerial photo interpretation. Within U.S. Forest Service areas, the corridor is defined by the USFS RMAP boundary developed from the Terrestrial Ecosystem Unit Inventory (TEUI) maps with modifications to maximize riparian connectivity (Triepke et al. 2015). That is, because riparian habitat connectivity is important for wildlife, segments with intermittent or ephemeral stream flow were included that connected perennial reaches. Being structured in this way allows the map to be used in a wide variety of applications that involve the entire riparian landscape, current and historic, e.g., conservation and restoration planning across the entire floodplain, wetland status assessments, and wildlife management initiatives, among others. The corridor can be downloaded as a separate layer from the NHNM website.

NMRipMap Legend

NMRipMap has a three-tiered legend to help support applications at different thematic scales from the general to the detailed (Table 1 and Appendix 1 – Annotated Legend). While there is not necessarily a one-to-one relationship, the hierarchy and map units are informed by the New Mexico Riparian Vegetation Classification developed by NHNM, which is based on extensive field data and analysis, and meets the U.S. National Vegetation Classification (USNVC) standard Ver. 2.0[4]. Where appropriate, we have cross-walked USNVC classification elements to map units with links to their descriptions at USNVC.org that provide additional detail on vegetation composition (Figure 3). Of particular interest is the Macrogroup level of the USNVC, which corresponds to the Habitats in the State Wildlife Action Plan where you can find addition information on Species of Greatest Conservation Need (SGCN) by habitat (Figure 4).

[4] https://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/NVCS_V2_FINAL_2008-02.pdf

Legend Structure

Level 1. General vegetation types characterized by major lifeforms and strata—forests and woodlands, shrublands, and herbaceous vegetation—plus a category of non-vegetated miscellaneous lands types.

Forests and woodlands: polygons dominated by stands of closed-canopied forest or open-canopied woodlands that are generally taller than 5 m (some stands are dominated by short-statured species such as junipers that are <5 m). Shrub patches or herbaceous vegetation may be present under trees and in openings.

Shrublands: polygons dominated by dense to open stands of woody shrubs between 0.5 and 5 m in height. Small young trees may be present along with scattered patches of individual mature trees or open areas dominated by herbaceous vegetation.

Herbaceous Vegetation: polygons dominated by stands of grass-like species (graminoids) and/or forbs. Small, young trees and shrubs may be present as scattered patches or individuals. Some open areas may be predominantly bare ground.

Miscellaneous Land Types: various built-up land types not directly associated with natural vegetation.

Level 2. Mid-level units with broad categories of elevation zones (Montane > 6,500 ft and Lowland ≤ 6,500 ft), native versus non-native woody species; natural and semi-natural vegetation, and riparian versus upland vegetation, and specific elements of Miscellaneous Land Types (e.g., roads, built-up areas, agriculture, etc.).

Level 3. Fine-scale units that reflect leaf retention (Deciduous versus Evergreen); specific species compositions based on origin (e.g., native species, Russian olive, or Tamarisk), or site characteristics (wet, dry, or alkaline). Each Level 3 unit is cross-referenced to NMSWAP habitats and the U.S. National Vegetation Classification (USNVC) Macrogroups, Groups, and Alliances that reflect specific species composition, environments, and ecology. See the New Mexico Riparian Habitat Map Annotated Legend in Appendix 2 for the links to the SWAP and USNVC classes.

On occasion, we used modifiers that provide supplemental information on composition, context, or conditions for a specific polygon. These are defined in Table 2.

Table 1. New Mexico Riparian Habitat Map legend [Version 2.0 Plus]. There are three levels to the legend in order of increasing specificity. MU_ID refers to the map unit code assigned for level 3 in the digital spatial data layers along with the level codes (to the left). Detailed descriptions with photos, rules separating units, and links to the New Mexico State Wildlife Action Plan Habitats and the U.S. National Vegetation Classification are provided in the Annotated legend (Appendix 1).

New Mexico Riparian Habitat Map Legend Version 2.0 Plus

Level Codes and Names			L3 MU ID
I	FOREST and WOODLAND		
IA	Montane Riparian Forest and Woodlands		
	IA1	Montane Native Evergreen Riparian Forest	12
	IA2	Montane Native Evergreen-Deciduous Riparian Forest	23
	IA3	Montane Native Deciduous Riparian Forest	11
IB	Lowland Riparian Forest and Woodlands		
	IB1	Western Lowland Native Deciduous Riparian Forest	6
	IB2	Great Plains Lowland Native Deciduous Riparian Forest	36
	IB3	Lowland Native-Introduced Russian Olive Deciduous Riparian Forest	24
	IB4	Lowland Native-Introduced Tamarisk Deciduous Riparian Forest	25
	IB5	Lowland Native-Introduced Russian Olive - Tamarisk Deciduous Riparian Forest	42
	IB6	Lowland Native Evergreen Dry Riparian Forest	7
	IB7	Lowland Native Evergreen-Deciduous Riparian Forest	41
	IB8	Southwest Warm Desert Native Deciduous Riparian Forest	45
	IB9	Southwest Desert Native Dry Deciduous Riparian Woodland	50
IC	Lowland Introduced Riparian Woodland and Scrub		
	IC1	Russian Olive Introduced Riparian Woodland and Scrub	16
	IC2	Tamarisk Introduced Riparian Woodland and Scrub	15
	IC3	Russian Olive - Tamarisk Introduced Riparian Woodland and Scrub	26
	IC4	Mixed Introduced Forest and Scrub	27
ID	Upland Forest and Woodland		
	ID1	Upland Forest and Woodland	20
IE	Semi-Natural Riparian Woodland and Scrub		
	IE1	Semi-Natural Riparian Woodland and Scrub	34
II	SHRUBLAND		
IIA	Montane Riparian Shrubland		
	IIA1	Subalpine-Montane Riparian Shrubland	18
	IIA2	Montane Dry Riparian Shrubland	35
IIB	Lowland Riparian Shrubland		
	IIB1	Lowland Wet Riparian Shrubland	4
	IIB2	Lowland Dry Riparian Shrubland	3
	IIB3	Desert Alkaline-Saline Wet Shrubland	40
	IIB4	Lowland Mixed Native- Russian Olive Riparian Scrub	29
	IIB5	Lowland Mixed Native-Introduced Tamarisk Riparian Scrub	30
	IIB6	Lowland Mixed Native - Russian Olive - Tamarisk Riparian Woodland and Scrub	31
IIC	Upland Shrubland		
	IIC1	Upland Shrubland	28
III	HERBACEOUS VEGETATION		
IIIA	Montane Marshes and Wet Meadows		
	IIIA1	Subalpine and Montane Wetland	19
	IIIA2	Montane Wet Meadow	13
IIIB	Lowland Marshes and Wet Meadows		

		IIIB1	Western Lowland Marsh	5
		IIIB2	Great Plains Lowland Marsh	37
		IIIB3	Arid West Lowland Wet Meadow	9
		IIIB4	Great Plains Lowland Wet Meadow	38
	IIIC	Montane Dry Meadow and Grassland		
		IIIC1	Montane Dry Riparian Meadow and Grassland	10
	IIID	Lowland Dry Meadow and Grassland		
		IIID1	Western Lowland Salt Meadow and Dry Grassland	8
		IIID2	Great Plains Lowland Salt Meadow and Dry Grassland	39
	IIIE	Semi-natural Herbaceous Vegetation		
		IIIE1	Ruderal Forb Meadow	47
		IIIE2	Pasture Wetlands	48
	IIIF	Upland Grassland		
		IIIF1	Upland Grassland	32
IV	MISCELLANEOUS LAND TYPES			
	IVA	Bare Unvegetated		
		IVA1	Riparian Bare Ground/Rockland [non-channel]	2
	IVB	Water/Channel		
		IVB1	Open Channel Riverwash/Water/Non-vegetated Bars	22
	IVC	Agriculture		
		IVC1	Agriculture – Cultivated crops	1
		IVC2	Agriculture – Hay/Pasture	49
	IVD	Urban/Built-Up Areas		
		IVD1	Development/Disturbed Ground	21
	IVE	Roads		
		IVE1	Roads	14
	IVF	Upland Non-Veg		
		IVF1	Upland Bare Ground/Rockland	33

Table 2. Map unit modifiers assigned as needed to polygons of the New Mexico Riparian Habitat Map. MU_ID_mod refers to the attribute name in the geodatabase for the map.

Modifier	MU_ID_mod	Rules
Agriculture	1	This indicates a polygon that is imbedded in an agricultural setting, outside of the current floodplain.
Treatment/Disturbed	2	Assigned where there is high confidence that mapped polygons have evidence of either vegetation treatment (mechanically or by herbicide) or other disturbances such as fires or floods that have recently altered the site. Based on NAIP imagery used in a given mapping domain.
Russian olive	3	Assigned when considered a major inclusion in stands but usually <25% of the polygon area (may be more in Semi-natural woodland and scrub or Agriculture).
Tamarisk	4	Assigned when considered a major inclusion in stands but usually <25% of the polygon area (may be more in Semi-natural woodland and scrub or Agriculture).
Russian Olive-Tamarisk	5	Assigned when considered a major inclusion in stands but usually <25% of the polygon area (may be more in Semi-natural woodland and scrub or Agriculture).
Ditch Bank	6	This modifier was used to indicate Semi-Natural Riparian Woodland and Scrub growing along a ditch bank outside the current active floodplain or when stands of natural vegetation were growing along a ditch bank (levies) inside the floodplain.
Native Vegetation	7	Assigned to indicate >25% cover within stands classified as Semi-natural woodland and scrub or Agriculture, or as major inclusion in non-native-dominated polygons (i.e., Russian olive and/or tamarisk).
Mixed native-exotic	8	Used as a modifier to indicate >25% cover within stands classified as Semi-natural woodland and scrub or Agriculture.
Marsh/Wetland	9	Assigned when considered a major inclusion in stands but usually <25% of the polygon area (may be more in Semi-natural woodland and scrub or Agriculture).

Modifier	MU_ID_mod	Rules
Treatment/Disturbed field verified	10	Used to indicate stands that had been significantly modified by treatment, insects or fire after the image date of the mapping domain based on field data.
Dead Overstory	11	Used to indicate herbaceous stands with a dead overstory, which include cottonwoods, willows or other shrubs and trees with the exception of tamarisk.
Alkali Flat	13	Used to indicate Alkali flats, mostly in the lower Pecos area, that are also bare ground or grassland but not Alkali shrubland.
Burned 2022	22	Indicates area burned in the 2022 Hermits Peak/Calf Canyon fire. Applied opportunistically in areas where burn history from 2022 was known.
Fen	66	Used to indicate a high elevation herbaceous wetland that may also be a fen. This modifier was opportunistically added during heads-up quality control based on imagery and in most cases is not field verified.
Managed for Natural Habitat	34	Used on areas like Bosque Del Apache and Sevilletta NWR or other public lands (BOR, MRGCD, etc.) that are on the opposite side of levees from the river or otherwise hydrologically disconnected from the river but being managed for wildlife habitat or natural vegetation. The MU_ID (Level 3 Vegetation Type) is assigned based on composition and this modifier is added to indicate it is hydrologically separated from the current floodplain. These areas were identified based on public lands where management is known, or on large swaths of naturally established vegetation directly adjacent to levees that have not been converted to ag/urban. This applies only to riparian vegetation that is inside a managed land-use area. It does NOT apply to any riparian vegetation that is clearly within a developed area, or vegetation along ditch banks or within agricultural areas and old fields; those areas are mapped as “semi-natural woodland vegetation” (MU_ID: 34).

Modifier	MU_ID_mod	Rules
Dead Tamarisk Overstory	99	Used to indicate stands that have >90% dead tamarisk in them. Many tamarisk-dominated stands have died by chemical treatment and have changed in community type but still have the structure of the dead trees/shrubs in them.
Sporobolus wrightii	30	Used only in the Animas Creek in the bootheel of New Mexico to distinguish large stands dominated by *Sporobolus wrightii.*

SWAP Habitat
Rocky Mountain Montane Riparian Forest
NVC Name
Rocky Mountain & Great Basin Montane Riparian Forest (M034)
SWAP General Vegetation Type
RIPARIAN WOODLANDS and WETLANDS

Rocky Mountain Montane Riparian Forest [M034], mostly of the Southern Rocky Mountains, Arizona/New Mexico Mountains, and Colorado Plateaus ecoregions, consists of riparian and permanently saturated forests and woodlands dominated by either broadleaf deciduous trees, montane conifers, or a mix of the two. The typical broadleaf dominants are narrowleaf cottonwood (Populus angustifolia), lanceleaf cottonwood (P. acuminata), Arizona alder (Alnus oblongifolia), and boxelder (Acer negundo). Conifers are represented by upland species that have extended their distribution into the riparian zone and may include subalpine fir (Abies lasiocarpa), Engelmann spruce (Picea engelmannii), blue spruce (P. pungens), and ponderosa pine (Pinus ponderosa). The understories are typically shrubby and may include gray alder (Alnus incana), redosier dogwood (Cornus sericea), peachleaf willow (Salix amygdaloides), and Bebb willow (S. bebbiana). Herbaceous layers can be dominated by forbs or graminoids or be sparsely vegetated, depending on the amount of shading, soil moisture, and disturbance history. Representative herbaceous species include bluejoint (Calamagrostis canadensis), horsetails (Equisetum spp.), and arrowleaf ragwort (Senecio triangularis). Introduced forage species, such as creeping bentgrass (Agrostis stolonifera), Kentucky bluegrass (Poa pratensis), timothy (Phleum pratense), and smooth brome (Bromus inermis), can be abundant. This forest type is mostly comprised of montane to subalpine riparian communities occurring as narrow bands lining streambanks and alluvial terraces in narrow to wide, low gradient valley bottoms and on floodplains with sinuous stream channels. Beavers cut younger cottonwoods (Populus spp.) and willows (Salix spp.) and frequently dam side channels; hence, they are thought to be important to maintaining the hydrological regime for these communities in unconfined floodplains. Elevations range between 1,600 and 3,475 m (5,250-11,400 ft) and the habitat is commonly associated with Montane-Subalpine Wet Shrubland and Wet Meadow [M075].

Figure 2. An example of a New Mexico State Wildlife Action Plan habitat description that would be linked to the NMRipMap map unit “IA - Montane Riparian Forest and Woodlands” (nmswap.org). It is a New Mexico-specific summary of the description for the USNVC MacroGroup “Rocky Mountain-Great Basin Montane Riparian & Swamp Forest” found at USNVC.org (see Figure 4).

M034 *Picea engelmannii - Populus angustifolia / Cornus sericea* Riparian & Swamp Forest Macrogroup

Type Concept Sentence: This macrogroup consists of montane riparian and swamp forests and woodlands dominated by cottonwood trees, conifer trees, or a mix with such species as *Acer negundo, Alnus rhombifolia, Picea engelmannii, Picea pungens, Pinus contorta, Pinus ponderosa, Populus angustifolia*, and *Populus balsamifera*. It occurs throughout the Great Basin and Rocky Mountains.

Collapse All / Expand All

Overview »

Common (Translated Scientific) Name: Engelmann Spruce - Narrowleaf Cottonwood / Red-osier Dogwood Riparian & Swamp Forest Macrogroup
Colloquial Name: Rocky Mountain-Great Basin Montane Riparian & Swamp Forest
Hierarchy Level: Macrogroup
Type Concept: This macrogroup consists of riparian and permanently saturated forests and woodlands dominated by cottonwood trees conifer trees or a mix. Species typically seen are *Abies grandis, Abies lasiocarpa, Acer negundo, Alnus rhombifolia, Fraxinus latifolia, Juglans major, Juniperus scopulorum, Larix occidentalis, Picea engelmannii, Picea pungens, Pinus contorta, Pinus ponderosa, Populus angustifolia, Populus balsamifera*. Many other tree species may dominate. Stands usually have complex structure of tree shrub and herbaceous layers. Shrubs species include dryland to wetland obligate species and range from *Artemisia* spp. to *Salix* spp., and include *Alnus* spp., *Betula occidentalis*, and *Cornus sericea*. Herbaceous layers can be dominated by forbs, graminoids or be sparsely vegetated, depending on the amount of shading and soil moisture and disturbance history. Dominant herbaceous species include *Asarum caudatum, Athyrium filix-femina, Calamagrostis canadensis, Carex obnupta, Clintonia uniflora, Distichlis spicata, Equisetum* spp., *Gymnocarpium dryopteris, Leymus triticoides, Maianthemum stellatum, Senecio triangularis*, and *Thalictrum fendleri*. Introduced forage species such as *Agrostis stolonifera, Poa pratensis, Phleum pratense*, and *Bromus inermis* can be abundant. This macrogroup occupies interior mountains and valleys at elevations east of the Cascade Range and Sierra Nevada below alpine along streambanks, hillside seeps and floodplain soils that are seasonally wet via high water tables or surface flooding. This macrogroup occurs throughout the Great Basin and Rocky Mountains, from high mountains in New Mexico north into Alberta and British Columbia and from Colorado west to Idaho, Washington, Nevada and Oregon.
Diagnostic Characteristics: This macrogroup includes plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic waterbodies and springs/seeps. Facultative or wetland tree species are characteristic and include the cottonwoods, conifers and aspen woodlands that line streams or seeps. These are communities tolerant of periodic flooding and high water tables.

Figure 3. An example of a USNVC type summary description the Rocky Mountain-Great Basin Montane Riparian & Swamp Forest MacroGroup (M034) that would in turn be linked to the NMRipMap map unit "IA - Montane Riparian Forest and Woodlands..

Map development

NMRipMAP is a wall-to-wall polygon map within the riparian corridor and was developed basin-by-basin across multiple years from 2017 to 2023 (see Figure 1). The image base for the map was one-meter NAIP color and infrared aerial photography from 2016 through 2020 along with LiDAR imagery from 2015-20, which provides vegetation height and cover. The map was built using a combination of automated polygon construction using object-based eCognition software[5] followed by image classification of polygons using Random Forests (Breiman 2001). The classification of polygons was focused on the third level of the legend and was driven by large set of "training data" developed from ground vegetation survey data collected for the project as well as legacy plot data from the NHNM plot database (1,500+ plots). We also compiled ancillary environmental datasets such as soils, geology, landform, and topography to aid the modeling of environmental envelops of vegetation types to further constrain their distributions (e.g., elevation and geographic limits). The automated processes were followed up by photo-interpretive hands-on GIS editing for quality control of map unit assignment along with the addition of modifiers per Table 2.

In 2022-2023, using GIS analysis and photo interpretation, the map was fully updated across all basins to 2020 aerial photos and LiDAR imagery (some still lacked LiDAR coverage and were addressed by photo interpretation only). Where fires occurred between 2020 and 2022, we kept the original pre-fire map unit but added a modifier that indicated it may have been burned. We reviewed the entire map for classification errors with an emphasis on identifying difficult-to-classify classes such as mixed native/introduced stands, conformance of Level 1 structural assignments with the LiDAR height data; upgrading the mapping of semi-natural vegetation and high-elevation wetlands. Boundaries were adjusted and the New Mexico Riparian Corridor map was updated accordingly.

For each basin map, a suite of attributes on composition and structure were computed per Table 3. The maps outputted to ArcGIS geodatabases and geopackages and made available for download or viewing in an on-line viewer at https://nhnm.unm.edu/riparian/NMRipMap.

Map scale and applications

With respect to spatial scale, the minimum map unit polygon size is 2.5 acres (0.10 ha) and the operational scale is 1:6,000 or about 0.1 miles (0.15 km) to the inch (Figure 4). That is, while in a GIS the map can be zoomed into any scale, our target was 1:6,000 precision for general viewing and analysis. For site-level projects, we recommend higher-resolution mapping be done at the project level to improve the precision and accuracy for specific project purposes.

[5] http://www.ecognition.com/

At scales from 1:6000 and above, the thematic resolution may be more important, and accordingly, the maps are available in separate layers by level of the legend. An example of how thematic resolution shifts from Level 1 down to level 3 is shown in Figures 5-7. The overall objective has been to provide a versatile a map project for a variety needs from regional planning to local evaluations.

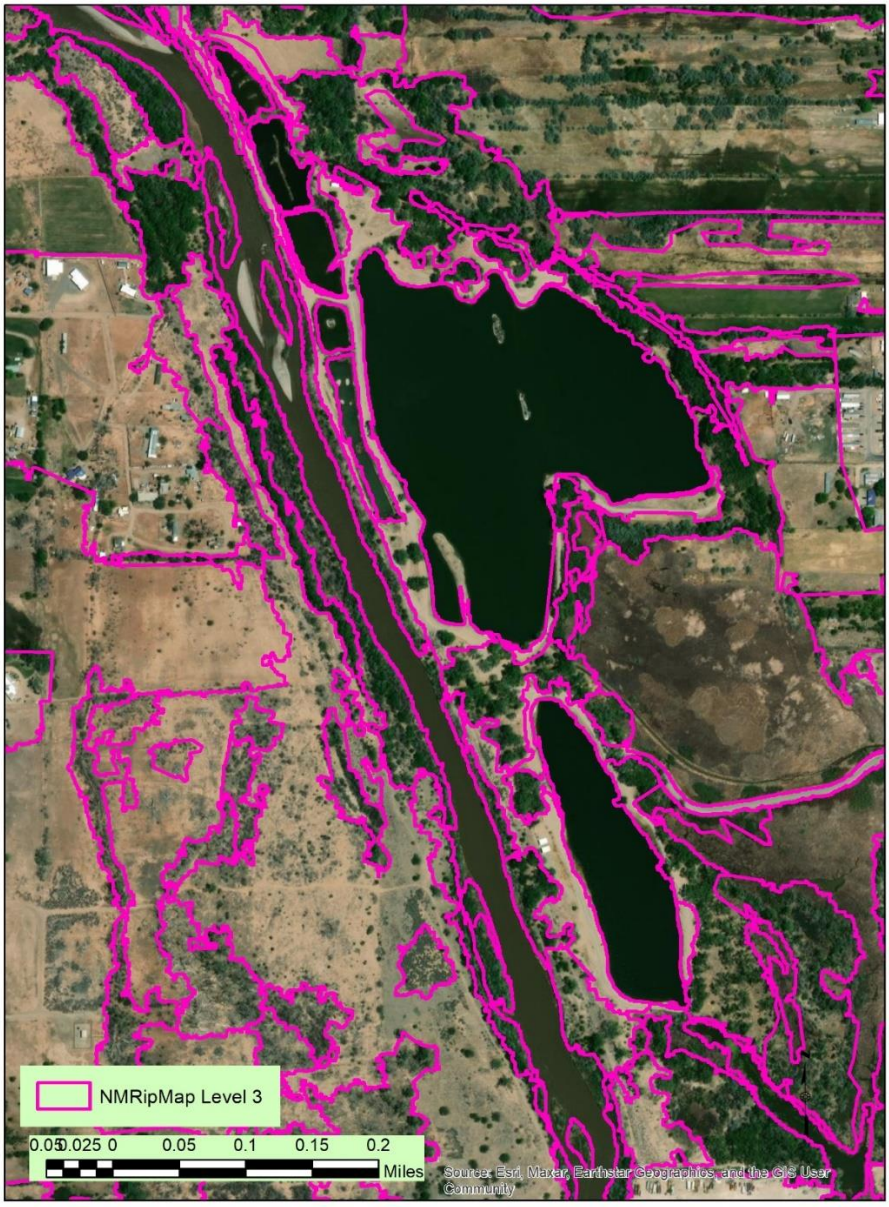

Figure 4. An example of the fine-scale NMRipMap polygon delineations at fine scale (approx. 1:6,000) where the minimum polygon size is 2.5 acres (0.10 ha). A view along the Rio Grande near Espanola, NM.

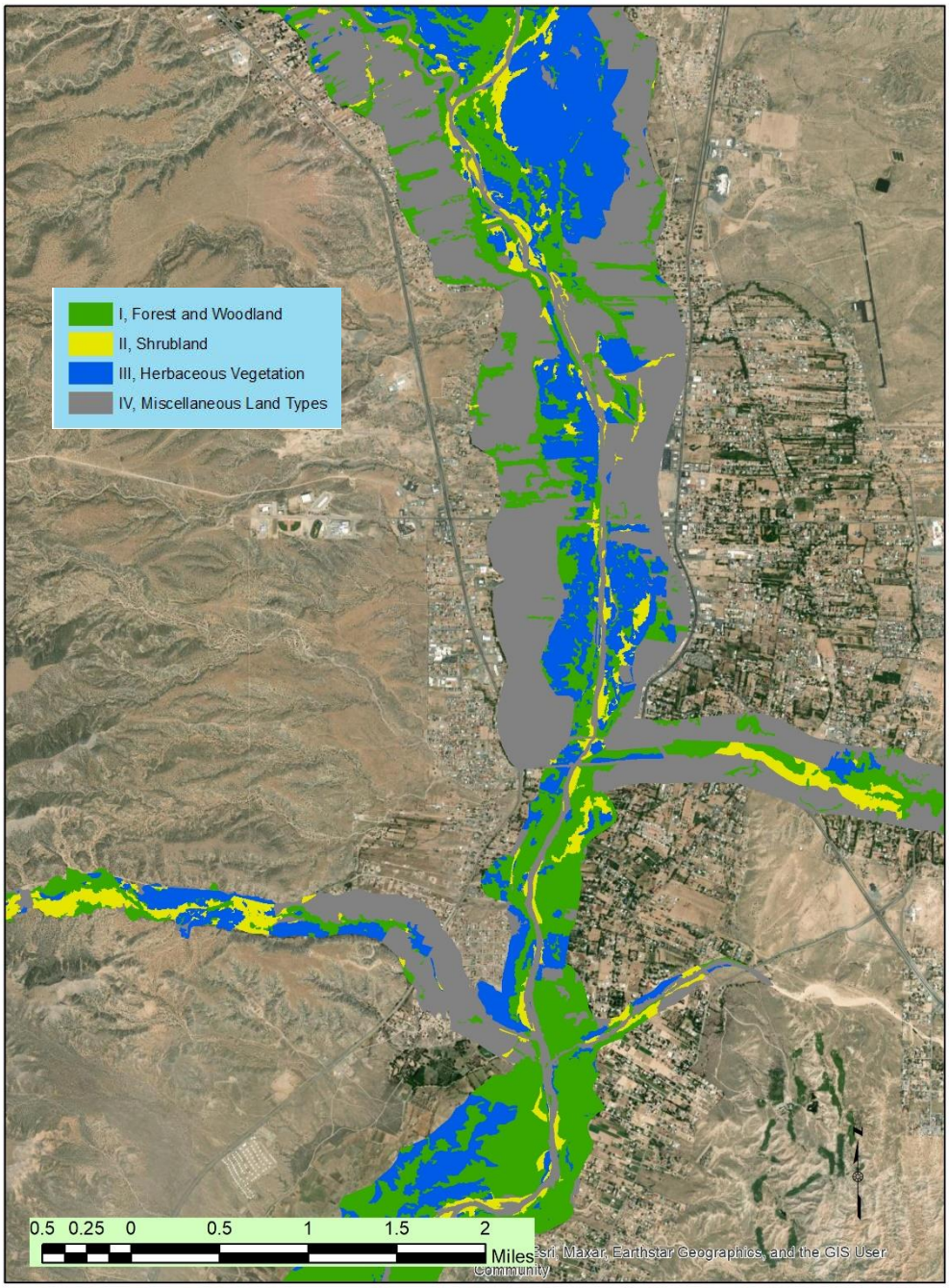

Figure 5. NMRipMap Level I map units at a relatively coarser resolution where the general pattern of vegetation is pronounced and useful, particularly for regional and sub-regional applications depending on their goals.

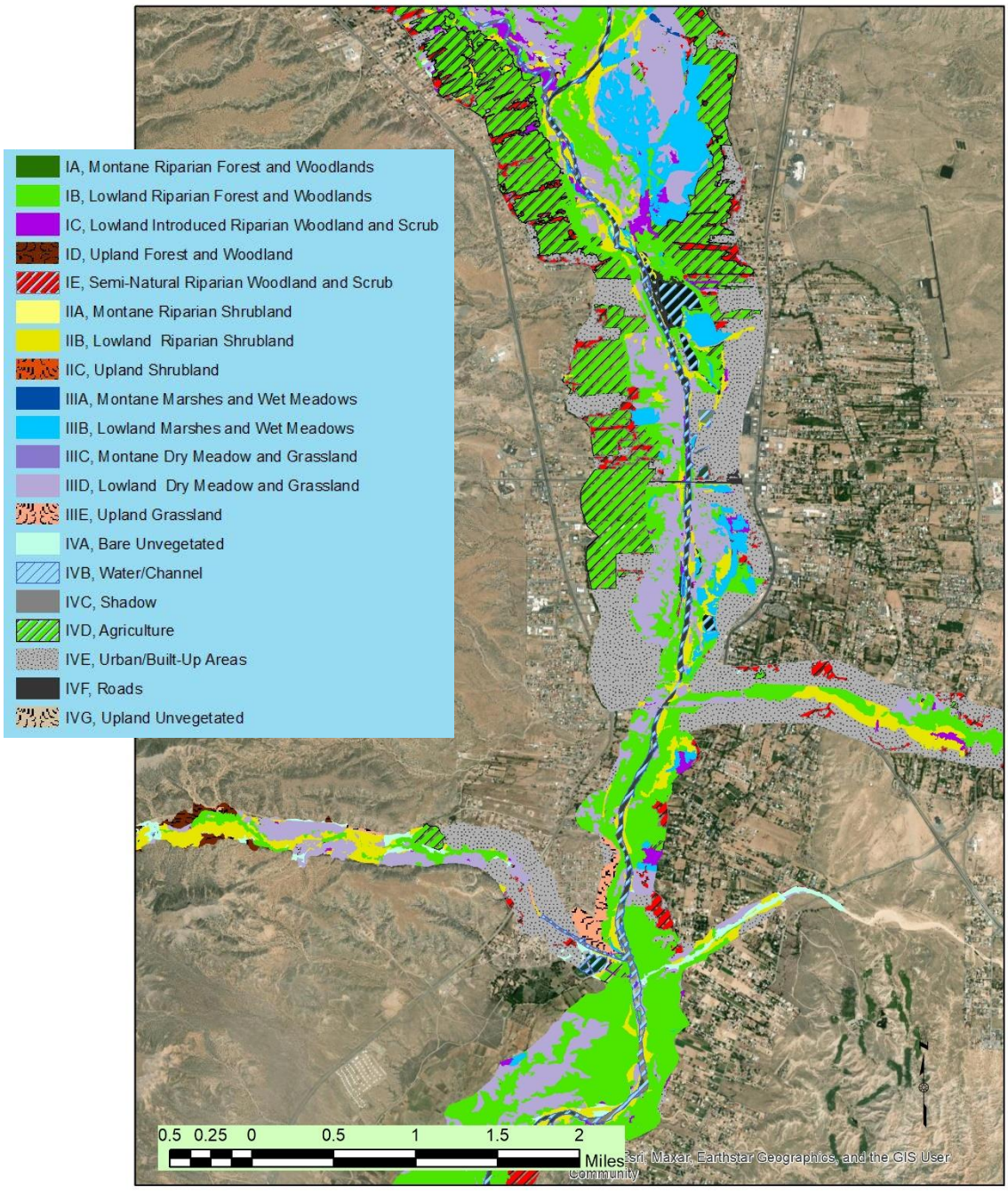

Figure 6. NMRipMap Level 2 map units even at coarser scales offer a fair amount of vegetation pattern that is still discernable and useful.

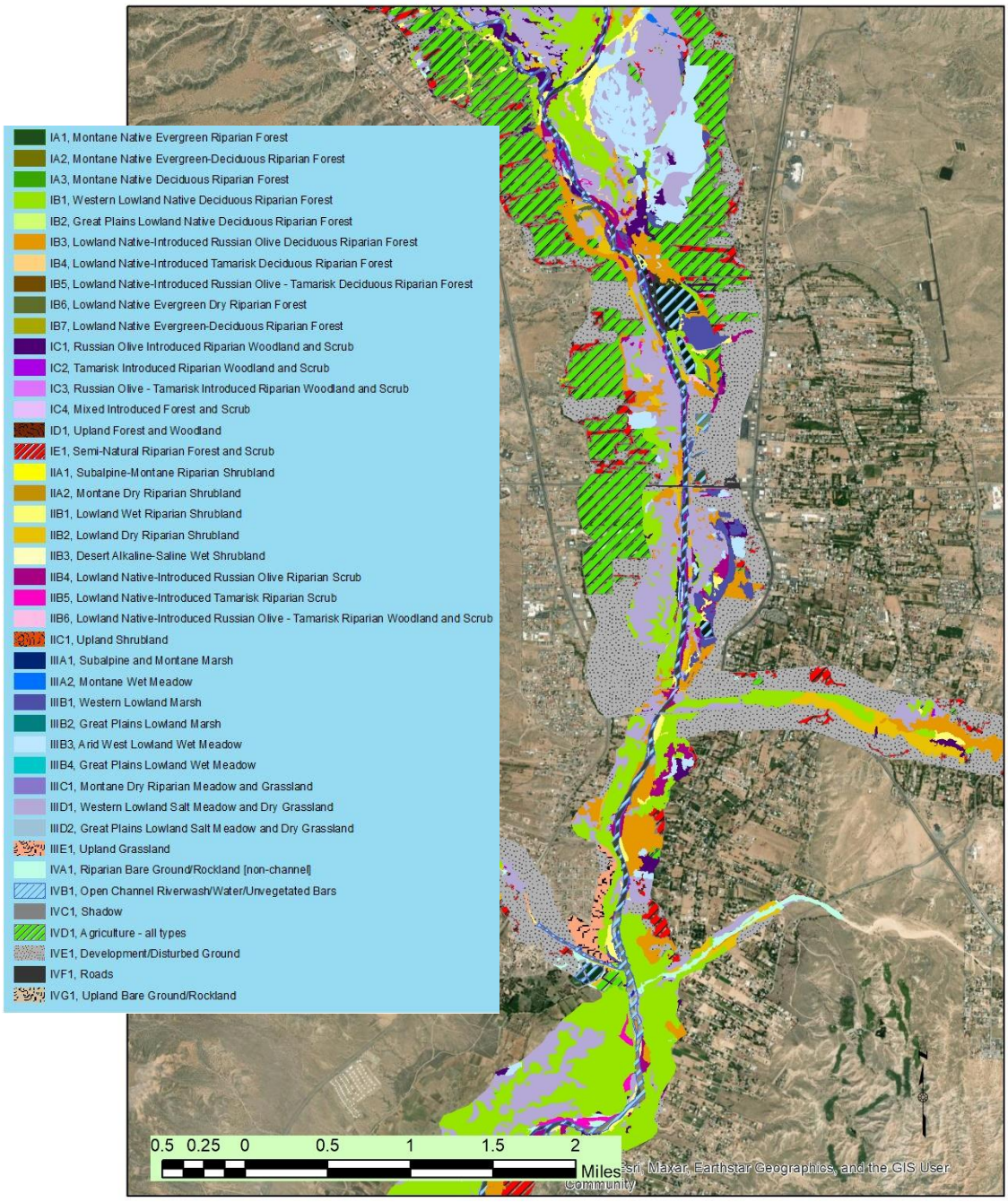

Figure 7. The use of NMRipMap Level 3 map units offer high detail that is most accessible at fine scales.

Acknowledgements

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References

Abood, S. and A. MacClean. 2012. Modeling & classifying riparian ecotones via GIS utilizing geophysical and vegetative inputs: a new approach. AWRA 2012 Summer Specialty Conference, Denver, CO.

Breiman, L. 2001. Random Forests. Machine Learning. 45 (1): 5–32.

NRCS. 2017. Web Soil Survey. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at https://websoilsurvey.nrcs.usda.gov/. Accessed 5/25/2017.

Planet Team. 2017. Planet Application Program Interface: In Space for Life on Earth. San Francisco, CA. https://api.planet.com.

Triepke, F.J., M.M. Wahlberg, D.C. Cress, and R.L. Benton. 2015. RMAP – Regional Riparian Mapping Project. USDA Forest Service project report available online <www.fs.usda.gov/main/r3/landmanagement/gis>. Southwestern Region, Albuquerque, NM. 53 pp.

USDA. 2016. National Agriculture Imagery Program (NAIP) aerial imagery. Available at https://gis.apfo.usda.gov/arcgis/rest/services.

Appendix 1

New Mexico Riparian Habitat Map (Version 2.0 Plus)

Annotated Legend

An annotated legend for the New Mexico Riparian Habitat Map follows with descriptions of each map unit that include a general concept statement, the rule set that defines the unit in terms of structure and composition, and a list of the main indicator species for each unit. In addition, there are links to the New Mexico State Wildlife Action Plan (SWAP) and the U.S. National Vegetation Classification (USNVC) that provide more details on the species composition and ecology of the vegetation communities included on the map unit. On occasion, modifiers to the map unit designation were added for a polygon to provide additional information on composition and status. A table of modifier definitions follows the main legend table.

The New Mexico Riparian Habitat Map Legend has three hierarchical levels:

Level 1. General vegetation types characterized by major lifeforms and strata—forest and woodlands, shrublands, and herbaceous vegetation— plus a category of non-vegetated Miscellaneous Land Types.

Forests and woodlands: polygons dominated by stands of closed-canopied forest or open-canopied woodlands (>10% canopy cover) that are generally taller than 5 m (some stands are dominated by short-statured species such as junipers that are < 5 m). Shrub patches or herbaceous vegetation may be present under trees and in openings.

Shrublands: polygons dominated by dense to open stands (> 25% canopy cover) of woody shrubs or sapling trees between 0.5 and 5 m. Scattered mature trees or small open areas dominated by herbaceous vegetation may be present.

Herbaceous Vegetation: polygons dominated by stands of grass-like species (graminoids) and/or forbs. Trees and shrubs may be present as scattered patches or individuals. Some open areas may be predominantly bare ground.

Level 2. Mid-level units with broad categories of elevation zones (Montane > 6,500 ft and Lowland <6,500 ft), native versus non-native woody species; natural and semi-natural vegetation, and riparian versus upland vegetation, and specific elements of Miscellaneous Land Types (e.g., roads, built-up areas, agriculture, etc.).

Level 3. Fine-scale units that reflect leaf retention (Deciduous versus Evergreen), specific species composition based on origin (native, Russian olive, or tamarisk), or site characteristics (wet, dry, or alkali).

I	**Forest & Woodland**	
	Tree-dominated communities (riparian and upland)	Tree canopy (> 5m tall) > 10% canopy cover
IA	**Montane Riparian Forest & Woodlands**	
	Forest and woodlands of mountain valley floodplains and canyons	Generally above 6,500 ft (1,980 m) elevation
IA1	**Montane Native Evergreen Riparian Forest**	**Map Unit ID** 12

Concept: Riparian forests dominated by evergreen conifer trees (blue spruce, Engelmann spruce, white fir, corkbark fir, Douglas-fir, and ponderosa pine). Deciduous shrubs such as thinleaf alder, Wood's rose, or redoiser dogwood can occur in the understory adjacent to the channel, or the understory can be herbaceous-dominated. Most commonly occurs in confined canyons in mountains throughout the state.

Rules: Conifers > 75% of the total tree canopy cover.

Indicator Species: Trees—*Abies concolor*, *Abies lasiocarpa* var. *arizonica*, *Picea engelmannii*, *Picea pungens*, *Pinus ponderosa*, and *Pseudotsuga menziesii*.

Other common species: Shrubs—*Alnus incana* ssp. *tenuifolia, Salix irrorata, Rosa woodsii, Cornus sericea* ssp. *sericea*.

Links:

NM SWAP: Rocky Mountain Montane Riparian Forest

USNVC Group: Rocky Mountain-Great Basin Montane Riparian & Swamp Forest (G506)

Figure 8. Montane Native Evergreen Riparian Forest along Manueles Creek near Ocate, NM.

IA2	Montane Native Evergreen-Deciduous Riparian Forest	Map Unit ID	23

Concept: Riparian forests dominated by both evergreen conifers (blue spruce, Engelmann spruce, white fir, corkbark fir Douglas-fir, and ponderosa pine) and deciduous trees (narrow-leaf cottonwood, and Arizona alder), with understories of deciduous shrubs (e.g., redosier dogwood, dewy-stem willow, thinleaf alder among others) and/or herbaceous species. Occurs primarily on floodplains in mountain valleys throughout the state.

Rules: Broadleaf deciduous trees >25% to <75% of the total tree canopy cover with evergreen trees >25% to <75% of the total tree canopy.

Indicator Species: Trees—*Abies concolor, Abies lasiocarpa* var. *arizonica, Picea engelmannii, Picea pungens, Pinus ponderosa, Pseudotsuga menziesii, Juniperus scopulorum, Acer negundo, Alnus oblongifolia,* and *Populus angustifolia.*

Other common species: Shrubs—*Cornus sericea, Salix irrorata, Salix exigua (lower elevations), and Alnus incana* ssp. *tenuifolia.*

Links:
NM SWAP: Rocky Mountain Montane Riparian Forest

USNVC Group: Rocky Mountain-Great Basin Montane Riparian & Swamp Forest (G506)

Figure 9. Montane Native Evergreen-Deciduous Riparian Forest along Rio Santa Barbara.

IA3	Montane Native Deciduous Riparian Forest	Map Unit ID	11

Concept: Riparian forests dominated by broad-leaved deciduous riparian trees (narrow-leaf cottonwood and Arizona alder), with understories of deciduous shrubs (e.g., dewystem willow, thinleaf alder) and/or herbaceous species. Occurs primarily on floodplains in mountain valleys throughout the state.

Rules: Broadleaf deciduous trees >75% of the total tree canopy cover; evergreen conifers subordinate or absent.

Indicator Species: Trees—*Populus angustifolia* and *Alnus oblongifolia* (southwest NM), at high elevations *Populus tremuloides*.

Other common species: Shrubs—*Cornus sericea, Salix irrota, Salix exigua (lower elevations), and Alnus incana ssp. tenuifolia*.

Links:
NM SWAP: Rocky Mountain Montane Riparian Forest

USNVC Group: Rocky Mountain-Great Basin Montane Riparian & Swamp Forest (G506)

Figure 10. Montane Native Deciduous Riparian Forest along Cabresto Creek in the northern Sangre de Cristo Mountains

IB	Lowland Riparian Forest & Woodlands	
	Gallery forest of lowland valley floodplains	Generally below 6,500 ft (1,980 m) elevation

IB1	Western Lowland Native Deciduous Riparian Forest	Map Unit ID	6

Concept: Gallery forests and woodlands dominated by Rio Grande cottonwood (and occasionally Fremont cottonwood). Stands can have other lowland riparian trees in the sub-canopy (e.g., Goodding's willow or peachleaf willow). Understories can be shrubby (coyote willow, New Mexico olive, or silver buffaloberry are common) or herbaceous-dominated (e.g., salt grass, scratchgrass). Occurs throughout New Mexico along lowland rivers except the northeastern Great Plains and southwestern Gila regions.

Rules: Native trees >75% of the total tree canopy cover.	
Indicator Species: Trees—*Populus deltoides* ssp. *wislizeni* (mostly in the Rio Grande valley), *Populus fremontii* (western NM), *Salix gooddingii,* and occasionally *Salix amygdaloides* (northern NM).	
Other common species: Shrubs—*Salix exigua, Forestiera pubescens* var. *pubescens,* and *Shepherdia argentea*. Forbs and grasses—*Distichlis spicata, Muhlenbergia asperifolia,* and *Anemopsis californica.*	
Links: **NM SWAP:** Southwest Riparian Forest **USNVC Group:** Western Interior Riparian Forest & Woodland (G797)	Figure 11. Western Lowland Native Deciduous Riparian Forest along the Rio Grande near Belen, NM.

IB2	Great Plains Lowland Native Deciduous Riparian Forest	Map Unit ID	36

Concept: Gallery forests and woodlands dominated by plains cottonwood with peach-leaf willow in the sub-canopy. Understories can be shrubby (coyote willow and willow baccharis) along with a wide variety of forbs and grasses. Occurs on the high plains of northeastern New Mexico extending out from the eastern flank of the Sangre de Cristo Mountains.

Rules: Native trees >75% of the total tree canopy cover.

Indicator Species: Trees—*Populus deltoides* ssp. *monilifera, Salix amygdaloides,* and *Acer negundo*

Other common species: Shrubs—*Salix exigua, Baccharis salicina.*

Links:
NM SWAP: Great Plains Floodplain Forest

USNVC Group: Great Plains Cottonwood - Green Ash Floodplain Forest (G147)

Figure 12. Great Plains Lowland Native Deciduous Riparian Forest along the left side bank of the Dry Clmmeron in northeastern New Mexico (Lowland Wet Riparian Shrubland dominated by coyote willow

IB3	Lowland Native-Introduced Russian Olive Deciduous Riparian Forest	Map Unit ID	24

Concept: Gallery forests dominated by a mix of native cottonwood in the overstory and introduced Russian olive in the sub-canopy primarily as a tall shrub and along the margins of the stands. Native shrubs such as New Mexico olive may still be common, and the grass and forb component can be diverse (dense-canopied stands tend to have sparse understories).

Rules: Native trees with > 25% to <75% of the total tree canopy cover, codominant with Russian olive as sub-canopy trees or shrubs with >25% to <75% of the total tree canopy cover.

Indicator Species: Trees—*Populus deltoides, Populus fremontii,* and *Elaeagnus angustifolia (I)*.

Other common species: Shrubs—*Salix exigua, Forestiera pubescens* var. *pubescens, Shepherdia argentea, Baccharis salicifolia,* and *Amorpha fruticosa.*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Western Interior Riparian Forest & Woodland (G797)

Figure 6. Lowland Native-Introduced Russian Olive Deciduous Riparian Forest along the Rio Grande south of Pilar in northern New Mexico.

IB4	Lowland Native-Introduced Tamarisk Deciduous Riparian Forest	Map Unit ID	25

Concept: Gallery forests dominated by a mix of native cottonwood in the overstory and introduced tamarisk in the understory as short trees or tall shrubs. Native shrubs may still be present (e.g., coyote willow and seepwillows), but overall plant diversity is often low. Stands are most prevalent along the lower, regulated reaches of rivers throughout the state.

Rules: Native trees with >25% to <75% of the total tree canopy cover codominant with tamarisk with >25% to <75% of total tree canopy cover.

Indicator Species: Trees—*Populus deltoides, Populus fremontii*. Shrubs—*Tamarix* spp. *(I)*.

Other common species: Shrubs—*Salix exigua* and *Baccharis salicina.*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Western Interior Riparian Forest & Woodland (G797)

Figure 7. Lowland Native-Introduced Tamarisk Deciduous Riparian Forest near San Acacia dam on the Middle Rio Grande.

IB5	Lowland Native-Introduced Russian Olive-Tamarisk Deciduous Riparian Forest	Map Unit ID	42

Concept: Gallery forests dominated by a mix of native cottonwood in the overstory and introduced tamarisk and Russian olive in the understory as short trees or tall shrubs. Native shrubs may still be present (e.g., coyote willow and seepwillows), but overall plant diversity is often low.

Rules: Native trees are codominant with Russian olive and tamarisk, all with >25% of the total tree canopy cover; tamarisk can occur as short trees or tall shrubs.

Indicator Species: Trees—*Populus deltoides, Populus fremontii, Elaeagnus angustifolia (I),* and *Tamarix* spp. *(I).*

Other common species: Shrubs—*Salix exigua* and *Baccharis salicifolia.*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Western Interior Riparian Forest & Woodland (G797)

Figure 8. Lowland Native-Introduced Russian Olive-Tamarisk Deciduous Riparian Forest near Bernalillo, New Mexico.

IB6	Lowland Native Evergreen Dry Riparian Forest	Map Unit ID	7

Concept: Woodlands dominated by upland junipers (oneseed and Rocky Mountain junipers) and pines (pinyon and ponderosa) on now dry floodplain terraces. These are open-canopied woodlands with grassy understories and scattered shrubs that are also commonly upland species. Sites typically occur along entrenched channels or at the back of the floodplain.

Rules: Junipers or pines dominate the tree canopy with at least 10% of total tree cover.

Indicator Species: Trees—*Juniperus monosperma, Juniperus scopulorum, Pinus edulis,* and *occasionally Pinus ponderosa.*

Other common species: Shrubs—*Rhus trilobata and Brickellia californica.* Grasses—*Bouteloua gracilis, Bouteloua curtipendula, and Sporobolus cryptandrus.*

Links:
NM SWAP: Southwest Riparian Forest

USNVC Group: Southern Rocky Mountain Juniper Open Woodland (G252)

Figure 9. Lowland Native Evergreen Dry Riparian Forest along the Rio del Oso in north-central New Mexico.

IB7	Lowland Native Evergreen-Deciduous Riparian Forest	Map Unit ID	41

Concept: Cottonwood, pine, and juniper woodlands of floodplain terraces, typically with grassy understories and scattered shrubs. Sites typically occur along entrenched channels or at the back of the floodplain.

Rules: Native trees (cottonwood) with >25% to <75% of the total tree canopy cover codominant with understory of junipers with >25% to <75% of total tree cover.

Indicator Species: Trees—*Populus deltoides, Populus fremontii, Juniperus monosperma,* and *Juniperus scopulorum.*

Other common species: Shrubs—*Rhus trilobata, Forestiera pubescens* var. *pubescens,* and *Brickellia californica.* Grasses—*Bouteloua gracilis, Bouteloua curtipendula,* and *Sporobolus cryptandrus.*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Western Interior Riparian Forest & Woodland (G797)

Figure 10. Lowland Native Evergreen-Deciduous Riparian Forest along the Canadian River in northeastern New Mexico.

IB8	Southwest Warm Desert Native Deciduous Riparian Forest	Map Unit ID	45

Concept: Gallery forests and woodlands dominated by a rich diversity of trees including Fremont cottonwood (and occasionally Rio Grande cottonwood), Arizona sycamore, Arizona walnut, velvet ash, and netleaf hackberry, among others. Common understory shrubs include seepwillow, coyote willow, and desert indigobush. It occurs along lowland rivers of southwest New Mexico (e.g., Gila, Mimbres, and San Francisco Rivers), extending into the lower Rio Grande south of Elephant Butte Reservoir.

Rules: Native trees >75% of the total tree canopy cover.

Indicator Species: Trees—*Populus fremontii, Platanus wrightii, Juglans major, Fraxinus velutina, Salix gooddingii,* and occasionally *Populus deltoides* ssp. *wislizeni.*

Other common species: Shrubs—*Baccharis salicifolia, Salix exigua,* and *Amorpha fruticosa.*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Western Interior Riparian Forest & Woodland (G797)

Figure 11. Southwest Warm Desert Native Deciduous Riparian Forest along the Mimbres River in southwestern New Mexico.

IB9	Southwest Desert Native Dry Deciduous Riparian Woodland	Map Unit ID	50

Concept: Woodlands on dry riparian terraces dominated by Arizona walnut, netleaf hackberry, honey mesquite, and occasionally Fremont cottonwood. Understories vary, but are often characterized by drier shrubs (e.g., California brickellbush, river walnut, and skunkbush sumac). It occurs along lowland rivers of southwest New Mexico (e.g., Gila, Mimbres, and San Francisco Rivers), extending into the lower Rio Grande, south of Elephant Butte Reservoir.

Rules: Native trees >75% of the total tree canopy cover.

Indicator Species: Trees—*Juglans major, Celtis laevigata* var. *reticulata, Prosopis glandulosa,* and occasionally *Populus fremontii*.

Other common species: Shrubs—*Brickellia californica, Juglans microcarpa,* and *Rhus trilobata*.

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Western Interior Riparian Forest & Woodland (G797)

Figure 12. Southwest Lowland Dry Deciduous Riparian Woodland dominated by netleaf hackberry along the Gila River in the Red Rock Wildlife Area near Lordsburg, NM.

IC	**Lowland Introduced Riparian Woodland and Scrub**		
	Woodlands and shrublands of lowland valley floodplains dominated by non-native woody species	Native Trees <25% of the total tree canopy cover; Stands generally below 6,500 ft (1,980 m) elevation	
IC1	**Russian Olive Introduced Riparian Woodland and Scrub**	**Map Unit ID**	**16**

Concept: Non-native Russian olive-dominated woodlands and scrub on lowland floodplains with grassy or shrubby understories. Remnant native shrubs may still be present (e.g., coyote willow, New Mexico olive). Some sites are relatively mesic with wetland herbaceous species such as horsetails and sedges. Others are drier and dominated by grasses (e.g., inland saltgrass and alkali muhly).

Rules: Native Trees <25% of the total tree canopy cover; Russian olive usually as a small tree or tall shrub.

Indicator Species: Trees—*Elaeagnus angustifolia (I).*

Other common species: Herbs—*Equisetum* spp.*, Distichlis spicata,* and *Muhlenbergia asperifolia.*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Interior West Ruderal Riparian Forest, Woodland & Scrub (G510)

Figure 13. Russian Olive Introduced Riparian Woodland and Scrub Rio Grande near Albuquerque, NM.

IC2	Tamarisk Introduced Riparian Woodland and Scrub	Map Unit ID	15

Concept: Non-native tamarisk-dominated woodlands and scrub on floodplains. Remnant native shrubs may still be present (e.g., coyote willow, New Mexico olive) and sites can by grassy with salt tolerant species (e.g., saltgrass, alkali muhly, and alkali sacaton), but more commonly stands are sparse and low in diversity.

Rules: Native Trees <25% and Russian olive < 25% of the total tree canopy cover.

Indicator Species: Trees—*Tamarix chinensis (I)* or *T. ramosissima (I).*

Other common species: Shrubs—*Salix exigua* and *Forestiera pubescens* var. *pubescens.* Grasses—*Distichlis spicata, Muhlenbergia asperifolia*, and *Sporobolus airoides.*

Links:
NM SWAP: Introduced Riparian Vegetation

USNVC Group: Interior West Ruderal Riparian Forest, Woodland & Scrub (G510)

Figure 14. Tamarisk Introduced Riparian Woodland and Scrub along the Rio San Jose in northwestern New Mexico.

IC3	Russian Olive-Tamarisk Introduced Riparian Woodland and Scrub	Map Unit ID	26

Concept: Non-native Russian olive and tamarisk are codominant in woodlands and scrub with shrubby, grassy, or sparse understories.

Rules: Native Trees <25% of the total tree canopy cover; Russian olive and tamarisk each >25% and < 75% of the total tree and tall shrub cover.

Indicator Species: *Elaeagnus angustifolia (I)* and *Tamarix chinensis (I) or T. ramosissima (I).*

Other common species: Shrubs—*Salix exigua* and *Forestiera pubescens* var. *pubescens.* Grasses—*Distichlis spicata, Muhlenbergia asperifolia*, and *Sporobolus airoides.*

Links:

NM SWAP: Introduced Riparian Vegetation

USNVC Group: Interior West Ruderal Riparian Forest, Woodland & Scrub (G510)

Figure 15. Russian Olive-Tamarisk Introduced Riparian Woodland and Scrub along the Rio Chama in north-central New Mexico.

IC4	Mixed Introduced Forest and Scrub	Map Unit ID	27

Concept: A mix of other non-native woody species are dominant (elm, tree of heaven, etc.) and can include Russian olive and tamarisk.

Rules: Native Trees <25% of the total tree canopy cover with non-native tree species >25% of the total tree cover and predominantly species other than Russian olive or tamarisk.

Indicator Species: *Ulmus pumila, Ailanthus altissima,* and *Morus alba.*

Other common species: Various ruderal herbs, e.g., *Marrubium vulgare (I), Ambrosia psilostachya,* and *Setaria viridis (I).*

Links:
NM SWAP: Introduced Riparian Vegetation

USNVC Group: Interior West Ruderal Riparian Forest, Woodland & Scrub (G510)

Figure 16. Mixed Introduced Forest and Scrub dominated by white mulberry (*Morus alba*) Rio Grande near Los Lunas, NM.

ID	Upland Forest and Woodland		
ID1	Upland Forest and Woodland	Map Unit ID	20

Concept: Adjacent upland, non-floodplain forest and woodlands.

Rules: Wetland/riparian species poorly represented or absent; upland dominant (e.g., conifers, aspen, oak, juniper).

Indicator Species: *Abies, Picea, Pinus, Juniperus, Pseudotsuga, Quercus,* and *Populus tremuloides.*

Other common species: Various upland species.

Links:

NM SWAP: N/A

USNVC Group: N/A

Figure 17. Upland Forest and Woodland occur along the upper slopes out of the riparian zone as shown here in the background along the Red River in northern New Mexico.

IE	**Semi-Natural Riparian Woodland and Scrub**	
	Relict and non-native woodland and shrublands outside core natural area riparian zones adjacent to channels	Excludes vegetation of relatively intact riparian and wetland natural areas along stream and river channels

IE1	**Semi-Natural Riparian Woodland and Scrub**	**Map Unit ID**	**34**

Concept: Relict woodlands and shrublands in agricultural and urban areas that are disconnected from the natural riparian corridor. Includes patches within agricultural fields, hedgerows, and stands along irrigation ditches. These are commonly dominated by a mix of native riparian species such cottonwoods along with non-native, often upland species such as Siberian elm. The understories also tend to be dominated by weedy (ruderal) species.

Rules: Includes herbaceous or barren irrigation ditches but excludes Built-Up Areas (IVE1); modifier if non-native tamarisk and Russian olive present.

Indicator Species: Trees—a mix of native riparian species (e.g., *Populus*) and non-native, often upland species (e.g., *Ulmus pumila*).

Other common species: Often includes native shrubs such as coyote willow (*Salix exigua*), along with non-native shrubs and various ruderal forbs and grasses.

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: Interior West Ruderal Riparian Forest, Woodland & Scrub (G510)

Figure 18. Semi-Natural Riparian Woodland and Scrub represented by Siberian Elms along a ditch in Albuquerque's north valley.

II	**Shrubland**			
	Shrubland dominated by shrubs and short trees (saplings and seedlings)	Shrubs (0.5-5 m tall) >25% canopy cover; trees (> 5m tall) < 10% canopy cover		
IIA	**Montane Riparian Shrubland**			
	Riparian shrublands of mountain valleys and canyons	Stands generally above 6,500 ft (1,980 m) elevation		
IIA1	**Subalpine-Montane Riparian Shrubland**		**Map Unit ID**	**18**

Concept: High-elevation shrublands dominated by thinleaf alder and willows (bluestem willow, Bebb willow, Drummond's willow, and strapleaf willow). Understories are mesic and can be rich and diverse in grasses and forbs including native and introduced species. Occurs along mountain streams and rivers throughout NM.

Rules: Native facultative-wet or obligate wetland shrubs with >75% of the total shrub canopy cover.

Indicator Species: *Alnus incana* ssp. *tenuifolia, Salix irrorata, Salix bebbiana, Salix drummondiana,* and *Salix ligulifolia.*

Other common species: Shrubs—*Rosa woodsii* and *Salix exigua.* Herbs—*Agrostis gigantea (I), Glyceria striata, Juncus arcticus* var. *balticus, Mentha arvensis,* and *Heracleum maximum.*

Links:

NM SWAP: Montane-Subalpine Wet Shrubland & Wet Meadow

USNVC Group: Western Montane-Subalpine Riparian & Seep Shrubland (G527)

Figure 19. Subalpine-Montane Riparian Shrubland along Polvadera Creek in north-central New Mexico.

IIA2	Montane Dry Riparian Shrubland	Map Unit ID	35

Concept: Shrublands dominated by mesic upland shrubs of mountain canyons; occurs on stream terraces or slopes immediately adjacent to stream channels in confined canyons.

Rules: Native facultative-wet or obligate wetland shrubs <25% of the total shrub canopy cover.

Indicator Species: *Rhus trilobata, Quercus gambelii, Ericameria* spp., and *Symphoricarpos* spp.

Other common species: N/A

Links:
NM SWAP: Rocky Mountain Montane Shrubland

USNVC Group: Southern Rocky Mountain Mixed Montane-Foothill Shrubland (G276)

Figure 20. Montane Dry Riparian Shrubland along the Rio Guadalupe in the Jemez Mountains.

IIB	**Lowland Riparian Shrubland**		
	Riparian shrublands of lowland valleys and canyons	Stands generally below 6,500 ft (1,980 m) elevation	
IIB1	**Lowland Wet Riparian Shrubland**	**Map Unit ID**	4

Concept: Shrubland dominated by native riparian shrubs (e.g., willow, seep willows) with typically mesic and diverse herbaceous understories with mix of native and introduced species. Among graminoids, Canada wildrye, redtop (I), Kentucky bluegrass (I), alkali sacaton, Baltic rush, and tall fescue (I) are the most common. Some stands on river bars can have sparse herbaceous cover. Stands occur on river bars and in back channels of lowland river floodplains throughout New Mexico.

Rules: Native facultative-wet or obligate wetland shrubs with >75% of the total shrub canopy; upland shrubs poorly represented or absent.

Indicator Species: Shrubs—*Salix exigua, Baccharis emoryi,* and *Baccharis salicifolia.*

Other common species: Graminoids—*Elymus canadensis, Agrostis gigantea, Poa pratensis, Sporobolus airoides, Juncus arcticus* var. *balticus*, and *Festuca arundinacea*

Links:

NM SWAP: Southwest Riparian Forest

USNVC Group: North American Warm Desert Riparian Low Bosque & Shrubland (G533)

Figure 21. Coyote willow shrub stand along the Rio Grande near Corrales, NM.

IIB2	Lowland Dry Riparian Shrubland	Map Unit ID	3

Concept: Shrublands of ephemeral desert washes (arroyo riparian) or dry river benches and terraces. Dominated by facultative and upland shrub species tolerant of occasional high-velocity stream flows. Common indicator shrubs are Apache plume, desert willow, rabbitbrush, and singlewhorl burrobrush. Also common are littleleaf sumac, brickellbush, sagebrush, and mesquite among others.

Rules: Native facultative-wet or obligate wetland shrubs >25% of the total shrub canopy cover; non-native shrubs <25% of the total shrub canopy cover.

Indicator Species: Shrubs—*Fallugia paradoxa, Chilopsis linearis, Ericameria nauseosa,* and *Hymenoclea monogyra*

Other common species: Shrubs— *Rhus microphylla, Brickellia laciniata, Artemisia tridentata*, and *Prosopis glandulosa.* Grasses—*Sporobolus airoides and Sporobolus wrightii.*

Links:
NM SWAP: Warm-Desert Arroyo Riparian Scrub

USNVC Group: Warm Semi-desert Dry Wash Shrubland (G541)

Figure 22. Lowland Dry Riparian Shrubland along the Rio Guadalupe in the Jemez Mountains of north-central New Mexico.

IIB3	Desert Alkaline-Saline Wet Shrubland	Map Unit ID	40

Concept: Shrublands of saline terraces of lowland river valleys and desert playas.

Rules: Dominated by native salt-tolerant facultative-wet or obligate wetland shrubs and scattered grasses and forbs.

Indicator Species: *Allenrolfea occidentalis, Suaeda moquinii, Atriplex* spp., *Salicornia* spp., and *Sarcobatus vermiculatus*

Other common species: Grasses—*Sporobolus wrightii, Sporobolus. airoides,* and *Distichlis spicata.*

Links:
NM SWAP: Warm & Cool Desert Alkali-Saline Wetland

USNVC Group: North American Desert Alkaline-Saline Wet Scrub (G537)

Figure 23. Desert Alkaline-Saline Wet Shrubland on White Sands National Monument in southern New Mexico.

IIB4	Lowland Mixed Native-Russian Olive Riparian Scrub	Map Unit ID	29

Concept: Mixed shrublands of native riparian shrubs (e.g., coyote willow, seep willow) and non-native Russian olive.

Rules: Native facultative-wet or obligate wetland shrub with >25% and <75% of the total shrub canopy cover and codominant with non-native Russian olive shrubs and trees.

Indicator Species: *Salix exigua, Baccharis emoryi, Baccharis salicifolia,* and *Elaeagnus angustifolia (I).*

Other common species: Miscellaneous herbs.

Links:
NM SWAP: Warm Desert Lowland Riparian Shrubland

USNVC Group: North American Warm Desert Riparian Low Bosque & Shrubland (G533)

Figure 24. Lowland Mixed Native-Russian Olive Riparian Scrub Rio Grande near Belen, NM,

IIB5	Lowland Mixed Native-Introduced Tamarisk Riparian Scrub	Map Unit ID	30

Concept: Mixed shrublands of native riparian shrubs (e.g., coyote willow, seep willow) and non-native tamarisk. Grasses can be well-represented to abundant.

Rules: Native facultative-wet or obligate wetland shrub with >25% and <75% of the total shrub canopy cover and codominant with non-native tamarisk shrubs and trees.

Indicator Species: *Salix exigua, Baccharis emoryi, Baccharis salicifolia,* and *Tamarix* spp. *(I).*

Other common species: Grasses—*Distichlis spicata* and *Sporobolus airoides,*

Links:
NM SWAP: Warm Desert Lowland Riparian Shrubland
USNVC Group: North American Warm Desert Riparian Low Bosque & Shrubland (G533)

Figure 25. Mixed coyote willow-tamarisk stand on the Rio San Jose in northwestern New Mexico.

IIB6	Lowland Mixed Native-Russian Olive-Tamarisk Riparian Woodland and Scrub	Map Unit ID	31

Concept: Mixed shrublands of native riparian shrubs (e.g., coyote willow, seep willow) and non-native tamarisk and Russian olive.

Rules: Native facultative-wet or obligate wetland shrubs are codominant with non-native tamarisk and Russian olive shrubs and trees, all with >25% of the total shrub cover.

Indicator Species: *Salix exigua, Baccharis emoryi, Baccharis salicifolia, Baccharis salicina, Elaeagnus angustifolia (I),* and *Tamarix* spp. *(I).*

Other common species: Grasses—*Distichlis spicata* and *Sporobolus airoides.*

Links:
NM SWAP: Warm Desert Lowland Riparian Shrubland
USNVC Group: North American Warm Desert Riparian Low Bosque & Shrubland (G533)

Figure 26. Mixed coyote willow-Russian olive-tamarisk shrub stand on Arroyo Chico in northwestern NM.

IIC	Upland Shrubland		
IIC1	Upland Shrubland	Map Unit ID	28

Concept: Adjacent upland, non-floodplain shrubland.

Rules: Obligate or facultative wetland shrubs poorly represented or absent.

Indicator Species: Various upland shrubs.

Other common species: A mix of upland forbs and grasses.

Links:

NM SWAP: N/A

USNVC Group: N/A

Figure 27. Upland shrubland along the Rio Pueblo de Taos in northern New Mexico.

III	**Herbaceous Vegetation**			
	Grassland and meadows dominated by herbaceous species (graminoids and forbs)	Shrubs (0.5-5 m tall) <25% canopy cover; trees (> 5m tall) < 10% canopy cover		
IIIA	**Montane Marshes and Wet Meadows**			
	Wetlands and wet meadows of mountain valleys	Generally above 6,500 ft (1,980 m) elevation		
IIIA1	**Subalpine and Montane Marsh**		**Map Unit ID**	**19**

Concept: Wetlands of mountain river valley bottoms commonly adjacent to river or stream channels or in slope wetlands.

Rules: Herbaceous facultative wet and obligate wetland species dominant.

Indicator Species: Graminoids—*Calamagrostis canadensis, Deschampsia cespitosa, Carex aquatilis, Carex nebrascensis, Carex utriculata,* and *Carex pellita.*

Other common species: Graminoids— *Agrostis gigantea (I)* and *Cinna latifolia.*

Links:

NM SWAP: Montane-Subalpine Wet Shrubland & Wet Meadow

USNVC Group: Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh (G521)

Figure 28. Subalpine and Montane Marsh on Valles Caldera National Preserve in northern New Mexico.

IIIA2	Montane Wet Meadow	Map Unit ID	13

Concept: Wet meadows of mountain river valleys, commonly occurring along the margins of the riparian zone or slope wetlands.

Rules: Herbaceous facultative and facultative-wet species dominant.

Indicator Species: *Juncus arcticus* var. *balticus, Poa pratensis (I),* and *Carex microptera.*

Other common species: Herbs—*Agrostis gigantea (I), Achillea millefolium,* and *Iris missouriensis.*

Links:
NM SWAP: Montane-Subalpine Wet Shrubland & Wet Meadow

USNVC Group: Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh (G521)

Figure 29. Montane Wet Meadow in Valle Vidal in north-central New Mexico.

IIIB	**Lowland Marshes and Wet Meadows**		
	Wetlands and wet meadows of lowland river valleys	Stands generally below 6,500 ft (1,980 m) elevation	
IIIB1	**Western Lowland Marsh**	**Map Unit ID**	5

Concept: Wetlands of lowland river valleys west of the Southern Great Plains region of northeastern New Mexico. Dominated by obligate wetland herbaceous species (e.g., sedges, flat sedges, spike rushes, threesquare, and monkey flowers). Commonly found adjacent to rivers, in back channels or other depressions in the floodplain, or as slope wetlands.

Rules: Obligate and facultative-wet species with western U.S. affinities dominant.

Indicator Species: Graminoids—*Schoenoplectus pungens, Eleocharis palustris, Carex pellita, Carex emoryi, and Cyperus* spp. Forbs—*Typha* spp.

Other common species: Graminoids—*Juncus arcticus* var. *balticus.* Forbs—*Mimulus* spp.

Links:

NM SWAP: Arid West Interior Freshwater Emergent Marsh

USNVC Group: Arid West Interior Freshwater Marsh (G531)

Figure 30. Western Lowland Marsh along Crystal Creek in northwestern NM.

IIIB2	Great Plains Lowland Marsh	Map Unit ID	37

Concept: Wetlands of lowland river valleys of the Southern Great Plains region of northeastern New Mexico. Dominated by obligate wetland herbaceous species (e.g., sedges, and spike rushes). Commonly found adjacent to rivers, in back channels or other depressions in the floodplain, or as slope wetlands.

Rules: Dominated by obligate and facultative-wet species with Great Plains U.S. affinities dominant.

Indicator Species: Graminoids—*Schoenoplectus americanus, Eleocharis palustris, Carex pellita,* and *Carex nebrascensis.* Forbs—*Typha* spp.

Other common species: Graminoids—*Juncus arcticus* var. *balticus.*

Links:
NM SWAP: Great Plains Wet Meadow, Marsh & Playa

USNVC Group: Great Plains Freshwater Marsh (G325)

Figure 31. Great Plains Lowland Marsh along Ponil Creek in northeastern New Mexico.

IIIB3	Arid West Lowland Wet Meadow	Map Unit ID	9

Concept: Wet meadows of lowland river valleys of New Mexico except the northeast Southern Great Plains region. Dominated by facultative wetland herbaceous species (e.g., mesic forbs and grasses). Commonly found adjacent to rivers or in other mesic parts of the floodplain.

Rules: Facultative-wet and facultative species with western U.S. affinities dominant.

Indicator Species: Grasses—*Muhlenbergia asperifolia Panicum obtusum*, *Juncus arcticus* var. *balticus, Cynodon dactylon (I),* and *Festuca arundinacea (I).* Forbs—*Anemopsis californica*.

Other common species: Often a rich mix of grasses and fobs including *Distichlis spicata* and *Sporobolus airoides.*

Links:
NM SWAP: Arid West Interior Freshwater Emergent Marsh

USNVC Group: North American Desert Alkaline-Saline Marsh & Playa (G538)

Figure 32. Arid West Lowland Wet Meadow along the Rio Grande in the Albuquerque reach.

IIIB4	Great Plains Lowland Wet Meadow	Map Unit ID	38

Concept: Wet meadows of lowland river valleys of the Southern Great Plains region of northeastern New Mexico.

Rules: Facultative-wet and facultative species with Great Plains U.S. affinities dominant.

Indicator Species: Grasses—*Pascopyrum smithii, Juncus arcticus* var. *balticus, Panicum obtusum,* and *Festuca arundinacea (I).*

Other common species: Often a rich mix of grasses and fobs including *Distichlis spicata* and *Sporobolus airoides*..

Links:

NM SWAP: Great Plains Wet Meadow, Marsh & Playa

USNVC Group: Great Plains Wet Prairie, Wet Meadow & Seepage Fen (G336)

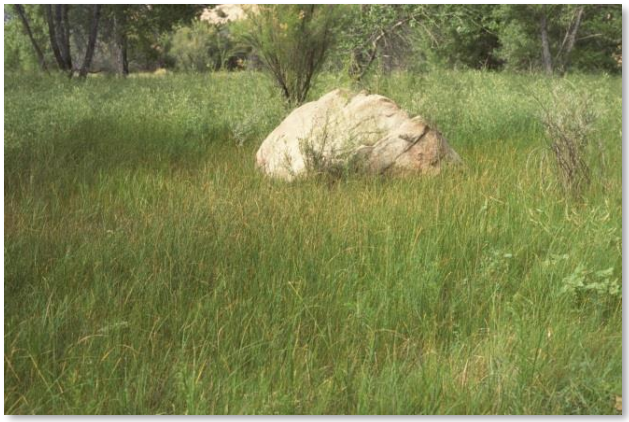

Figure 33. Great Plains Lowland Wet Meadow along the Canadian River in Mills Canyon in northeastern New Mexico.

IIIC	**Montane Dry Meadow and Grassland**		
	Dry grasslands and meadows of montane valleys	Stands generally above 6,500 ft (1,980 m) elevation	
IIIC1	**Montane Dry Riparian Meadow and Grassland**	**Map Unit ID**	**10**

Concept: Dry grasslands and meadows within the riparian corridor of mountain valleys.

Rules: Facultative and upland grasses and forbs dominant; inclusions of facultative-wet species.

Indicator Species: Grasses and forbs—*Festuca idahoensis, Potentilla hippiana,* and *Achillea millefolium.*

Other common species: A mix of facultative-upland and upland forbs and grasses.

Links:

NM SWAP: Rocky Mountain Subalpine-High Montane Meadow

USNVC Group: Southern Rocky Mountain Montane-Subalpine Grassland (G268)

Figure 34. Montane Dry Riparian Meadow and Grassland along the east fork of the Rio Brazos in north-central New Mexico.

IIID	**Lowland Dry Meadow and Grassland**		
	Dry grasslands and meadows of lowland river valleys	Stands Generally below 6,500 ft (1,980 m) elevation	
IIID1	**Western Lowland Salt Meadow and Dry Grassland**	**Map Unit ID**	**8**

Concept: Saltgrass meadows and dry grasslands of lowland river valleys except in the Southern Great Plains region of northeastern New Mexico.

Rules: Facultative and upland grasses dominant; inclusions of facultative-wet species.

Indicator Species: Grasses—*Distichlis spicata* and *Sporobolus airoides.*

Other common species: A mix of facultative-upland and upland forbs and grasses.

Links:

NM SWAP: Warm & Cool Desert Alkali-Saline Wetland

USNVC Group: North American Desert Alkaline-Saline Marsh & Playa (G538)

Figure 35. Western Lowland Salt Meadow and Dry Grassland along the Pecos River at Bitter Lakes National Wildlife Refuge near Roswell, NM.

IIID2	Great Plains Lowland Salt Meadow and Dry Grassland	Map Unit ID	39

Concept: Saltgrass meadows and dry grasslands of lowland river valleys of the Southern Great Plains region of northeastern New Mexico.

Rules: Facultative and upland grasses dominant; inclusions of facultative-wet species.

Indicator Species: Grasses—*Distichlis spicata, Hordeum jubatum, Sporobolus airoides.*

Other common species: A mix of facultative-upland and upland forbs and grasses.

Links:
NM SWAP: Great Plains Wet Meadow, Marsh & Playa

USNVC Group: Great Plains Saline Wet Meadow & Marsh (G324)

Figure 36. Great Plains Lowland Salt Meadow and Dry Grassland occurs on higher terraces along streams as seen here along Wolf Creek in northeastern New Mexico.

IIIE	Semi-Natural Herbaceous Vegetation		
IIIE1	Ruderal Herbaceous Meadow	Map Unit ID	47

Concept: Strongly dominated by non-native or sometimes generalist native forb species in areas of past or present disturbance—post fire and restoration.

Rules: Non-native and weedy native forb species dominant over inclusions of other native riparian species.

Indicator Species: Forbs—*Bassia scoparia, Salsola spp., Carduus nutans, Cirsium arvense, Chenopodium album, Suaeda nigra, and Xanthium strumarium*.

Other common species: Sometimes grasses such as *Echinochloa crus-galli, Cynodon dactylon,* and *Bromus tectorum* are common

Links:

NM SWAP: Introduced Riparian Vegetation

USNVC Group: Western North American Ruderal Marsh, Wet Meadow & Shrubland (M301)

Figure 37. Ruderal Forb Meadow dominated by *Bassia scoparia* at a burn site along the Rio Grande in Belen, NM.

IIIE2	Pasture Wetlands	Map Unit ID	48

Concept: Wetland patches within pastures, or pasture areas that are predominantly wetland.

Rules: Wetlands (including springs or saturated soil areas) within pastures that are separated from the active floodplain and likely have significant disturbance due to grazing or mowing. They are dominated by wetland obligate species and are usually fenced.

Indicator Species: Graminoids—*Schoenoplectus americanus, Eleocharis palustris, Carex pellita,* and *Carex nebrascensis.* Forbs –*Typha* spp.*and Dipsacus fullonum (I).*

Other common species: N/A

Links:
NM SWAP: N/A

USNVC Group: Anthropomorphic Vegetation Cultural Class (CCL01)

Figure 38. Pasture wetland along the Rio Hondo in northern New Mexico.

IIIF	Upland Grassland		
IIIF1	Upland Grassland	Map Unit ID	32

Concept: Upland slope grassland.

Rules: Dominated by upland grass species; obligate or facultative-wet wetland herbaceous species poorly represented or absent.

Indicator Species: N/A

Other common species: N/A

Links:

NM SWAP: N/A

USNVC Group: N/A

Figure 39. Upland Grassland outside the floodplain and on the slope leading to the forest edge along Placer Creek in northern New Mexico.

IV	Miscellaneous Land Types		
IVA	Bare Unvegetated		
IVA1	Riparian Bare Ground/Rockland [non-channel]	Map Unit ID	2

Concept: Bare ground and rock-land outside river channels.

Rules: Exposed, naturally non-vegetated within the floodplain. Excludes water and exposed soils of channels (see IVB1; MU 22) and heavily disturbed ground or developed areas (see IVE; MU21).

Indicator Species: N/A

Other common species: N/A

Links:

NM SWAP: N/A

USNVC Group: N/A

Figure 40. Riparian Bare Ground/Rockland [non-channel] along the San Juan River in northwestern New Mexico.

IVB	Water/Channel		
IVB1	Open Channel Riverwash/Water/Non-vegetated bars	Map Unit ID	22

Concept: Bare ground and water within river channels.

Rules: Includes water in channels, side channels and ponds along with mudflats, sandy shoals, boulder, cobble and gravel bar surfaces. Excludes non-channel Riparian Bare Ground/Rockland (see IVA; MU 2).

Indicator Species: N/A

Other common species: N/A

Links:
NM SWAP: N/A
USNVC Group: N/A

Figure 41. Open Channel Riverwash/Water/Non-vegetated bars in the Rio Grande near Belen, NM.

IVC	Agriculture		
IVC1	Agriculture—cultivated crops	Map Unit ID	1

Concept: Developed agricultural areas.

Rules: Active and fallow fields; orchards, vineyards.

Indicator Species: N/A

Other common species: N/A

Links:
NM SWAP: N/A
USNVC Group: Anthropomorphic Vegetation Cultural Class (CCL01)

Figure 42. Agriculture—all types along the Animas River near Aztec, NM.

IVC2	Agriculture – hay/pasture	Map Unit ID	49

Concept: Grassy pasture areas with intensive livestock use but without regular tilling.

Rules: These pasture areas are generally dominated by grasses and may have significant disturbance due to grazing. They are usually fenced, and many are also irrigated. Dominated by native facultative or facultative-wet grasses, non-native planted pastures grasses, or a mix of both.

Indicator Species: N/A

Other common species: N/A

Links:
NM SWAP: N/A
USNVC Group: Anthropomorphic Vegetation Cultural Class (CCL01)

Figure 43. Cattle pasture along the Rio Quemado in Chimayo, NM.

IVD	Urban/Built-Up Areas		
IVD1	Development/Disturbed ground	Map Unit ID	21

Concept: Built-up areas and human-disturbed ground.

Rules: Includes urban, exurban, mines, golf-courses, ski areas and agricultural facilities. Agricultural lands may be included when surrounded by other urban features.

Indicator Species: N/A

Other common species: N/A

Links:

NM SWAP: N/A

USNVC Group: N/A

Figure 44. Development/Disturbed ground adjacent to Rio Grande in Albuquerque, NM.

IVE	Roads		
IVE1	Roads	Map Unit ID	14

Concept: Roads and bridges.

Rules: Developed, graded roads or high-use two-tracks.

Indicator Species: N/A

Other common species: N/A

Links:

NM SWAP: N/A

USNVC Group: N/A

Figure 45. Roads including bridges like this crossing one the Canadian River in Mills Canyon in northeastern New Mexico.

IVF	Upland Non-Veg		
IVF1	Upland Bare Ground/Rockland	Map Unit ID	33

Concept: Natural area bare ground and rockland on upland slopes.

Rules: No detectable vegetation response.

Indicator Species: N/A

Other common species: N/A

Links:
NM SWAP: N/A
USNVC Group: N/A

Figure 46. Upland Bare Ground/Rockland along the Canadian River in Mills Canyon in northeastern New Mexico.

Appendix 2

New Mexico Riparian Habitat Map (NMRipMap) Attribute Table

Version 2.0 Plus

Table 1 provides a list of all attributes assigned to polygons in the New Mexico Riparian Habitat Map Version 2.0 Plus developed by the New Mexico Game and Fish Department and Natural Heritage New Mexico at the University of New Mexico. Field Name refers to the coded variable name in the GIS file for the map. Alias is the extended name for the Field Name and descriptions are provided for each field. See the NMRipMap Project Summary for details on map development.

Table A2.1. NMRipMap Version 2.0 Plus attributes

Field Name	Alias	Description
Map_Domain	Mapping Domain	Mapping domains of USFS (USDA US Forest Service and Geospatial Technology and Applications Center (GTAC)) versus NHNM (UNM Natural Heritage New Mexico and Missouri Resource Assessment Partnership (MoRAP))
MU_ID	Map Unit ID	GIS geodatabase Map Unit ID code linked to "L3_Code" for level 3 and lowest level of the map legend hierarchy
MU_ID_mod	Map Unit ID mod	GIS geodatabase Map Unit ID code modifiers
L1_Code	Level 1 Map Unit Code	Map legend hierarchy Level 1 Map Unit code; top level and most generalized
L1_Name	Level 1 Map Unit	Map legend hierarchy Level 1 Map Unit name; top level and most generalized
L2_Code	Level 2 Map Unit Code	Map legend hierarchy Level 2 Map Unit code; mid-level generalization
L2_Name	Level 2 Map Unit	Map legend hierarchy Level 2 Map Unit name; mid-level generalization
L3_Code	Level 3 Map Unit Code	Map legend hierarchy Level 3 Map Unit code ; Lowest level and greatest detail
L3_Name	Level 3 Map Unit	Map legend hierarchy Level 3 Map Unit name; Lowest level and greatest detail

Field Name	Alias	Description
SWAP_Habitat	SWAP Habitat	State Wildlife Action Plan habitat type
SWAP_url	SWAP URL	URL link for SWAP habitat type (text string)
Leaf_Reten	Leaf Retention	Dominant leaf retention class. Deciduous, Evergreen or Mixed Deciduous-Evergreen based on spectral image analysis and photo interpretation
Elevation	Elevation Subclass	Montane (usually above 6500ft/1980m) or Lowland (usually below 6500ft/1980m)
Elev_mean	Elevation (m)	Mean elevation in meters based on 10-m digital elevation model
Slope_mean	Mean Percent Slope	Mean percent slope based on 10-m digital elevation model
Tot_Herb_Cov	Total Herbaceous Cover	Percent canopy cover based on proportion of polygon pixels with LiDAR canopy height model values <0.5m; mostly herbaceous graminoids and forbs, prostrate shrubs, tree saplings, and bare ground; unavailable for non-LiDAR areas
Tot_Shrub_Cov	Total Shrub Cover	Percent canopy cover for all shrubs based on proportion of polygon pixels with LiDAR canopy height model values >= 0.5 and <5 (sum of Short_Shrub_Cov, Tall_Shrub_Cov, and Dwf_Shrub_Cov); mostly shrubs, small trees, and occasionally tall grass and forbs; unavailable for non-LiDAR areas
Tot_Tree_Cov	Total Tree Cover	Percent canopy cover for all trees based on proportion of polygon pixels with LiDAR canopy height model values >=5 m (sum of Med_Tree_Cov and Tall_Tree_Cov); unavailable for non-LiDAR areas
Med_Tree_Cov	Medium Tree Cover	Percent canopy cover based on proportion of polygon pixels with LiDAR canopy height model values >=5 and <12m; mostly medium-tall trees; unavailable for non-LiDAR areas
Tall_Tree_Cov	Tall Tree Cover	Percent canopy cover based on proportion of polygon pixels with LiDAR canopy height model values >12m; mostly tall trees; unavailable for non-LiDAR areas

Field Name	Alias	Description
Dwf_Shrub_Cov	Dwarf Shrub Cover	Percent canopy cover based on proportion of polygon pixels with LiDAR canopy height model values >=0.5 and <1 m; mostly short shrubs; unavailable for non-LiDAR areas
Short_Shrub_Cov	Short Shrub Cover	Percent canopy cover based on proportion of polygon pixels with LiDAR canopy height model values >=1 and <3 m; mostly shrubs; unavailable for non-LiDAR areas
Tall_Shrub_Cov	Tall Shrub Cover	Percent canopy cover based on proportion of polygon pixels with LiDAR canopy height model values >=3 and <5 m; mostly tall shrubs; unavailable for non-LiDAR areas
Woody_Cov	Woody Cover	Proportion; decimal percent) of polygon pixels with LiDAR canopy height model value =0.5 meter representing total tree and shrub cover; unavailable for non-LiDAR areas
Wdy_Ht_Mn	Average Woody Height	Mean LiDAR woody canopy height model for a polygon; excludes LiDAR values <=0.5 m; unavailable for non-LiDAR areas
Woody_CovCls	Total Woody Cover Class	Canopy cover class for total tree and shrub cover based on Woody Cover (Wdy_Cov) where: ”0) non-Tree-Shrub”, “1) 10-25%”, “2) 25-50%”, “3) 50-75%”, or “4) 75-100%”; unavailable for non LiDAR areas
Veg_SzCls	Average Vegetation Height Class	Average vegetation canopy height size class for a polygon based on the canopy height model values for all vegetation life-forms; includes bare ground where: Class: 1) 0-0.5 m, 2) 0.5-5 m, 3) 5-12 m, or 4) 12+ m; unavailable for non-LiDAR areas
NVC_Mg_Codes	NVC Macrogroup Code	National Vegetation Classification (usnvc.org) Macrogroup code
NVC_Mg	NVC Macrogroup Name	National Vegetation Classification (usnvc.org) Macrogroup name

Field Name	Alias	Description
NVC_Group_Codes	NVC Group Code	National Vegetation Classification (usnvc.org) Group code
NVC_Group	NVC Group Name	National Vegetation Classification (usnvc.org) Group name
NVC_Alliance_Codes	NVC Alliance Codes	National Vegetation Classification (usnvc.org) associated Alliances codes. The common names for these Alliance Codes can be looked up in the document "NVC_AllianceCodeCommonNames.pdf"