METADATA REPORT FOR 2022 MATHESON WETLAND AND VEGETATION MAPPING

by Peter Goodwin

A contract deliverable for Contract #231242 11/22/22 with The Nature Conservancy and Utah Division of Wildlife Resources

UTAH DNR GEOLOGICAL SURVEY

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Cover photo: Salt grass (*Distichlis spicata*) resprouting after being cut and baled during historical farming on the Matheson Wetland Preserve.

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EXECUTIVE SUMMARY

The Utah Geological Survey (UGS) recently completed a vegetation mapping effort at the Matheson Wetlands Preserve (the Preserve) near Moab, Utah, as part of a multi-year project to establish baseline data, research, and monitoring necessary to evaluate potential impacts and develop strategies that maintain the ecological health of the Preserve. The UGS mapped vegetation communities across the entire preserve as well as several adjacent, privately-owned parcels important to water management on the Preserve (figure 1). Target vegetation communities were identified through literature reviews, discussions with land managers, and reconnaissance fieldwork conducted in spring and fall 2022. The completed vegetation mapping identifies the dominant vegetation and wetland communities, likely water source, and hydropattern for all features greater than 0.1 acres on the Preserve. Polygon boundaries were hand-digitized in ArcGIS to reflect vegetation, hydrology, and topographic differences readily visible in the source 2021 NAIP imagery. This report places the vegetation mapping effort in context with other ongoing UGS research at the Preserve, documents mapping methodology, and serves as metadata for the associated spatial data by describing each of the feature classes and fields in the mapping geodatabase. This mapping geodatabase can be downloaded from: https://ugspub.nr.utah.gov/publications/open_file_reports/ofr-748/ofr-748.zip.

INTRODUCTION

The Scott and Norma Matheson Wetlands Preserve (the Preserve) occupies nearly 900 acres between the Colorado River and city of Moab, Utah, and encompasses an extensive floodplain-wetland complex that provides several unique functions in the arid west such as recreation, educational opportunities, and crucial aquatic habitats for sensitive wildlife species. The ability of the Preserve to provide these functions is related to water supplies from surrounding groundwater and surface water systems and is likely to be affected by upgradient changes in water use and delivery to the Preserve. The Nature Conservancy (TNC) and the Utah Division of Wildlife Resources (UDWR) jointly manage the Preserve and contracted the Utah Geological Survey (UGS) to conduct a multi-year study that would better inform managers with the baseline data, research, and monitoring necessary to evaluate potential impacts and develop strategies that maintain the ecological health of the Preserve. As part of this multi-year study, the UGS mapped vegetation communities to reflect current habitat and conditions and serve as a baseline for further groundwater studies, remote sensing analyses, or management actions.

METHODS

Vegetation mapping was conducted "wall to wall" across the study area (figure 1), which includes all parts of the Preserve owned by TNC and UDWR, as well as several adjacent, privately-owned parcels important to water budget studies on the Preserve (K. Ladig, UGS, written communication, 2022). Broadly, the mapping identified distinct vegetation communities and supporting hydrology through a combination of field studies and photointerpretation to create a contiguous dataset describing the dominant vegetation, typical hydropatterns, and likely water source for each polygon in the dataset.

Vegetation communities present in the study area were identified by reviewing existing mapping (Cooper and Severn, 1994), discussions with Preserve managers (L. Whittam (TNC) and M. Hansen (UDWR), personal communication, 2022), and field surveys conducted by Pete Goodwin, UGS wetland ecologist, May 25–27, 2022, and November 2–3, 2022. Vegetation communities were classified in two ways: a broader wetland community class distinguished by dominant hydrology or large vegetation differences (table 1) and a more detailed vegetation community class distinguished by relative cover of individual plant species (table 2). Hydropatterns and likely water sources were categorized into nine hydropatterns (table 3) and eight water sources (table 4). Hydropatterns directly relate to Cowardin water regime classifications used by the National Wetland Inventory (NWI) (Dahl and others, 2020).

Identification and delineation of individual vegetation communities followed general UGS NWI mapping methods where polygons were hand-digitized with GIS software to align with boundaries and features visible in recent 2021 National Agriculture Imagery Program (NAIP) aerial imagery (Goodwin and Molinari, 2022). We used a size threshold of 0.1 acres when identifying distinct polygons; features greater than 0.1 acres were mapped as distinct polygons, and features below the threshold were merged into surrounding polygons. Polygon boundaries reflect vegetation, hydrology, and topographic differences readily visible in the 2021 NAIP imagery. Other imagery sources were also reviewed to better distinguish vegetation and hydrology, including NAIP imagery collected in 2011, 2016, and 2018; historical aerial imagery freely available through Google Earth; and lidar elevation and canopy data from 2018.

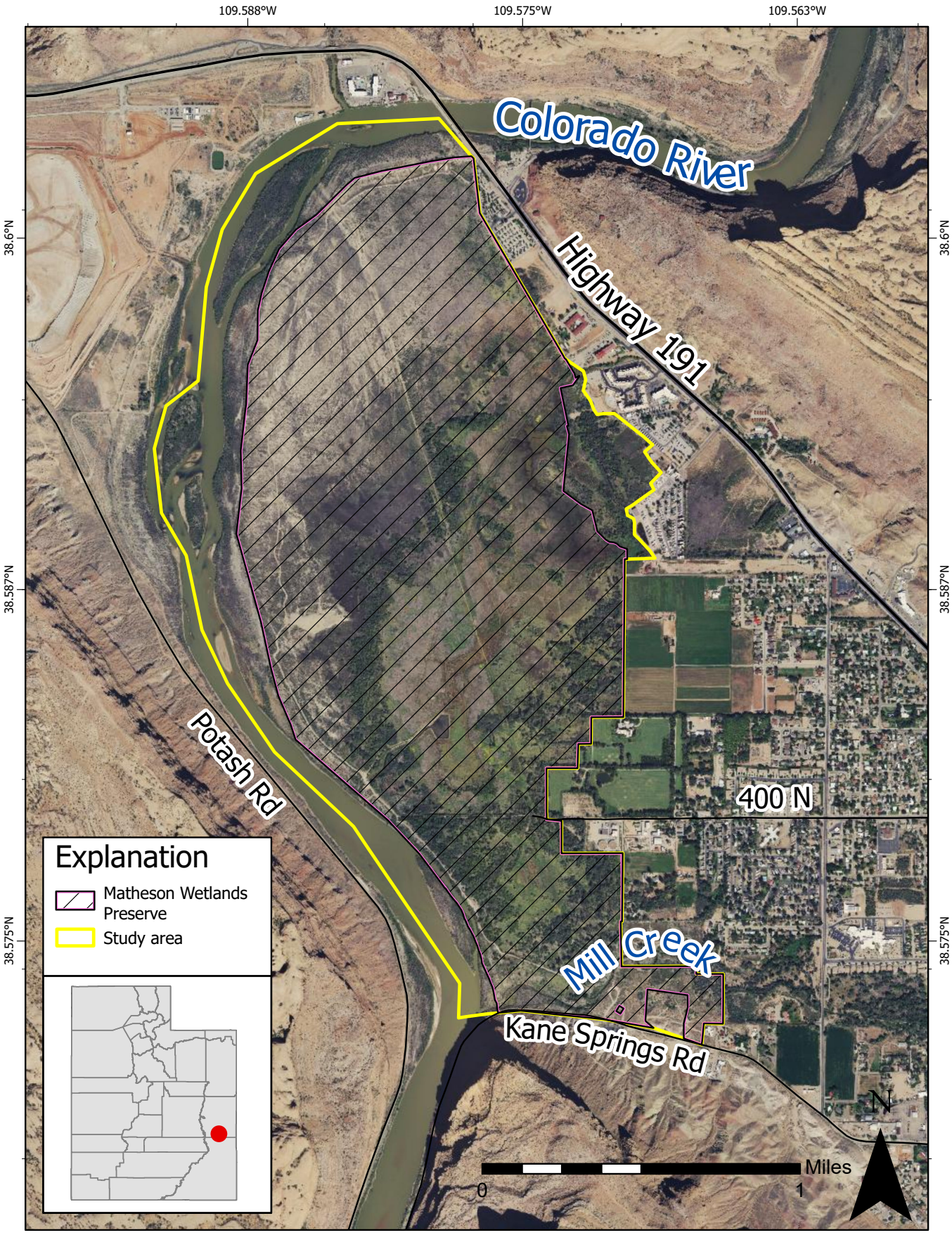

Figure 1. *Overview of study area and Matheson Wetlands Preserve.*

Table 1. *Wetland community classes.*

Wetland Class	Description
Permanent water	Flooded areas with surface water that at least persists throughout most growing seasons.
Seasonal water	Seasonally flooded areas that dry to bare soil during most summers.
Marsh	Shallowly flooded or nearly permanently saturated areas dominated by herbaceous vegetation like cattails or bulrush
Woody wetland	Seasonally flooded or saturated areas dominated by woody shrubs. Sufficient hydrology to form distinct hydric soil features.
Wet meadow	Seasonally flooded or saturated areas dominated by herbaceous vegetation like cocklebur, sedges, rushes, and other hydrophytes. Sufficient hydrology to form distinct hydric soil features.
Riparian forest	Occasionally flooded or saturated areas dominated by trees over 20 feet tall. Enough hydrology to support unique vegetation communities but not to form distinct hydric soil features.
Riparian shrubs	Occasionally flooded or saturated areas dominated by woody shrubs. Enough hydrology to support unique vegetation communities but not to form distinct hydric soil features.
Riparian meadow	Occasionally flooded or saturated areas dominated by herbaceous vegetation like reed canary grass, kochia, or salt grass. Enough hydrology to support unique vegetation but not to form distinct hydric soil features.
Upland	Dry to rarely flooded areas dominated by upland species like four-wing saltbush, Russian thistle, cheatgrass and other invasive annual grasses.

Table 2. *Vegetation community classes.*

Vegetation Class	Description
Permanent water	Permanent rivers, streams, and ponds.
River shoreline	Seasonally flooded banks and sandbars along the Colorado River.
Seasonal water	Seasonally flooded ponds or impoundments lacking vegetation cover when dry.
Bulrush	Live or standing dead bulrush (*Schoenoplectus acutus*).
Phragmites	Dense stands of living or treated phragmites (*Phragmites australis*); unknown if native or non-native as all samples collected had a combination of traits unique to both.
Reed canary meadow	Nearly monotypic patches of reed canary grass (*Phalaris arundinaceous*).
Saltgrass meadow	Grassy patches dominated by saltgrass (*Distichlis spicata*).
Invasive annuals	Dense patches of invasive annual species like kochia (*Kochia scoparia*), Russian knapweed (*Acroptilon repens*), or broad-leaved pepperweed (*Lepidium latifolium*).
Mixed emergent	Seasonally flooded or saturated areas either dominated by cocklebur (*Xanthium strumarium*) and dogbane (*Apocynum cannabium*), sedges and spikerushes, or not characterized by a single species identifiable from imagery.
Grassy riparian	Native species like Great Basin wildrye (*Leymus cinnereus*) or a mix of several species.
Cottonwood and Gooding's willow forest	Open to dense stands of Fremont's cottonwood (*Populus fremontii*) or Gooding's willow (*Salix goodingii*).
Russian olive	Shrubby and tree-like Russian olive (*Elaeagnus angustifolia*).
Willow thicket	Dense patches of willows, typically dominated by sandbar willow (*Salix exigua*).
Healthy tamarisk	Living, apparently healthy tamarisk (*Tamarix* sp.) with full crowns and higher density.
Stressed tamarisk	Dead or apparently unhealthy tamarisk with decadent crowns and low density.
Mixed shrubs	Shrubby areas, neither dominated by a single species nor characterized by a single species identifiable from imagery.
Upland shrubs	Native upland shrubs like greasewood (*Sarcobatus vermiculatus*) or four-wing saltbush (*Atriplex gardnerii*).
Upland forbs and grasses	Invasive and annual upland forbs and grasses like cheatgrass (*Bromus tectorum*), seaside barley (*Hordeum marinum*), blue mustard (*Chorispora tenella*) or Russian thistle (*Salsola kali*).
Barren upland	High percentage of bare ground with occasional standing dead tamarisk and Russian thistle or artificial surfaces like pavement or dirt roads.

Table 3. *Hydropatterns adapted from Cowardin water regimes (Dahl and others, 2020).*

Hydropattern	Cowardin Code	Description
Permanently flooded	H	Water covers the substrate throughout the year in all years.
Intermittently exposed	G	Water covers the substrate throughout the year in all years except in years of extreme drought.
Semi-permanently flooded	F	Surface water persists through the growing season in most years. When surface water is absent, the water table is usually at or very near land surface.
Flooded and Saturated	E	Surface water is present for extended periods (generally for more than a month) during the growing season but is absent by the end of the season in most years. When surface water is absent, the substrate typically remains saturated at or near the surface.
Permanently Saturated	D	The substrate is saturated at or near the surface throughout the year in all, or most, years. Widespread surface inundation is rare, but water may be present in shallow depressions that intersect the ground-water table, particularly on a floating peat mat.
Seasonally Flooded	C	Surface water is present for extended periods (generally for more than a month) during the growing season but is absent by the end of the season in most years. When surface water is absent, the depth to substrate saturation may vary considerably among sites and years.
Seasonal Saturation	B	The substrate is saturated at or near the surface for extended periods during the growing season, but unsaturated conditions prevail by the end of the season in most years. Surface water is typically absent but may occur for a few days after heavy rain and upland runoff.
Temporarily flooded	A	Surface water is present for brief periods (from a few days to a few weeks) during the growing season, but the water table usually lies well below the ground surface for most of the season.
Riparian	Rp	Transitional between wetlands and uplands and water is present frequently enough to support unique vegetation communities but unable to form unique hydric soil characteristics.

Table 4. *Assigned water sources.*

Water Source	Description and application
Overbank flooding	Feature fed by overbank flooding from Colorado River or Mill Creek.
Alluvial aquifer	Feature seems to be connected to the shallow aquifers associated with the Colorado River or regional groundwater system.
Precipitation accumulation	Feature collects water from non-channelized runoff or is part of a stormwater system.
Stream flow accumulation	Feature collects water from a stream (ephemeral to perennial) or is a flowing stream or canal itself.
Irrigation	Feature fed by canals, diversions outside the floodplain, or runoff from irrigated fields.
Artificial	Areas that have been obviously constructed and water source seems to be entirely removed from any natural system.
Groundwater	Features lacking obvious surface water inputs and unlikely to be affected by riverine flooding.
Spring	Areas of known spring discharge or features directly supported by known spring discharge.

GIS DATA INCLUDED IN MATHESON VEGETATION MAPPING GEODATABASE

Final Dataset

MathesonBoundary_20220830: Study area extent

MathesonMapping_20230206_final: Vegetation mapping dataset including:

1. Cowardin: Full Cowardin attribute
2. Hydropattern: Hydropattern assigned using Cowardin water regimes
    a. A—Temporarily flooded
    b. B—Seasonally saturated
    c. C—Seasonally flooded
    d. D—Permanently saturated
    e. E—Seasonally flooded/saturated
    f. F—Semi-permanently flooded
    g. G—Intermittently exposed
    h. H—Permanently flooded
    i. Rp—Riparian
3. WetlandCommunity: broad wetland community assigned during 2022 mapping
    a. perwa—Permanent water
    b. seawa—Seasonal water
    c. marsh—Marsh
    d. woowt—Woody wetland
    e. wetmd—Wet meadow
    f. ripfo—Riparian forest
    g. ripsh—Riparian shrubs
    h. ripmd—Riparian meadow
    i. uplan—Upland
4. VegetationCommunity: detailed vegetation community assigned during 2022 mapping
    a. perwat—Permanent water
    b. rivshr—River shoreline
    c. seawat—Seasonal water
    d. bulrsh—Bulrush
    e. phragt—Phragmites
    f. canmed—Reed canary meadow
    g. salmed—Saltgrass meadow
    h. invann—Invasive annuals
    i. mixemr—Mixed emergent
    j. grsrip—Grassy riparian
    k. cwgwfo—Cottonwood and Gooding's willow forest
    l. rusoli—Russian olive
    m. wilthk—Willow thicket
    n. heltam—Healthy tamarisk
    o. strtam—Stressed tamarisk
    p. mixshr—Mixed shrubs
    q. ripshr—Mixed riparian shrubs
    r. uplshr—Upland shrubs
    s. uplfor—Upland forbs and grasses
    t. barupl—Barren upland
5. WaterSource: likely water source assigned during 2022 mapping
    a. OvrFl—Overbank flooding
    b. AllAq—Alluvial aquifer
    c. PrcAc—Precipitation accumulation
    d. StrFl—Stream flow accumulation
    e. Irrig—Irrigation
    f. Artif—Artificial
    g. GrdWt—Groundwater
    h. Sprng—Spring

MathesonPhotoPoints: photos collected over the course of spring and fall fieldwork

QAQC_points: field data and photos collected as part of fall spot check of mapping accuracy

vegPoints_downloaded: field data and photos collected as part of spring and fall vegetation mapping and reconnaissance

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Cooper, D., and Severn, C., 1994, Ecological characteristics of wetlands at the Moab Slough, Moab, Utah: Denver, Colorado, unpublished report prepared for Recovery Program of the Endangered Fishes of the Upper Colorado, 49 p.

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