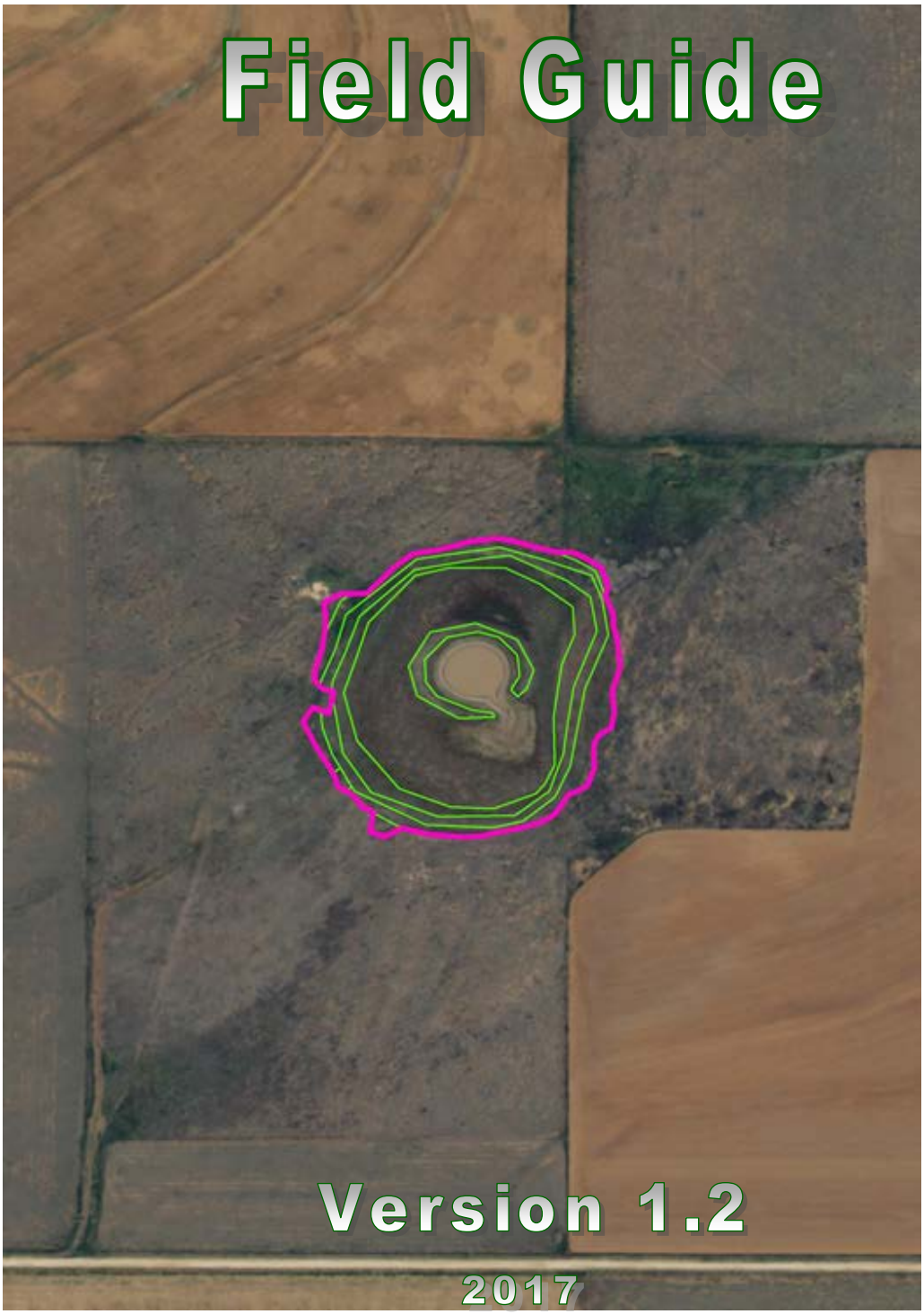
New Mexico Rapid Assessment Method

Playa Wetlands



Field Guide

Version 1.2

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Cover and front-page photos: Cover: An example of the delineation of a current playa wetland (pink) on the Southern High Plains of eastern New Mexico, and vegetation patterns within the playa. Front and Abbreviations pages: Southern High Plains playas of eastern New Mexico in late fall and spring (photos: E. Muldavin).

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Abbreviations

AU	Assessment Unit
CBF	Current Basin Floor
FA	Focal Area
GIS	Geographic Information System
GPS	Global Positioning System
HPW	Historic Playa Wetland
L1	Level One
L2	Level Two
LUI	Land Use Index
LUZ	Land Use Zone
NHNM	Natural Heritage New Mexico
NMED	New Mexico Environment Department
NMRAM	New Mexico Rapid Assessment Method
PDF	Portable Document Format
PW	Playa Wetland
SA	Sampling Area
SQUID	Surface Water Quality Information Database
SWQB	Surface Water Quality Bureau
UNM	University of New Mexico
U	Unknown or Unverified
UTM	Universal Transverse Mercator
V	Verified

I. Introduction

This New Mexico Rapid Assessment Method (NMRAM) Field Guide provides procedures for conducting a rapid ecological assessment of playa wetlands in the Southern High Plains of eastern New Mexico. It complements the NMRAM Manual by providing specific protocols and datasheets for evaluating ten playa wetland ecological condition metrics using a combination of GIS-based measurements and field surveys. In addition to details on metric measurements, appendices are provided that include the data collection worksheets, a plant species list with wetland indicator status, soil sampling guidelines, and a glossary of terms.

The ten metrics are grouped into four attribute categories: Size, Landscape Context, Biotic, and Abiotic (Table 1). Five of the metrics can be measured using maps and aerial imagery in a GIS framework, and these are termed "Level 1" metrics (Absolute Playa Size, Surrounding Land Use, Playa Configuration, Playa Hydroperiod Reduction, and Playa Watershed Connectivity). In contrast, the other five metrics are evaluated in the field; these are termed "Level 2" metrics (Exotic Annual Plant Abundance, Wetland Species Index, Vertical Habitat Disruption, Soil Condition Index, and Water Source Augmentation). Level 1 metrics are also confirmed or modified as necessary during the field survey. In addition, a set of stressor checklists by attribute class are completed during the field survey along with annotated field maps and documentary photographs.

All metrics and stressor checklists are measured in the context of a Sampling Area (SA) within a delineated current Playa Wetland (PW) boundary. Typically, the SA includes the entire PW, but for logistical or programmatic reasons the practitioner has the option of defining a specific area within the PW as a targeted Focal Area (FA) by which to constrain the field sampling of Level 2 metrics. But all Level 1 metrics refer to the entire playa wetland.

Based on the GIS analysis and field data, each metric receives a rating score from one to four, representing poor to excellent ecological condition. Metric scores are then weighted by importance and rolled up into an attribute score (i.e., Size, Landscape Context, Biotic and Abiotic Scores). Lastly, attribute scores are further weighted and rolled up into a single overall SA Wetland Condition Rank and Score where A = Excellent (≥3.25-4.0); B = Good (≥2.5-<3.25); C = Fair (≥1.75-<2.5), and D = Poor (1.0 -<1.75). The rationale behind scoring procedures and the efficacy of any given metric are provided in the NMRAM Manual.

A set of worksheets organized by attribute classes has been developed to support efficient data capture (Appendix A). These data collection worksheets are provided as printable forms in Appendix A and as a downloadable fillable PDF file that computes and rates most metrics automatically and rolls up the scores for the user. The worksheet packet contains a cover worksheet for recording basic information, surveyor identification, narrative descriptions of the SA by attribute, and an Assessment Summary. The worksheets together with maps and photographs make up the NMRAM Assessment Package that becomes the supporting record at a project level and the tool for data entry into the Surface Water Quality Information Database (SQUID) (a comprehensive database currently under construction by NMED Surface Water Quality Bureau that will provide access to information about wetland areas, wetland habitats, and ecological condition).

Timing of the assessment matters. An accurate and complete assessment of all metrics requires sampling the playa when it is not inundated and vegetation is present on the basin floor (excluding excavated pits). If the playa is inundated or only recently dried when the team visits, the sampling should be postponed until about a month after it has dried to give sufficient time for vegetation expression. The PW can be provisionally assessed using Level 1 metrics and then returned to a month or so after the playa has dried to complete assessment of Level 2 metrics and generate the final SA Rank. If logistic factors prevent returning for the Level 2 measurements, the playa can be assessed at Level 1 only and the Coversheet rating method checkbox marked as "Level 1 metrics only for currently inundated playa" (the score for the PW remains provisional). The interactive data sheets will automatically provide a ranking for a provisional Level 1 Assessment. The reason for the Level 1 assessment should be documented in the coversheet comments field.

Table 1. List of NMRAM Playa Wetland metrics and whether they are Level 1 (L1) GIS-based metrics or Level 2 (L2) field-based metrics. See "Delineating Assessment Boundaries" for definitions of the measurement areas and abbreviations.

Metrics	Level	Measurement area
Size		
S1. Absolute Playa Size	L1	PW
Landscape Context		
L4. Surrounding Land Use	L1	LUZ
L5. Playa Configuration	L1	CBF
Biotic		
B7. Exotic Annual Plant Abundance	L2	SA
B6. Wetland Species Index	L2	CBF
B9. Vertical Habitat Disruption	L2	SA + 100 m
Abiotic		
A7. Playa Hydroperiod Reduction	L1	SA
A8. Soil Condition Index	L2	CBF
A9. Water Source Augmentation	L2	LUZ
A10. Playa Watershed Connectivity	L1	LUZ

II. Pre-field Protocols

Download Worksheets

Worksheets are provided in Appendix A and a digital version is available from the NMED SWQB website.[1] The downloaded worksheets are smart PDFs where data and ratings are directly entered in the field using a tablet or other digital device, or recorded manually on printed forms and entered subsequently into the digital file. The PDF worksheets are designed to compute some metric ratings automatically when the data are entered; other metric ratings must still be

[1] https://www.env.nm.gov/surface-water-quality/

evaluated directly. The worksheets also track the field process, global positioning system (GPS) locations, and photo inventory.

Delineating Assessment Boundaries

Playa Wetland (PW)

For purposes of the NMRAM, the Playa Wetland (PW) boundary is defined as including the current playa floor and the immediate sloping perimeter up to the visual edge which approximates the upper boundary of the annulus (Figure 1). It typically coincides with a break to a more moderate slope and a change in vegetation (the vegetation transition may be subtle or obscured in playas that have been dry for extended periods of time). The visual edge should be level all around the playa since it reflects the upper lake boundary. Everything outside of the visual edge is considered non-playa upland landscape. The PW is initially delineated using visual cues from aerial imagery in the GIS or from available wetland maps, and then validated during the field survey.

Land Use Zone (LUZ)

Once the PW has been defined, a Land Use Zone boundary is drawn extending out 500 m from the PW boundary for playas <8 ha and 1,000 m for very large playas ≥8 ha (Figure 2).

Sampling Area (SA) and Focal Area (FA)

The Sampling Area (SA) is that area from which Level 2 field measurements are taken (Figure 3). It typically corresponds to the PW boundary with two general exceptions:

- SA as a representative subsample. In the case of very large playas (>8 ha), it may be logistically unfeasible to cover the entire playa during the field survey and the SA may be restricted to a smaller representative portion of the PW (Level 1 metrics still apply to the entire PW).
- SA as a restricted subsample. A practitioner can create a restricted Focal Area (FA) within a PW in which to delineate an SA for the field metrics (Level 1 metrics still apply to the entire PW). Typically, these are cases where a playa is distinctively heterogeneous with respect to land use history, there are ownership restrictions that constrain the SA placement, or there are specific project needs to be met for only a portion of the playa, etc.

SAs are provisionally mapped prior to the field visit, then modified as needed based on field indicators. Overall, delineation of SAs should be done with care and the decision rules used to delineate the SA documented in the provided fields on the SA Cover Worksheet to provide context for evaluating the assessment outcome.

Current Basin Floor (CBF)

The basin floor is the level, bottom portion of the PW below the annulus (see Figure 1). The Current Basin Floor (CBF) boundary is delineated as the extant, flat portion of the playa. It *excludes* recent sloping alluvial fans, artificial platforms and berms, or other disturbance features that constrain or cover the playa floor. This boundary is best delineated during the field survey and supports the Wetland Species Index (B7) and Soil Condition Index (A8) metrics.

Historic Playa Wetland (HPW)

Playa Configuration (L5) measures the departure of the current playa wetland represented by the PW boundary from an estimated historical extent prior to impacts represented by the Historic Playa Wetland (HPW). Under reference conditions, playas tend to be circular to elliptical in shape reflecting the shape of the playa micro-basin (watershed). Sometimes they take on a teardrop form associated with a natural in-basin drainage. The HPW is delineated based on visual evidence in aerial imagery that reflect the original playa configuration such as remnant visual edges or changes in slope reflecting the old annulus.

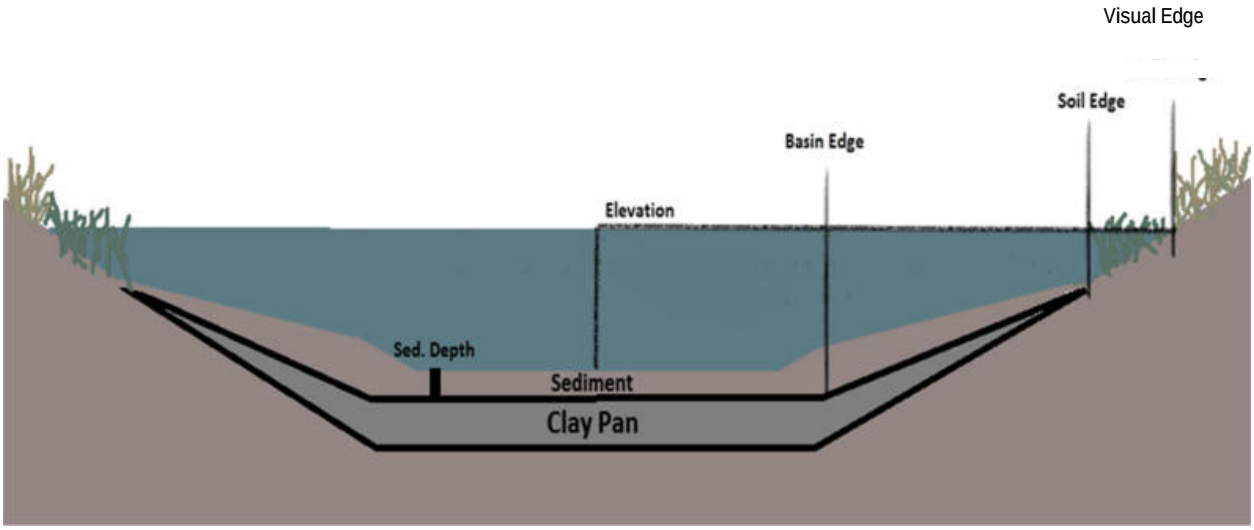

Figure 1. Cross-sectional diagram of a typical playa wetland depicting the underlying clay pan, a recent sediment package that may or may not be present, and the ephemeral lake in blue. The annulus is defined as the area between the basin floor edge and the upper clay pan soil edge. The clay pan soil edge may or may not correspond to the visual edge that demarks the upper limit of the ephemeral lake, but because the soil edge is often difficult to determine in the field, the visual edge is used here as an approximation of the upper boundary of the annulus (modified from Daniel et al. 2014).

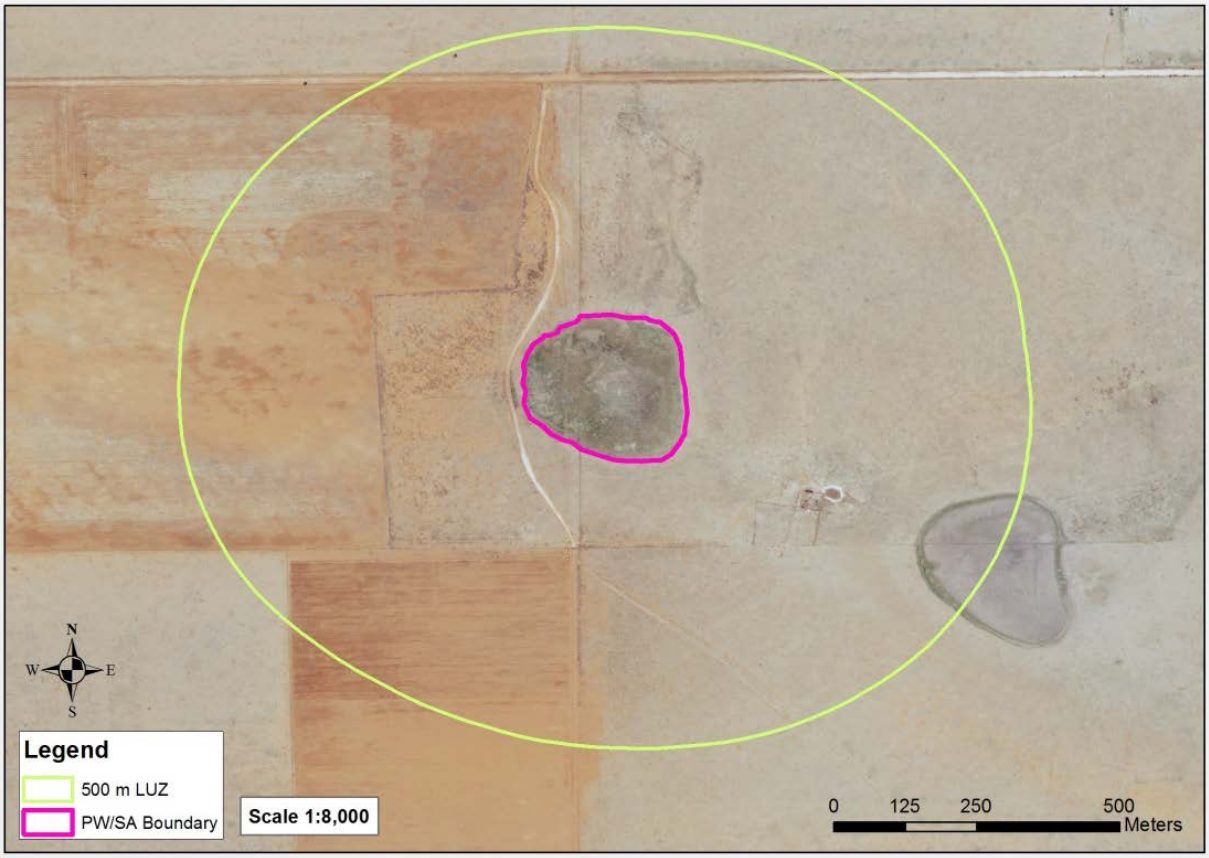

Figure 2. An example of Playa Wetland (PW) boundary and the Land Use Zone (LUZ) boundary extending out 500 m from the PW boundary. In this case the PW boundary is also the Sampling Area (SA) boundary.

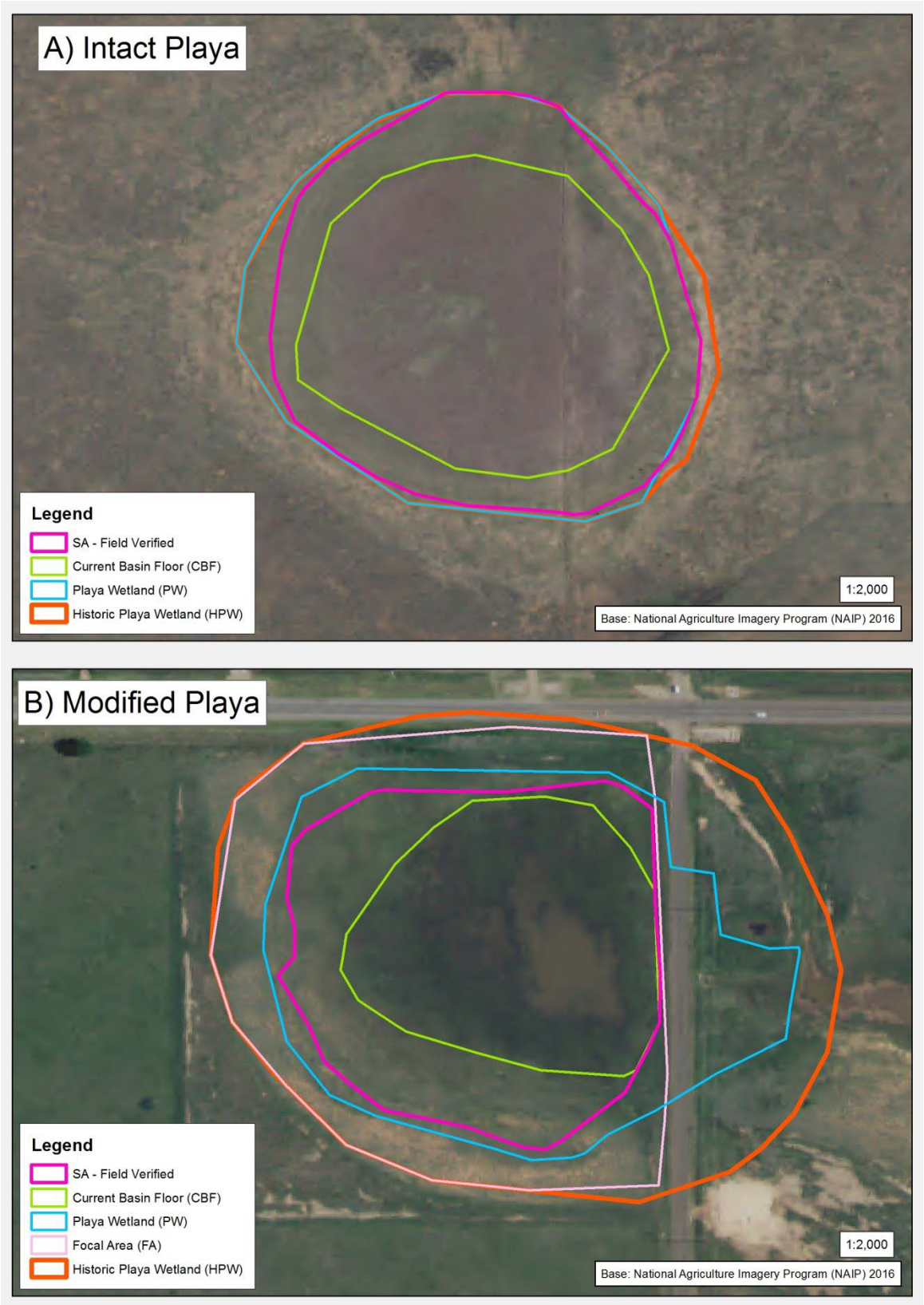

Figure 3. Examples of boundary delineations for Level 2 field assessment: a) a typical playa where there may be only two boundaries, the combination Playa Wetland/Historic Playa Wetland/Sampling Area and Current Basin Floor boundaries b) a modified playa requiring a user-defined Focal Area to select a Sampling Area for the Level 2 metrics, but the Level 1 metrics still apply to the overall Playa Wetland boundary or Historical Playa Wetland.

Field Maps

The foundation for the NMRAM is a set of three field maps on which landscape, biotics and abiotic features are mapped to support metric scoring (Figure 4).

1) Landscape Map. One map for each team member at approximately 1:6,000-8,000 scale that shows the PW, FAs if designated, SA(s), and the LUZ. Any modifications to and within the LUZ boundary along with any features to aid the field validation of Landscape Context or Abiotic metrics around the SA should be sketched on the Landscape Map. Both the Biotic and Abiotic team members need a copy to note changes to boundaries and annotate relevant features. Changes should be compiled onto one map during the final site scoring. This copy then becomes part of the NMRAM Assessment Package deliverables.
2) Playa Wetland Map. One map for each team member at between 1:1,500-3,000 scale that shows PW and HPW boundaries, FAs and SAs within the PW. These maps are used for detailed biotic and abiotic features mapping to support metric scoring (SA Biotic and SA Abiotic Maps, respectively). This is also the map used for delineating the CBF in the field. For consistency, modifications to the PW or SA boundaries should be compiled on the SA Biotic Map. The final CBF boundary is mapped on the SA Abiotic Map. These maps also become part of the NMRAM Assessment Package.
3) Road Map. A third optional map at 1:24,000 or coarser is useful for locating a site relative to highways and towns and identifying macro-scale disturbance features that may be affecting the playa wetland.

Each map should have a 100- or 200-m UTM grid overlay to help navigation in the field along with a north arrow and scale bar.

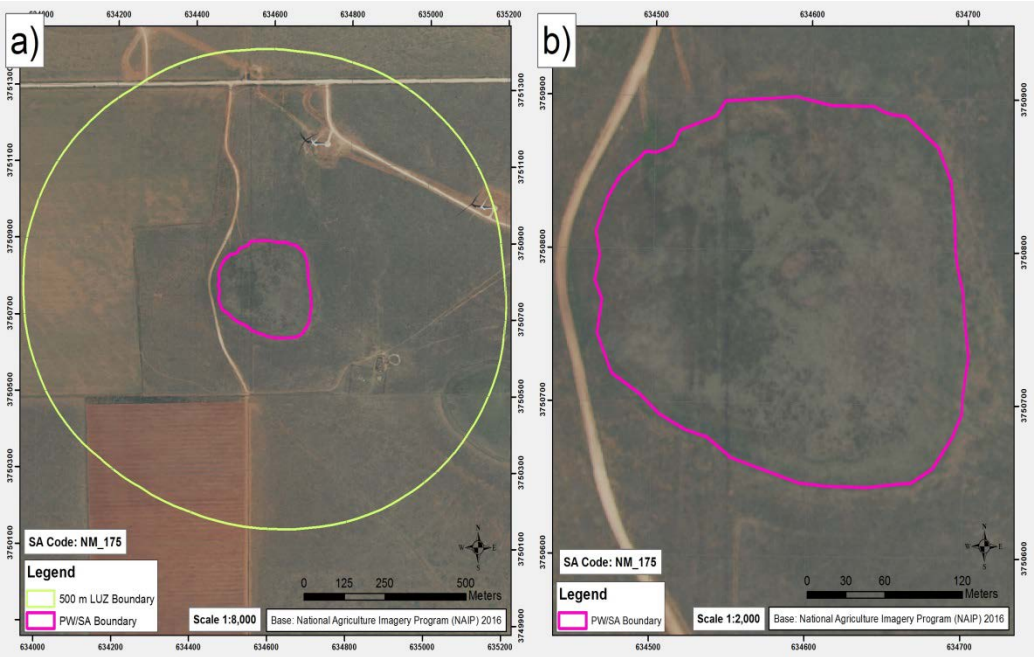

Figure 4. Examples of Landscape and SA field maps for assessment: a) a landscape-scale map with Playa Wetland (PW) boundary (pink) and Land Use Zone (LUZ) boundary (yellow) for measuring the Size and Landscape Context metrics; b) a fine-scale SA map for field vegetation, landscape, and abiotic features mapping within an SA.

Land Ownership and Sampling Permissions

In general, sampling permissions can be obtained for public lands, but each land management agency has its own rules and regulations that must be followed to obtain access. Many land management agencies have a formal application process for obtaining a special use permit or other official written permission. Agencies should be contacted as far in advance as possible to determine the correct process for obtaining permission, with a month generally being the minimum amount of time in which a permit can be processed.

When sampling on private lands, permission for access needs to be sought and granted. Allow sufficient time in the planning stage to contact owners and to schedule your visit once permission has been granted. If the ownership is unknown, records can be checked at county courthouses for contact information. Owners should be contacted by phone or with a visit, and written permission for access obtained. While delineation of the SA generally encompasses an entire playa, in a situation where there are multiple landowners for one playa and owner permission has only been obtained from one, the SA boundary will have to be adjusted to only those portions of the playa for which permission has been granted and that portion designated as a Focal Area (FA) within the PW overall boundary.

Field Equipment, Guides, and Worksheets Checklist

- ☐ Two copies of the landscape maps, one for each team, and one each of Abiotic and Biotic SA Maps (either paper or writable on a tablet or other device). A third optional map at 1:24,000 is often useful for locating a site relative to highways and towns.
- ☐ Set of Data Collection Worksheets (Appendix A) for the SA.
- ☐ Covered clipboards to protect worksheets and maps (if using paper copies).
- ☐ Optional: A ruggedized tablet or other protected electronic device uploaded with fillable PDF worksheets and field guides.
- ☐ Pencils and water-resistant markers for labeling paper maps or other sheets or items which may come in contact with water.
- ☐ GPS unit and directions to site (with GPS coordinates).
- ☐ Camera and photo board.
- ☐ Binoculars for viewing landscape conditions.
- ☐ Compass, for accurately orienting field maps and conducting mapping exercises.
- ☐ Pin flags to mark features and soil sampling sites and for photographs.
- ☐ Plant press for collecting plants needing identification.
- ☐ Munsell Soil Color Book, squirt bottle filled with water, and shovel or soil auger.
- ☐ Measuring tape and plastic tarp for laying out soil cores.
- ☐ Bleach and bucket: it is mandatory that all field technicians sterilize boots with a bleach and water mixture before and after entering wet playas to prevent the spread of aquatic nuisance species, as well as other potential pathogens.

III. Metric Measurement

SA Cover Worksheet

Use the *SA Cover Worksheet* (Worksheet Page 1) to track the basic assessment information about a given SA within a PW.

- Enter the project or any other relevant site designation that can help track the assessment.
- Assign a unique PW name.
- Assign a unique SA Code and SA Name, which are user-defined per project need. For tracking purposes, an SA Code and SA Name should not duplicate other SAs for a given project. For multiple SAs within the same PW, provide an FA number associated with a given SA (SA Codes and Names should reflect that the SAs are within the same PW).
- For the SQUID database, enter the AU (Assessment Unit) Code and AU Name available from the NMED SWQB website.
- Indicate if the SA has been restricted within the PW (Partial PW) and, if so, is it representative of the whole PW or not? Provide the reasons in the SA boundary rationale.
- Describe the general location.
- Provide directions to the site and required site permissions.
- Enter ownership information and note any restrictions on data sharing, if applicable.
- Enter surveyor names and initials by their roles in the assessment (each surveyor's initials must be unique as initials will automatically populate worksheet pages with initials by role assignment in the fillable PDF).
- Enter the central location in latitude-longitude coordinates and/or UTM coordinates and include the zone and datum.

The remainder of the SA Cover Worksheet will be completed as part of the field survey described below including the date, start and end times of the field survey, information about playa hydrology at the time of the survey, SA description and narratives of conditions by major attribute category, and a provisional field Score and Rank.

Assessing Level 1 Metrics

Level 1 metrics are those Size, Landscape Context, and Abiotic metrics that can be evaluated in a GIS framework using maps and aerial photographs and then verified in the field during the field survey described below (see Table 1).

Suggested basic GIS layers:

- Recent ortho-rectified aerial photography or satellite imagery with a minimum resolution of 1 m (3 feet);
- Roads and trails;
- Ownership; and
- Topographic maps or digital elevation models.

Sources for geospatial data include New Mexico Resource Geographic Information System (http://rgis.unm.edu/browsedata), BING, and Google Earth, among others. See the Metric Protocols Section below for specific instructions on Level 1 metric measurements.

Assessing Level 2 Metrics and Completing the Assessment

There are three Biotic and four Abiotic metrics that are measured or verified as part of the field survey of the SA (see Table 1). The survey requires a field team composed of a minimum of two members: one to evaluate the Biotic metrics while the other evaluates the Abiotic metrics. The team member responsible for the biotic reconnaissance should have a basic understanding of the local flora (particularly common dominant grasses and forbs that occur in playas of the Southern High Plains (see Haukos and Smith 1997), and be able to distinguish annual, perennial, native, exotic, upland and wetland species (see Appendix B for a list of common playa species with duration, origin and wetland indicator status).

The team member responsible for the Abiotic metrics should have basic training in hydrology, assessing wetland soil color and texture and associated soil profile features, and recognizing geomorphological characteristics relevant to playas. As they work through the SA, both team members should watch for stressors and conditions along the SA edges relevant to the Landscape Context metrics. Upon completion of the field survey, the team works together to verify the Size and Landscape Context metrics, complete the Stressor Checklists, write the SA narrative summaries, and assign a provisional Wetland Condition Rank before leaving the site. The intent is that a team should be able to complete the field survey in three to five hours, depending on the complexity and size of the site, and personnel resources.

Field Assessment Steps

1. Preliminaries. Together, team members fill in basic survey information (date, time, location, etc.) on the SA Cover Worksheet. The team then conducts a joint rapid reconnaissance of the site to set up the survey and preliminarily review the SA boundary based on on-the-ground conditions with an emphasis on confirming the upper visual edge of PW/SA boundary along with initial evaluation of the CBF boundary (these are important for both abiotic and biotic metrics). All changes to the PW/SA configuration or location are recorded on the field maps and noted on the SA Cover Worksheet with rationales for the changes. This becomes the supporting record for the best professional judgements of the team members.
2. Biotic survey. The biotic team member:
    a. Maps major vegetation community patches within the SA on the SA Biotic Map (see Biotic Metrics for details). These data are the basis for measuring the Exotic Annual Plant Abundance (B6) and Wetland Species Index (B7) metrics.
    b. Validates the upper visual edge boundary with at least four GPS points and modifies the PW/SA boundary as needed on the SA Biotic Map (If time permits, this can be backed up with a GPS track survey). Remembering that the visual edge will have an equal elevation around the playa representing the lake margin when filled, look for changes in slope and associated benches, and changes in vegetation, which as a group indicate the transition from playa basin to surrounding slope. Changes in vegetation color, height, and species composition can all be helpful indicators. When

a playa has been dry for many years or significantly hydrologically altered, vegetation changes may not be obvious. Vegetation should never be the only indicator used to determine the visual edge. When assessing the slope look for small "ledges" running parallel to the playa bottom, wrack, bare patches and any other features that distinguish the visual edge above the playa bottom and the upland. Figure 5 provides two examples of a sight-line along a visual edge in the field.

c. Maps and notes vertical structures and locations to be used in rating the Vertical Habitat Disruption (B9) metric.

d. Rates each metric based on the observed evidence from the maps and worksheets along with the narrative guides in the ratings tables.

3. Abiotic survey. The abiotic team member:

   a. Delineates the CBF boundary on the SA Abiotic Map (see Figure 3). The CBF is used for Soil Condition Index (A8) and Playa Hydroperiod Reduction (A7).

   b. Sets up the soils transect within the CBF along which to gather three soil samples for the Soil Condition Index (A8).

   c. Records and annotates maps with indicators of water augmentation and reduction from within the LUZ for the Water Source Augmentation (A9) and Playa Watershed Connectivity (A10) metrics.

   d. Rates each metric based on the observed evidence from the maps and checklists, along with the narrative guides in the ratings tables.

4. Current Basin Floor review. During the Abiotic and Biotic surveys, the team members need to confer on the boundary of the CBF. It is necessary for the SA Biotic Map to use the same CBF boundary as the SA Abiotic Map. Vegetation polygons on the SA Biotic Map cannot cross the CBF boundary if the proper scores are to be obtained for the Wetland Species Index (B7).

5. Landscape Context review. During and after the Abiotic and Biotic surveys, the Landscape Context metrics measured prior to the field survey are reviewed based on field evidence. It is important to note local conditions that are causing changes in the PW/SA boundary and/or affecting any of the metric conditions. Each team member is likely to survey different areas in the SA and each should note landscape context condition issues that may affect the ratings, particularly in areas adjacent to the SA boundary. These are reported on the SA Cover Worksheet.

6. Stressor Checklists. After completing the Abiotic and Biotic surveys the team members collaboratively complete the Stressor Checklists using notes and observations made during reconnaissance.

7. Narrative Summaries. Before leaving the site, team members collaboratively complete the narrative summaries on the SA Cover Worksheet, review and complete the in-field ranking of all metrics and provide a provisional SA Score and Rank and Assessment Summary (signed off with team member initials). See SA Ecological Condition Ranking (Section V) below for details. Finally, the end time for the survey is entered on the SA Cover Worksheet before leaving the site.

Figure 5. Examples of the visual edge from a wet and a dry playa. Both photos were taken standing on the visual edge and looking along it toward a curve in the playa boundary (photos by Chris Canavan).

Documentary Photographs

During the SA boundary survey, documentary photographs should be taken of the overall playa and features that have a significant impact. A minimum of eight photos should be taken at a playa; two at each of the cardinal directions on the visual edge, one facing across the playa, and one facing upslope. These photo-points are recorded on the Photo Point Log located at the end of the Landscape Context metrics in Appendix A. Additional photos may be taken of significant features within or adjacent to the SA and recorded on the general Photo Point Log at the end of Appendix A. Features that alter the size of the SA, or significantly impact playa hydrology and/or sedimentation are particularly useful to photograph. Documentary photographs are strongly recommended for soil profiles (include Munsell soil color chart in the photo), as well for each major vegetation patch, and for unknown plant species.

Best Management Practices For Pest Control

To prevent the spread of aquatic diseases and nuisance species, it is imperative that field team members follow procedures to clean and sterilize field equipment. Outside the wetland, at the staging area before entering the wetland and upon leaving, boots, waders, and field equipment (e.g., shovels, etc.) that come in contact with surface waters must be hosed or washed off. This must occur away from wetlands and surface waters. All porous material (including felt-soled shoes, which are not recommended due to concerns about didymo (Didymosphenia geminata)) must be immersed in a 2% bleach solution for five minutes or until thoroughly soaked, then rinsed or dried thoroughly. Any remaining solution must be poured away from vegetation.

IV. Metric Protocols

Size Metrics

S1 Absolute Playa Size

Definition: An assessment of current size of a playa wetland including the annulus and basin floor.

Seasonality: Any time, but best assessed from summer imagery in years with a definite rainy season that can potentially fill playas.

Protocol:

1. Estimate the area in hectares within the PW boundary using a GIS polygon measurement function (e.g., ArcGIS or Google Earth), or from a hard-copy map using a dot grid calibrated to the map scale (see Figure 4).

2. Enter value into the box on Worksheet 1 and rate using Table S1.

3. During the field survey verify size estimate.

Landscape Context Metrics

There are two Landscape Context metrics, Surrounding Land Use (L4) and Playa Configuration (L5), that are designed to measure the alteration by various land uses of the natural landscape surrounding a playa wetland and of the playa wetland itself. Once the metrics have been rated, they are rolled up into a single Landscape Context Attribute score on the SA Rank Summary Worksheet. The Land Use Stressor Checklist is also filled out as part of the SA survey to aid interpretation of ecological conditions in the delineated surrounding landscape (see Stressor Checklist protocols below).

L4 Surrounding Land Use

Definition: The amount and intensity of human alteration of the landscape surrounding the SA.

Seasonality: Any season, but best assessed from summer imagery in years with a definite rainy season when detecting vegetation patterns will be optimal.

Protocol: Surrounding Land Use evaluates land use elements in a Land Use Zone (LUZ) that extends out from the PW perimeter. Within the zone, a Land Use Index (LUI) is calculated based on the relative extent of a suite of land use elements that are weighted by their potential impact on the PW, from 0.0 indicating high impact to 1.0 no impact (Worksheet 2).

1. Delineate the LUZ extending out from the PW boundary. For small- to large-sized playas (<8 ha) the LUZ extends 500 m beyond the PW boundary, and for very large playas (≥8 ha) it extends out 1000 m (see Figure 2).

2. Using current aerial photography in a GIS platform or from the Landscape Map, estimate the percentage of each land use element in the zone and enter the value in Worksheet 2 as actual percent (% LUZ Area). Elements cannot overlap and the total coverage must equal 100% within the zone.

3. For each element, multiply the percentage area times the weighting coefficient and record that score in the LUI Score column. Sum the scores in the LUI Score column (This will be done automatically for those using the fillable PDF worksheets.)

4. Rate using the Table L4.

5. Enter rating on the SA Rank Summary Worksheet (This will be done automatically for those using the fillable PDF worksheets).

For example, if 40% of the adjacent area is center-pivot agriculture (40 * 0.2 = 8), 40% natural area (e.g., no human land use) (40 * 1.0 = 40), and 20% contoured rangeland (20 * 0.5 = 10), the total land use score would equal 58 as the sum of 8 + 40 + 10. The rating from Table L4 would be a 2.

L5 Playa Configuration

Definition: Playa configuration evaluates the departure of the current PW shape and size (area) from the historical configuration as a function of direct anthropogenic alterations, particularly fill from accelerated erosion and artificial sources.

Seasonality: Any season, but water-filled basins may obscure some artificial and erosional fill features.

Protocol:

1. Based on visual evidence in aerial imagery, delineate the approximate boundary location of the HPW and the current PW (see boundary description above and examples in Figure 6 below). In playas at or near reference condition, the PW and HPW will be the same.
2. Estimate the percent reduction between the PW and the HPW based on the mapped boundaries. Worksheet 3 may be used to determine disturbance features that cause departure from natural shape.
3. Rate the departure of the playa from its natural shape and size using Table L5. Enter rating on the SA Rank Summary Worksheet. Note that a road through the interior of the PW rates an automatic 1.

This metric can be rated from imagery only as part of a Level 1 provisional assessment, or it can be field verified as part of a Level 2 assessment. For a Level 1-only assessment, the outcome is completely based on unverified imagery interpretation. If a Level 2 field survey is conducted, Step 1 can be completed by evaluating the current PW boundary in the field during the preliminary rapid reconnaissance, rather than in a GIS (although a GIS-derived provisional boundary is still recommended).

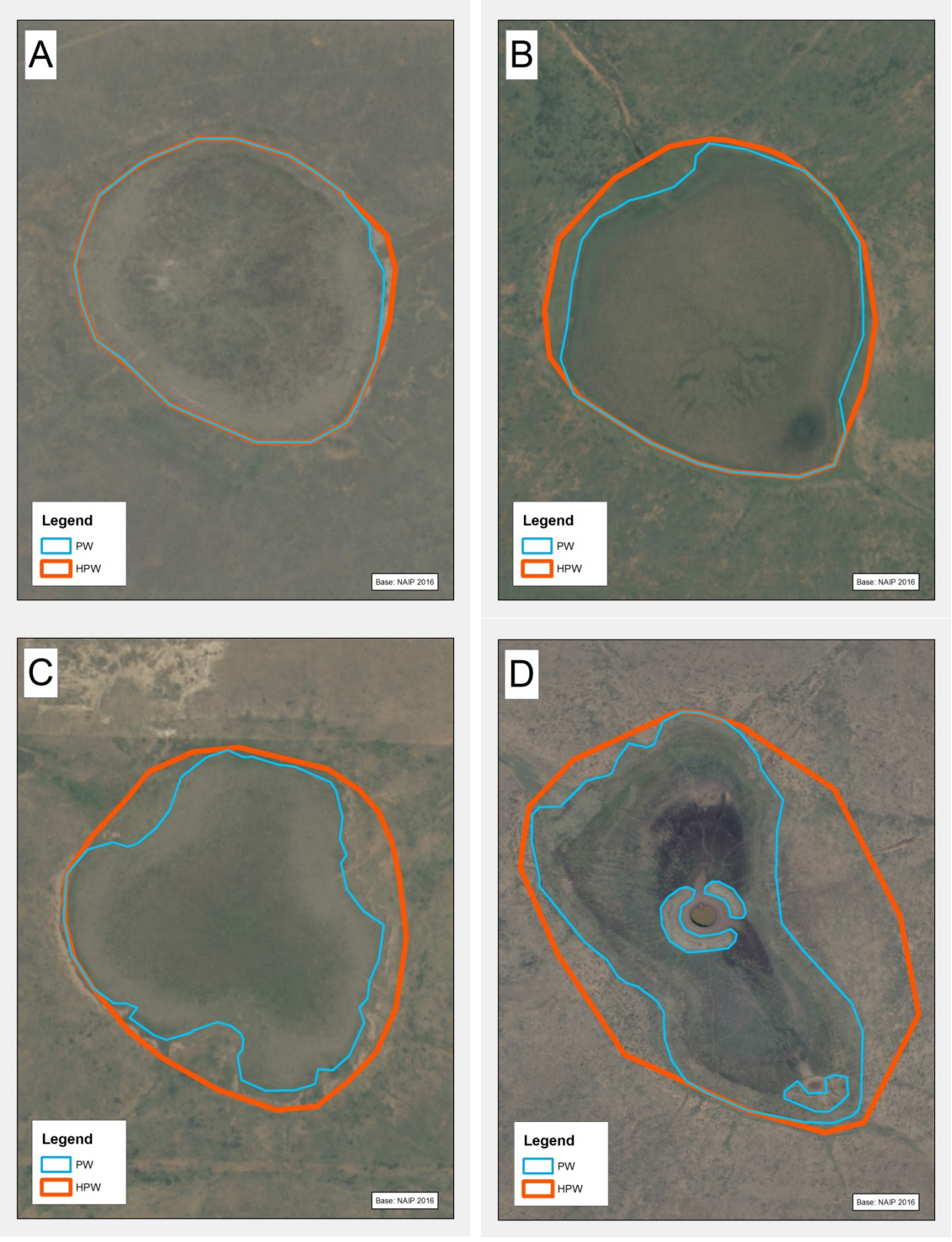

Figure 6. Playa Configuration: examples of A, B, C and D rated playas with the PW (blue) and HPW (orange) boundaries delineated. All examples showed on NAIP 2016 imagery.

Biotic Metrics

There are three Biotic metrics that are designed to measure key biological attributes within a wetland that reflect biotic ecosystem integrity: Exotic Annual Plant Abundance (B6), Wetland Species Index (B7), and Vertical Habitat Disruption (B8). Both B6 and B7 are dependent on the mapping of vegetation community patches (polygons) within the SA and identifying the six dominant herbaceous species within each vegetation community patch polygon. Vegetation community patch polygons are drawn directly on the SA Biotic Map as part of the field survey. Along with the patch mapping, vertical structures which include vegetation and/or man-made structures taller than 2 m are mapped to aid in evaluating the Vertical Habitat Disruption metric.

Once the metrics have been rated, they are rolled up into a single Biotic Attribute score on the SA Rank Summary Worksheet. The attribute narratives on the SA Cover Worksheet that describe SA conditions and impacts should also be completed at this time. The Biotic Stressor Checklist is filled out after the SA has been mapped and walked through (see Stressor Checklists Section below).

Vegetation Mapping and Recording Protocols

1. Each homogeneous patch of vegetation is mapped within the SA boundary and labeled with the corresponding number from the polygon column on Worksheet 4 (Figure 7). *Only polygons of homogeneous vegetation greater than 0.10 ha [0.25 acre] are delineated (i.e., the minimum mapping unit polygon size)*. Patches smaller than 0.10 ha are considered inclusions within a surrounding larger patch. The one exception to this rule is very narrow annulus bands on small playas, which should be delineated as separate polygons even when they are less than the minimum map unit size.
2. To facilitate the scoring of metrics B6 and B7 each vegetation polygon must fall entirely on one side or the other of the CBF boundary.
3. On Worksheet 4, enter the percent of the SA occupied by the vegetation polygon and whether it is located on the CBF or elsewhere (“CBF” or “other” on Worksheet 4 Playa Location Column). In addition, enter the percentage amount of woody cover within the polygon.
4. The percent canopy cover (as actual percent) of each of the six most abundant herbaceous species (graminoids and forbs) is entered for each mapped polygon. (Because this is measured as canopy cover, the total for the polygon can be more than or less than 100% cover.)

   For those using the fillable PDF worksheets, a dropdown list for the most common species can be used to fill in the species columns by USDA Plants symbol. This will also assign the Duration (D), Binary Wetland Code (W) and Origin (O) columns automatically when you push the Calculate button below the table.
5. For each species, assign the Duration (D) category for the species: A=annual or biennial; P=perennial, U=unknown (the Duration class for the most common playa species is provided in Appendix B).

6. For each herbaceous species in Worksheet 4, assign a "Binary Wetland Code" (W) per Table 2. (Wetland indicator status and Wetland Binary Code for the most common playa species are provided in Appendix B).
7. For each species assign the Origin (O) category for the species: E=exotic or introduced; N=native; U=unknown (the Origin class for the most common playa species is provided in Appendix B).
8. For unknown species, collect and press a voucher specimen for later confirmation. Label each collection with the date, collector, SA Code, polygon number, and 2FORB1, 2FORB2, 2GRAM1 etc. species codes. On Worksheet 4, either enter the corresponding 2FORB1, 2FORB2, 2GRAM1 etc. codes under the species or for unidentified forbs or graminoids, then enter the Duration, Binary Wetland Code and Origin manually if known. Use the comments section to correlate each unidentified species within each polygon to the voucher specimen identification codes.

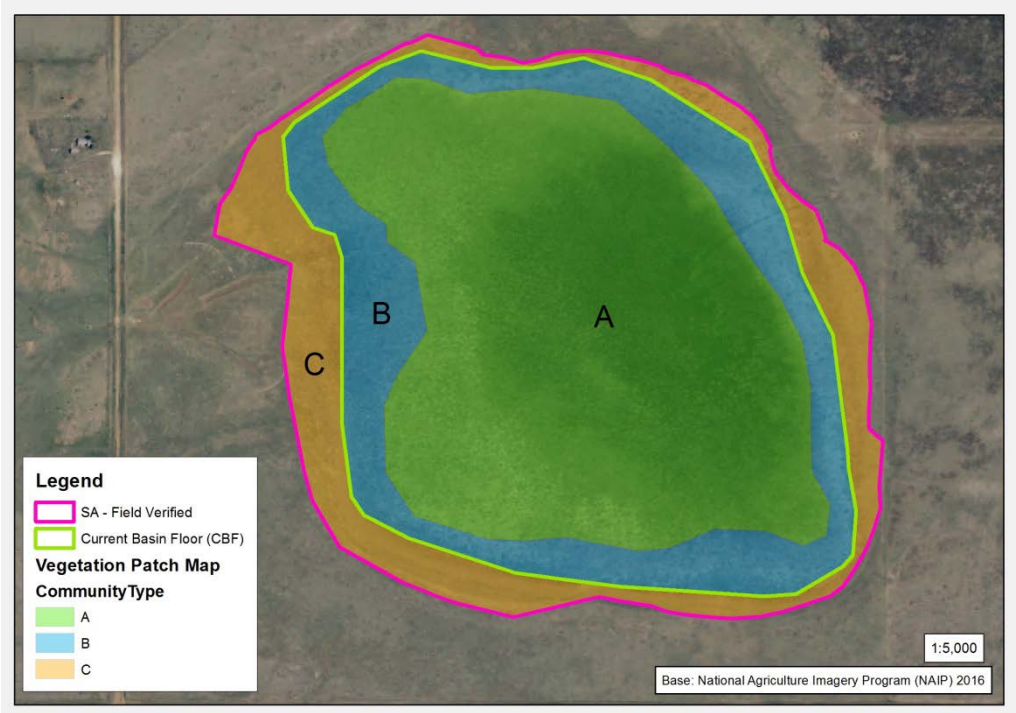

Figure 7. An example of a vegetation community patch map (SA Biotic Map) that underpins NMRAM Biotic metrics. The polygons are numbered and recorded on Worksheet 4.

Table 2. Wetland Species Indicator Status and NMRAM Binary Wetland Code (Based on 2012 National Wetland Plant List).

Wetland Indicator Status	Binary Wetland Code	
Obligate (OBL) Wetland Species	W	Wetland
Facultative Wetland (FACW)Species	W	Wetland
Facultative (FAC) Species	X	Non-Wetland
Facultative Upland (FACU) Species	X	Non-Wetland
Upland (UPL)Species	X	Non-Wetland

Undetermined (U)/ Non-Indicator (NI)	X	Non-Wetland

B6. Exotic Annual Plant Abundance

Definition: An index of the relative abundance of exotic annual plant species cover relative to the overall herbaceous plant cover within the playa wetland driven by local and landscape-scale impacts versus natural plant diversity in unimpacted playas.

Seasonality: Best assessed during the growing season when herbaceous species are most easily detected and identified.

Protocols: Exotic Annual Plant Abundance is based on relative abundance of exotic annuals versus the overall herbaceous plant cover in the SA using the vegetation patch map polygon composition with the level of disturbance rated based on the level of incursion of exotic annual species cover (Worksheet 4).

1. Calculate the Exotic Annual Plant Abundance score for all polygons using Worksheet 5.
2. For each mapped polygon within the CBF, enter Decimal % of the SA occupied, the sum of exotic annual species % cover, and the total sum of all herbaceous species % cover from Worksheet 4 on the "Current Basin Floor Polygons" section of Worksheet 5.
3. For each mapped polygon outside the CBF in the SA, enter Decimal % of the SA occupied, the sum of exotic annual species % cover, and the total sum of all herbaceous species % cover from Worksheet 4 on the "All Other Polygons in SA" section of Worksheet 5.
4. For each polygon, divide Exotic Annual Cover by Total Herbaceous Cover to get the Relative Exotic Annual Cover.
5. Multiply the Relative Exotic Annual Cover by the Decimal % of the SA and enter the result under Weighted Relative Exotic Annual Cover.
6. For all polygons sum Weighted Relative Exotic Annual Cover to determine the total Weighted Relative Exotic Annual Cover for the SA in the box at the bottom of Worksheet 5.
7. Multiply the total Weighted Relative Exotic Annual Cover for the SA by 100 to convert to final Exotic Annual Plant Abundance percent rating for the SA and use to rate the SA in Table B6
8. Enter overall SA rating from Table B6 on the SA Rank Summary Worksheet.

B7. Wetland Species Index

Definition: An index of wetland condition based on the presence and abundance of dominant or co-dominant wetland species in the CBF.

Seasonality: Best assessed during the growing season when herbaceous species are most easily detected and identified.

Protocols: Wetland Species Index is based on relative wetland species abundance on the CBF using the wetland status of the six dominant herbaceous species in the mapped vegetation patch polygons located within the CBF boundary (Worksheet 4).

1. On Worksheet 5, enter the sum of wetland species cover for each polygon designated as CBF on Worksheet 4.
2. For each polygon, divide Total Wetland Species Cover by Total Herbaceous Cover to get the Wetland Relative Cover.
3. Multiply the Decimal % of SA times the Wetland Relative Cover value and enter the result under Weighted Relative Wetland Cover.
4. Repeat for all CBF polygons and sum the scores in the box provided on Worksheet 5.
5. Multiply the total Weighted Relative Wetland Cover by 100 to convert to SA Wetland Species Abundance percent.
6. Based on the SA Wetland Species Abundance percent, rate the SA using Table B7.
7. Enter rating on the SA Rank Summary Worksheet.

B9. Vertical Habitat Disruption

Definition: An assessment of the impact of vertical structures and woody vegetation that have encroached on the playa due to habitat alterations by humans, including both constructed features and the presence of tall woody species not historically associated with playa habitat.

Seasonality: This metric is not sensitive to season.

Protocols: Vertical Habitat Disruption is provisionally mapped and labeled prior to field work, and verified and evaluated during the field reconnaissance.

1. During the initial reconnaissance and vegetation patch mapping using the Biotic Landscape Map, identify from Worksheet 6 and clearly label any vertical structures or woody vegetation that exceeds 2 m (6 ft) inside the SA and within 100-m of the SA boundary. Provide date of imagery.
2. Based on the mapped features and their extent, rate Vertical Habitat Disruption using Table B9. Enter rating on the SA Rank Summary Worksheet.

Abiotic Metrics

There are four Abiotic metrics that reflect the physical status of a playa wetland. Two are Level 2 field metrics: Soil Condition Index (A8) and Water Source Augmentation (A9). Playa Hydroperiod Reduction (A7) can be a Level 1 metric when an assessment is provisional, or the score can be further refined based on field data during a Level 2 assessment, and Playa Watershed Connectivity (A10) is primarily a GIS analysis with field verification.

The Abiotic team member is responsible for the final delineation of the CBF boundary drawn on the SA Abiotic Map (see Delineating Assessment Boundaries above for details). This team member verifies pit size relative to the CBF and determines the average pit depth for the Playa Hydroperiod Reduction (A7) metric. Additionally, the 500- or 1000-m LUZ is visually searched for features that could directly affect playa hydrology and sedimentation. These features are used to rate Water Source Augmentation (A9) and Playa Watershed Connectivity (A10) and are tracked

on metric-specific checklists as well as being recorded on the Abiotic Landscape Map during the survey.

The Abiotic team member conducts the soil sampling for the Soil Condition Index (A8), which will require auguring a minimum of three soil samples along a transect on the CBF following the protocols outlined below. Soil sample locations are marked on the SA Abiotic Map and GPS coordinates are recorded. Documentary photographs of horizons are recommended. Soil color is difficult to accurately photograph in the field, so care should be taken to assess the color correctly during the field visit.

Once the metrics have been rated, they are rolled up into a single Abiotic Attribute score on the SA Rank Summary Worksheet. The attribute narratives on the SA Cover Worksheet that describe SA conditions and impacts should also be completed at this time. The Hydrological Modifications and Physical Structure stressor checklists are filled out as part of the SA survey. These are used to aid interpretation of conditions in the overall assessment (see Stressor Checklists section below).

A7. Playa Hydroperiod Reduction

Definition: The degree to which the natural playa hydroperiod has been reduced by the existence of a pit excavation(s) in the playa floor that concentrates water and lowers flood height and aerial coverage.

Seasonality: This metric can be assessed in any season.

Protocols:

1. Prior to the field survey, map pit excavations in the playa floor in the GIS on the SA Abiotic Map for later verification. Do not include corresponding fill materials dumped adjacent to the pits.
2. Using worksheet 7, estimate the percentage aerial coverage of each pit with the SA and its average depth. Confirm sizes and depths during the field survey.
    a. For a Level 1 only assessment assume an average pit depth of 1.5 m.
    b. For a Level 2 assessment estimate the actual average pit depth during the field visit.
3. Using Table A7a as guide along with the narrative, rate the metric using Table A7b.

A8. Soil Condition Index

Definition: A soil-based index that assesses the alteration of the playa bottom soils by sediment accumulation due to anthropogenic impacts within the playa and in the surrounding watershed.

Seasonality: This metric must be measured when the sample transect described below is not flooded.

Protocol: This metric is based on determining the depth of non-basin-floor-clay sediment that overlies the indigenous, CBF clay pan and the degree of seasonal water saturation evident in the soils that reflects a functioning playa wetland (see Figure 1). The assessment is based on soil color and texture. As a minimum, playa soils should be sampled using an augur or shovel at three

points along a transect running from east to west across the CBF: one at the center and two towards the edges from east to west. The goal is to sample soil conditions along the CBF that are representative of sediment accumulation over the natural playa floor but with the exclusion of direct disturbance features such as pits, gullies and artificial fill piles. To aid in placement, locations for the soil cores can be identified from GIS before visiting the site.

1. Transect setup. From the aerial image, select a location near the center of the playa along which to place an east/west transect within the CBF boundary.
2. Along the transect, place one of the three sample points at or near the center of the CBF. The remaining points are then placed between five and 10 m from the CBF edge. For small playas, the east and west sample points should be a minimum of 10 m from the center location, and may be staggered (zig-zagged) when necessary to meet this spacing requirement.
3. Flag the soil sample sites, and record GPS locations on Worksheet 8. Samples should not be placed on artificially impacted soils including pits, gullies, and berms and recent alluvial fans that cover portions of the CBF. Adjustments to the sampling design made in the field should be documented on the map, with comments in the notes.
4. At the sample sites, dig or augur a soil sample to a maximum depth of 50 cm or until a layer of "basin-floor clay" ≥ 10 cm thick is encountered prior to reaching 50 cm.
5. To be characterized as a "basin-floor clay" the sediment must be clay in texture according to the soil texturing protocol found in Appendix C, and it must be dark and depleted with a Munsell value of 4 or less and chroma of 1 or 2 (chroma 1 for a value of 4).
6. During the digging process, the different layers (soil horizons) of the soil profile are characterized using Worksheet 8. For each layer, depth from the surface in cm is measured at the bottom of the layer.
7. Using a Munsell Soil Color Book, determine the hue, value and chroma of a representative sample of the soil matrix for each layer (mottling and inclusions should be noted in the comments). Coloring should be done on mixed and moistened soils.
8. If the soil meets the definition of a basin-floor clay as defined above, look closely at un-mixed clay aggregate faces for sediment coatings. A hand lens can be helpful but is not required to see these. If more than 10% of the aggregate faces are coated then estimate the proportion of sediment apparent on the face of the aggregates.
9. Details on determining soil texture and percent sediment, and soil matrix hue, value, chroma are provided in Appendix C.
10. For each layer, determine the soil texture by feel following the soil texture protocol found in Appendix C**.** Note in the comments the depth that the basin-floor clay is reached.
11. Documentary photographs of the soil core should be taken with a tape measure and the Munsell Soil Color Book laid out next to the soil sample and included in the photograph (Figure 8). Record photo numbers on Worksheet 8 (Photo #).
12. Using Table A8a, assign a soil color type as either type A or B to the top layer of the sample core based on the soil chroma and value from the Munsell Soil Color Book. Assignment of

chroma and value should be focused on the most prominent color of the layer - avoid inclusions or very thin surface layers. Enter “A” or “B” in the Soil Color Type box of the corresponding Core # on Worksheet 8.

13. Based on the depth from the surface of non-basin-floor-clay sediments (sediments above the clay pan) and the Soil Color Type, assign an Initial Core Raw Score to each profile using Table A8b and enter scores on Worksheet 8 (Core Raw Score box).
14. If there were on average >30% sediment coatings recorded within any basin floor clay layer found in the top 20 cm of the soil core, subtract 0.5 from the Core Raw Score to arrive at the Modified Score and enter the new value in the Modified Score box of the corresponding Core#.
15. A final Average SA Score is calculated by averaging the Core Raw Score or Modified Score for each core and entering the value on Worksheet 8, Average SA Score box. The Soil Condition Index is rated using Table A8c.

Figure 8. A documentary photograph of the soil sample is recommended. The top of the tape measure is the top of the core.

A9. Water Source Augmentation

Definition: Water source modifications that augment playa water supply and that may extend the hydroperiod, increase the frequency of wetting, or alter the extent of the playa when filled with water.

Seasonality: This metric can be assessed in any season.

Protocols: This metric focuses on detecting features that augment the water supply to the playa in the LUZ. Features are identified from the Landscape Map and during the field survey that would augment flow to the playa (e.g., adjacent intensive development, irrigated agriculture, etc.). While a preliminary GIS-based assessment can be conducted using available imagery and maps, many features that affect water inputs are often not apparent in imagery. Accordingly, this metric relies on careful attention during the field survey to features that affect water inputs, where they are, and their impact on the playa.

1. Prior to the field survey, map water source augmentation features within the LUZ on the Abiotic Landscape Map for verification, and check off water sources on Worksheet 9 with GIS as the source.
2. For features mapped in outer areas of the LUZ, conduct a vehicle reconnaissance verification as necessary. Use Worksheet 9 to verify GIS-checked features and if confirmed, mark them as verified (V) under Field. Add other features detected on the ground in the Field column.
3. During the initial field reconnaissance, search the LUZ zone from the PW boundary for water-source augmentation features. Use Worksheet 9 to verify previously checked features, and add newly identified features. Mark them as verified (V) under Field.
3. Rate the metric in Table A9 using the checklist as a guide along with the table narrative. Enter rating on the SA Rank Summary Worksheet.

A10. Playa Watershed Connectivity.

Definition: An assessment of the degree of hydrologic connectivity of surface water flows from the watershed surrounding the playa. The metric is measured noting physical features in the landscape that interrupt, hold back, store, or otherwise deplete natural water flows to the playa, causing a shortening of the hydroperiod, a lowering of the wetting frequency, and an overall reduction in playa function.

Seasonality: This metric can be assessed in any season.

Protocols: This metric focuses on detecting features that deplete the water supply to the playa in the LUZ. While a preliminary, GIS-based assessment can be conducted using available imagery and maps, many features that affect water depletions are often not apparent in imagery. Accordingly, during a Level 2 assessment this metric relies on careful attention during the survey to features that cause water depletions, their location, and their impact on the playa. The GIS assessment can help detect impacts further out in the LUZ such as erosion control features and impoundments that retain water in the adjacent landscape, but the impacts of these should be verified in the field via vehicle reconnaissance wherever possible.

1. Prior to the field survey, map physical features in the landscape that interrupt, hold back, store, or otherwise deplete natural water flows to the playa on the Abiotic Landscape Map for verification and check them off on Worksheet 10 with GIS as the source.
2. For features mapped in outer areas of the LUZ, conduct a vehicle reconnaissance verification as necessary. Use Worksheet 10 to verify GIS-checked features and if confirmed, mark them as verified (V) under Field. Check off other features detected on the ground and mark them verified (V) in the Field column.
3. During the field survey of the SA, visually search the LUZ from the PW boundary for water depletion features. Use Worksheet 10 to verify previously GIS-checked features, and add newly identified features. Mark them as verified (V) under Field. Unverified GIS features are marked with a "U."
4. Rate the metric in Table A10 using the checklist as a guide along with the table narrative. Enter rating on the SA Rank Summary Worksheet.

Stressor Checklists

Stressor checklists are designed to assess the intensity of stressors that occur within the SA and the LUZ. Stressors are anthropogenic disturbances which would be expected to have an effect on the condition of the SA. The purpose of the stressor checklists is to provide information that furthers the understanding of the current wetland condition. Stressors *are not* used in scoring and ranking the condition of the wetland.

Stressor checklists are grouped into four categories: 1) Land Use (Worksheet 11a); 2) Vegetation (Worksheet 11b); 3) Hydrologic Modifications (Worksheet 11c); and 4) Physical Structure (Worksheet 11d). Stressor checklists identify stressors that occur within the PW and the LUZ.

To complete the stressor checklists,

1. For each checklist, record absent, minor (<10% of the area), moderate (mod) (10-50% of the area) and intense (>50% of the area) stressors that occur in the LUZ and the PW.
2. Summarize the PW stressors by counting the stressors present per attribute category, by location and intensity class. (The fillable PDF will do this automatically).
3. Record any comments about the stressors in the comment box. Enter the total number of stressors by location and intensity on the SA Rank Summary Sheet and complete summary comments on the SA Cover Worksheet

Figure 9. Natural resource extraction is a common stressor on playa in the southern part of the reference domain.

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V. SA Ecological Condition Ranking

For each SA, the metric ratings are compiled, weighted and scored, and an overall weighted Condition Score and Rank for the SA are assigned on the SA Rank Summary Worksheet. The metric and attribute weighting hierarchy is built into the SA Rank Summary Worksheet such that individual and attribute category weighted scores can be calculated easily and then rolled up into a final numeric SA Wetland Condition Score and Rank. The PDF version of the form *automatically* compiles the scores from the various worksheets, computes a ranking score from 1.0 (poor) to 4.0 (excellent), and assigns a letter SA Wetland Condition Rank as follows:

Rating descriptions

- A, Excellent Condition (>3.25-4.0)) – wetlands with intact functions and processes, unaltered playa floors, appropriate vegetative communities dominated by native herbaceous species with wetland indicator species relatively common and very few to no exotic annuals, no introduced vertical structures, and usually of medium to large absolute size with no reduction in size due to boundary disturbances or disturbances within the playa. These wetlands are largely undisturbed, with a minimal human footprint both within the playa and in the surrounding landscape; they are wetlands considered to meet the wetland reference standard.
- B, Good Condition (>2.5-3.25) – somewhat degraded in response to environmental stressors. These wetlands have various combinations of relatively minor disturbances or factors negatively affecting condition, e.g., some alteration of the hydrological and sediment regimes due to on-site or surrounding landscape anthropogenic disturbances; minor alterations to the playa floor; native herbaceous species dominate majority of vegetation patches but may have some patches dominated by exotic annual plant species; few to no introduced vertical structures; and often of medium or large absolute size with minimal reduction in size due to boundary disturbances. Often, these wetlands are good candidates for wetland restoration because impacts can be reversed with a high likelihood of recovery. Wetlands in good condition may be the best available.
- C, Fair Condition (>1.75-2.5) – moderately degraded in response to environmental stressors. These wetlands have one or more factors that significantly affect condition, e.g., significantly disrupted hydrological or sediment regimes; significant alterations of the playa floor; degraded vegetative condition marked by presence of some community types dominated by exotic annuals or upland species, more than a few introduced vertical structures; usually of small to medium absolute size, or a reduction in size due to boundary disturbances or disturbances within the playa. The surrounding landscape is often significantly modified so that it affects playa function, but may have some natural elements remaining. These wetlands may have restoration potential depending on specific wetland conditions and on the stressors that are affecting that condition. However, restoration measures are expected to be more extensive (and maybe more costly) than B-ranked wetlands.
- D, Poor Condition (1.0 -1.75) – a combination of factors that significantly degrade the playa wetland with highly disrupted hydrological and sediment regimes, highly altered playa bottoms, poor vegetative composition that is dominated by exotic annuals and upland species, and usually of small to medium absolute size, or highly modified size due to

boundary disturbances and disturbances within the playa. These wetlands often have little or no undisturbed surrounding landscape. These wetlands generally would require extensive rehabilitation measures to realize their natural potential and provide their ecological functions.

Default Ratings for Special Cases

On the SA Rank Summary Worksheet rating method selection section there are also two options for automatic rankings for playas under special cases where the playa is highly altered and the rating defaults to a "D" rank as follows:

- Playas that have been altered to hold water year-round, with the entire playa bottom perennially wetted (e.g., man-made lake).
- A playa that has been filled completelywith sediment or modified by land uses to the point it is no longer recognizable as a playa wetland (e.g., converted fully to cropland).

In both cases, notes should be provided under the Assessment Summary on the SA Cover Worksheet about the alterations.

Figure 10. A playa that has been altered to hold water year-round.

Figure 11. A playa that has been completely converted by earthwork.

Provisional and Final Scores

While final scoring will generally occur during a final post-field review, a Provisional Field Score and Rank is assigned in the field to allow any questions or gaps in the data set to be addressed before a Final Score and Rank is assigned. Accordingly, there is a box at the bottom of the SA Cover Worksheet for a Provisional Field Score and Rank and the initials of the team member who provided the provisional score and rank. The Final Score and Rank is also recorded on the bottom of the SA Cover Worksheet and includes the initials of the team member who provided the score and the final date of scoring.

Reporting and the NMED Surface Water Quality Bureau – Water Quality Integrated Database (SQUID)

The worksheets, maps, and photographs together make up the NMRAM Assessment Package. Any of the package components can be used individually in project-level reports, but the package is also designed for entry into the SQUID Database. This database is intended as a comprehensive, central clearing house for information on New Mexico's waters with a web interface providing various reporting tools to facilitate the analysis of single and comparison of multiple sites from around the state.

See https://www.env.nm.gov/surface-water-quality/ for updates.

VI. References

Daniel, D. W., L. M. Smith, D. A. Haukos, L. A. Johnson, and S. T. McMurry. 2014. Land Use and Conservation Reserve Program Effects on the Persistence of Playa Wetlands in the High Plains. Environmental Science & Technology 48:4282-4288.

Haukos, D. A., and L. M. Smith. 1997. Common flora of the playa lakes. Texas Tech University Press, Lubbock.

Appendix A

New Mexico Rapid Assessment Method

Playa Wetlands

Field Guide Worksheet Packet

(Version 1.2)

This packet of worksheets is provided for conducting the New Mexico Rapid Assessment Method (NMRAM) for Playa Wetlands. The worksheets are used in conjunction with the Field Guide for evaluation of five Level 1 GIS mapping metrics (Absolute Playa Size, Surrounding Land Use, Playa Configuration, Playa Hydroperiod Reduction and Playa Watershed Connectivity), five Level 2 field-based metrics (Exotic Annual Plant Abundance, Wetland Species Index, Vertical Habitat Disruption, Soil Condition Index and Water Source Augmentation) and evaluation of stressors using Stressor Checklists. The worksheets are designed for either paper use or digital application using an active fillable PDF available from the New Mexico Environment Department Surface Water Quality Bureau (https://www.env.nm.gov/surface-water-quality/). The PDF version computes some of the metric scores and auto-fills the SA Rank Summary Worksheet and headers. If the field team members use paper versions in the field, they can fill in a PDF later to compute the scores and make reports. Regardless, all raw data must be collected first.

NMRAM Playa Wetlands Version 1.2

SA Cover Worksheet			
SA Code	Partial PW ☐	Project	
SA Name	PW		
AU Code	AU Name		
SA General Location and Boundary (Rationale, comments)			
Driving Directions and Required Site Permissions.			
Ownership		Data Sharing Restrictions	

Surveyor Role	Surveyor Name	Initials	Playa Hydrology	
Size & Landscape			Water Present?	
Biotic			Last Known Inundation	
Abiotic			Water Source	
Stressors				

Northing	Easting	Zone	Datum	Latitude	Longitude
Survey Date		**Start Time**		**End Time**	

SA Description

SA Landscape Context (summarize the wetland and surrounding landscape; include condition and impacts)

SA Biotic Condition (vegetation patterns, composition and structure, exotics and invasives, disturbance evidence, fire and herbivory)

SA Abiotic Condition (hydrological alterations, sediment inputs, water sources, modifications to playa shape, soil features, soil disturbance, pits and fill, other SA impacts)

Assessment Summary (Overall site condition summary and comments after the field data is collected.)

Provisional Field Score _____ Rank _____ Surveyor(s) _____	Final Score _____ Rank _____ Initials _____ Date _____

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

Choose one of the ratings below.	
○	**All metrics measured**
○	Level 1 metrics only for currently inundated playa
○	Playa completely filled with sediment and no longer exists. **SA Wetland Rank =D**
○	Playa permanently filled with water from artificial sources. **SA Wetland Rank=D**

Does the SA include the whole PW?	
○	The SA includes the entire PW
○	The SA is partial but represents the entire PW
○	The SA is partial and represents a portion of the PW

NMRAM - SA Rank Summary Worksheet: Playa 1.2

Metric Description	Rating	Weight	Final Score
Size		Σ	
S1. Absolute Playa Size		1	
Landscape Context		Σ	
L4. Surrounding Land Use		0.5	
L5. Playa Configuration		0.5	
Biotic		Σ	
B6. Exotic Annual Plant Abundance		0.4	
B7. Wetland Species Index		0.4	
B9. Vertical Habitat Disruption		0.2	
Abiotic		Σ	
A7. Playa Hydroperiod Reduction		0.3	
A8. Soil Condition Index		0.3	
A9. Water Source Augmentation		0.2	
A10. Playa Watershed Connectivity		0.2	

SA Condition Scoring Summary

Major Attribute	Score	Weight	Weighted Score
Size		0.1	
Landscape Context		0.25	
Biotic		0.3	
Abiotic		0.35	
SA WETLAND CONDITION SCORE Σ			
SA WETLAND RANK =			

Level One SA Condition Scoring Summary

Metric	Score
S1. Absolute Playa Size	
L4. Surrounding Land Use	
L5. Playa Configuration	
A7. Playa Hydroperiod Reduction	
A10. Playa Watershed Connectivity	
LEVEL ONE SA WETLAND CONDITION SCORE (Average)	
LEVEL ONE SA WETLAND RANK =	

SA Ratings

Rank	Score	Description
A	≥3.25 - 4.0	Excellent Condition
B	≥2.5 - <3.25	Good Condition
C	≥1.75 - <2.5	Fair Condition
D	1.0 - <1.75	Poor Condition

Stressor Summary	Land Use Zone			Playa Wetland		
	Minor	Moderate	Intense	Minor	Moderate	Intense
Total # Stressors						

SA CODE: Date:

SA Name: Surveyor Initials:

Size

S1. Absolute Playa Size

Worksheet 1. Playa Area The area of the absolute playa size includes the annulus and basin floor. Estimate the absolute playa size using aerial photography or other wetland maps whose rules include the annulus and basin floor. Field check absolute playa size for any significant deviations or misinterpretations. Enter absolute playa size on worksheet 1 and Table S1 and enter rating on SA Rank Summary Worksheet.

Hectares	Acres

Table S1. Ratings for Absolute Playa Size

Score	Size	Description
○ 4	≥ 8 ha (≥ 20 acres)	Very large playa compared to other examples of the same type and potentially capable of supporting a wealth of biodiversity in a functional sustaining ecosystem.
○ 3	≥4 - <8 ha (≥5 - <20 acres)	Large playa compared to other examples of the same type.
○ 2	≥1 - <4 ha (≥2.5 - <5 acres)	Medium size playa compared to other examples of the same type.
○ 1	<1 ha (<2.5 acres)	Small playa unlikely to sustain full biodiversity and highly susceptible to impacts.

Landscape Context

L4. Surrounding Land Use

Worksheet 2. Land Use Index (LUI). Enter the percent of the Land Use Zone (LUZ) area occupied by a given land use element. Note that for playas less than 8 ha (20 acres), use 500 meter LUZ area. For playas greater than or equal to 8ha, use 1000 meter LUZ area. Calculate LUI Score by element as the product of the element impact coefficient times the percent area occupied by the element. Sum the weighted scores to create the final LUI scores. (total area occupied must equal 100%.) Rate using Table L4 and enter the rating in the SA Rank Summary Worksheet.

Land Use Element	Coef	% LUZ	LUI Score
Urban/suburban development, permanent structures (houses, barns, commerical buildings) paved and unpaved parking lots	0		0
City parks, sports fields and courses, commercial landscapes maintained	0.2		
orchards, tree plantations, windbreaks	0.2		
Paved road (highway or residential), graded gravel or dirt road	0		
Two-track dirt road, livestock trails, hiking trails	0.6		
Gas pump, drill pad, pipeline (above or below ground), storage tanks	0		
Wind Turbines	0.4		
Powerline without road	0.8		
Center pivot agricultural field, irrigated row crop, plowed fields, orchards or tree plantations	0.2		
Stock tanks, ditch, dirt or rock mounds, berms, bare dirt	0.4		
Trash piles, dumps or old vehicles	0.1		
Dairy, feedlot, paddocks	0		
Pasture, vegetated fallow or old field, CRP Fields	0.6		
Contour rangeland erosion control features	0.5		
Mature restoration areas returned to natural conditions (native vegetation, no contouring)	0.8		
Open rangeland - natural land, area managed for natural vegetation	1		
LUI Score Sum			

Table L4. Ratings for Surrounding Land Use Based on the LUI Scores

Rating	LUI Score
○ 4	≥95 - 100
○ 3	≥80 - <95
○ 2	≥40 - <80
○ 1	<40

Calculate L4 Rating

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

L5. Playa Configuration

Worksheet 3. Playa Configuration. Check features that impinge on the natural shape and boundary configuration and the interior of the playa. Provide visual estimate of percent playa area occupied by each disturbance feature type that causes departure from natural shape of playa including features within the playa . Mark whether the disturbance feature is GIS-based only, field based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table L5 and enter rating in L5 box on the SA Rank Summary Worksheet.

Imagery Date

Disturbance Features	%of SA	Source	
		GIS	Field
Excavation (pits, ditches, trenches, earthen tanks along perimeter of playa only)		☐	
Fill (Berms, rubble, trash piles, fill materials)		☐	
Unpaved roads and trails		☐	
Paved Roads, parking lots		☐	
Dairy/feedlot paddock		☐	
Oil/gas/windmill platforms and lines		☐	
Alluvial fans		☐	
Erosion gullies		☐	
Buildings		☐	
Agricultural field leveling, center-pivot fields, row crops		☐	
Disking, grading, plowing		☐	
Mining/gravel excavation		☐	
Recontouring for stormwater catchment		☐	
Concrete culverts		☐	
Buried sewer/utility lines, pipelines, storage tanks		☐	
Other		☐	

Table L5. Rating for Playa Configuration

Rating		Description
○ 4	<5%	Playa configuration intact; little or no disruption due to anthropogenic disturbance, PW generally round, elliptical or teardrop shaped with no obvious reduction from historic size.
○ 3	≥5% - <10%	Some limited disturbance to the playa configuration; disturbance features generally small and low impact. No berms or elevated constructed features on the interior of the PW. PW mostly round, elliptical or teardrop shaped with some alteration of the natural border and minimal reduction from historic size.
○ 2	≥10% - <25%	Clear evidence of disturbance to playa configuration: disturbance features have moderate impact.May have small berms or few elevated constructed features on the interior of the PW. PW deviating from round, elliptical or teardrop shape on at least one side with obvious alteration of the natural border and noticeable reduction from historic size.
○ 1	≥25%	Playa configuration highly disrupted with many or large disturbance features having a high impact. Berms or elevated constructed features on the interior of the PW are large or numerous. PW no longer round, elliptical or teardrop shaped with an obvious irregular border on many sides and a noticeable reduction from historic size. A road through the interior of a PW rates an automatic 1.

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

Photo Point Log for Playa and Watershed Photographs (Taken along Playa Wetland Boundary at each cardinal direction point)							
Cardinal Direction	**Easting**	**Northing**	**Latitude**	**Longitude**	**Playa**	**Watershed**	**Comments**

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

Biotic

Worksheet 4. Species composition by polygon for Exotic Annual Plant Abundance and Wetland Species Index metrics. Record Polygon location as "CBF" for Current Basin Floor or "Other" for other surrounding polygons in the SA. Record % of SA as the percentage of the SA occupied by the map polygon; the sum of all polygons must equal 100%. Record % woody cover and each herbaceous species cover as actual percent (e.g., 8% as 8). "D" refers to duration recorded as either "A" for annual or biennial, "P" for perennial or "U" for Unknown. "W" refers to the binary Wetland Code in Table 2 in the Field Guide, and is recorded as either "w" for wetland or "x" for non-wetland or unknown. "O" refers to Origin and is recorded as "N" for native species, "E" for exotic or introduced species, and "U" for unknown species or unknown origin.

Polygon	Playa Location	% of SA	% Woody Cover	Species1	% Cover	D	W	O	Species2	% Cover	D	W	O	Species 3	% Cover	D	W	O	Species 4	% Cover	D	W	O	Species 5	% Cover	D	W	O	Species 6	% Cover	D	W	O
1																																	
2																																	
3																																	
4																																	
5																																	
6																																	
7																																	
8																																	
9																																	
10																																	
11																																	
12																																	

Comments (other species of note; status, environmental conditions; voucher specimens collected for unknowns.)

Calculate

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

B6. Exotic Annual Plant Abundance

	Worksheet 5. Annual Exotic Plant Abundance and Wetland Species Index Scoring								
			Annual Exotic Plant Abundance				Wetland Species Index		
Polygon Location	**Polygon Number**	% of SA	Exotic Annual Cover	Total Herbaceous Cover	Relative Exotic Annual Cover	**Weighted Relative Exotic Annual Cover**	Total Wetland Cover	Relative Wetland Cover	**Weighted Relative Wetland Cover**
Current Basin Floor Polygons									
								Σ Weighted Relative Wetland Cover	
All Other Polygons in SA									
∑ Weighted Relative Exotic Annual Cover									

Table B6. Ratings for Exotic Annual Plant Abundance

Rating	Weighted Relative Annual Cover	Description
○ 4	0%	**Excellent Condition.** Exotic annual species are not present or very scarce in the SA and not significant components of any vegetation polygon to make the list of six species.
○ 3	≤5%	**Good Condition.** Exotic annual species are present in the SA but have low abundance and only make the list of six species at low cover in few or smaller vegetation polygons.
○ 2	>5 - ≤30%	**Fair Condition.** Exotic annual species are common in the SA, included on the list of six species in many vegetation polygons, or present in high cover in one or two smaller vegetation polygons.
○ 1	>30%	**Poor Condition.** Exotic annual species abundant and present throughout the SA, and/or the dominant species in many vegetation polygons.

Table B7. Ratings for Wetland Species Index

Rating	Weighted Relative Wetland Cover	Description
○ 4	>50%	Excellent wetland status. Facultative wetland and/or obligate wetland species are dominant and abundant in most patches within the current basin floor.
○ 3	>25 - ≤50%	Good wetland status. Wetland and non-wetland species mixed across the current basin floor, either co-dominants or alternating dominance and abundance among vegetation patches.
○ 2	>5 - ≤25%	Fair wetland status. Non-wetland species are dominant and abundant but some wetland species are represented in the top 6 dominants for some patches on the current basin floor.
○ 1	≤5%	Poor Wetland Status. Wetland species are poorly represented in, or absent from the top 6 dominants for most patches, or are completely absent from the current basin floor.

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

B9. Vertical Habitat Disruption

Worksheet 6. Vertical Habitat Disruption. Check vertical structure features that occur within the SA or 100 m (328ft) of the SA Boundary (buffer) . Provide number of features by type. Mark whether the disturbance feature is GIS-based only, field-based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table B9 and enter rating in B9 box on the SA Rank Summary Worksheet.

Imagery Date

Vertical Structure	Number of Features		Source	
Feature	SA	100m	GIS	Field
Buildings, towers and utility lines			☐	
Power lines/Wind turbines			☐	
Small windmills, road signs, billboards			☐	
Oil or gas derrick			☐	
Single tree			☐	
Grove of trees or tall shrubs (estimate # of individuals)			☐	
Scattered trees and tall shrubs (estimate # of individuals)			☐	
Tall fence (> 2m)			☐	
Other			☐	

Table B9. Ratings for Vertical Habitat Disruption

Rating	Description
○ 4	No vertical structures or tall woody vegetation within the SA and 100 m
○ 3	No vertical structures or tall woody vegetation within the SA, and only 1 structure or a small grove of trees (<4 trees) within the 100 m
○ 2	No vertical structures or tall woody vegetation within the SA, and 2-4 vertical structures or larger grove of trees (4-10 trees) within the 100 m
○ 1	Vertical structures or trees are within the SA; and/or more than 4 vertical structures, many scattered trees or shrubs, or large grove of trees (>10 trees) within the 100 m, power lines or wind turbines in the SA or within 100 m ranks D.

SA CODE: Date:

SA Name: Surveyor Initials:

Abiotic

A7. Playa Hydroperiod Reduction

Worksheet 7. Playa Hydroperiod Reduction. Enter pit area as percentage of the CBF and the average depth of the pit. Using Table A7a find the rating for Playa Hydroperiod Reduction using the Pit% of CBF and average pit depth. If average pit depth is unknown, use 0.5-2m depth. Enter the rating on Table A7b and in the SA Rank Summary Worksheet.

Pit % of CBF	Pit avg. depth (m)

Table A7a. Playa Hydroperiod Reduction rating calculation

	Average pit depth		
Pit % of CBF	<.5m	.5 - 2m	>2m
<1%	4	4	3
≥1 - <5%	4	3	2
≥5 - <10%	3	2	1
≥10%	2	1	1

Table A7b. Ratings for Playa Hydroperiod Reduction

Rating	Description
○ 4	Little or no playa wetland hydroperiod reduction by excavations that drain waters into a pit or trench.
○ 3	Some playa wetland hydroperiod reduction by excavations that drain waters into a pit or trench.
○ 2	Moderate playa wetland hydroperiod reduction by excavations that drain waters into a pit or trench.
○ 1	Excessive hydroperiod reduction by excavations that drain waters into a pit or trench.

A8. Playa Soil Condition Index

Worksheet 8. Soil Condition Index. Number each core location along the transect on the Abiotic Map. On Worksheet 8, select the core location (East/Center/West) and fill in GPS coordinates. Characterize soil layers to a depth of 50 cm (20 in) for each core, photograph and record photo # of the soil core. For clay pan layers, record an estimate of % percent sediment intrusion and indicate clay pan in the comments box. Using the uppermost layer for each soil core, assign a Soil Color Type as A or B from the soil value and chroma according to Table A8a and enter in the Soil Color Type box for the core. Using the Soil Color Type identified from Table A8a, select the soil condition raw score based on the depth to the clay pan measured from the surface and enter in the Core Raw Score box for the core. If > 30% sediment intrusion was recorded for the clay pan layer, then reduce the Core Raw Score by 0.5 and fill in the Modified Score box for the core. Average the three core scores and enter into the Average SA score box. Rate the Soil Condition Index using the Average SA Score on Table A8c and enter rating on SA Rank Summary Worksheet.

Core # 1 | Easting | Northing | Photo #

Layer	Depth (cm)	Hue	Value	/	Chroma	Texture	% Sediment	Comments	Soil Color Type:
				/					
				/					Core Raw Score:
				/					
				/					Modified Score:
				/					

Core # 2 | Easting | Northing | Photo #

Layer	Depth (cm)	Hue	Value	/	Chroma	Texture	% Sediment	Comments	Soil Color Type:
				/					
				/					Core Raw Score:
				/					
				/					Modified Score:
				/					

Core # 3 | Easting | Northing | Photo #

Layer	Depth (cm)	Hue	Value	/	Chroma	Texture	% Sediment	Comments	Soil Color Type:
				/					
				/					Core Raw Score:
				/					
				/					Modified Score:
				/					

Notes for Soil Cores:

Table A8a. Soil Color Type assignment based on soil chroma and value

	Value	2	2.5	3	4	5-8
Chroma	1	A	A	A	A	B
	2	A	A	A	B	B
	3-8	B	B	B	B	B

Table A8b. Playa soil condition raw scores based on depth to clay pan measured from the surface and soil color type from Table A8a.

Non-Clay depth from the surface (cm)	Soil Color Type A Dark Soils Raw Scores	Soil Color Type B Light Soils Raw Scores
0-<2	4	3.5
≥2-<5	3.5	3
≥5-<10	3	2.5
≥10-<15	2.5	2
≥15-<20	2	1.5
≥20	1.5	1

Average SA Score:

Table A8c. Rating for Soil Condition Index

Rating	Description
4	SA Soil Condition Score ≥3.5 - 4
3	SA Soil Condition Score ≥2.5 - <3.5
2	SA Soil Condition Score ≥1.5 - <2.5
1	SA Soil Condition Score <1.5

SA CODE: Date:

SA Name: Surveyor Initials:

A9. Water Source Augmentation

Worksheet 9. Water Source Augmentation. Check water sources that increase inflows from artificial sources. Include features that occur within the LUZ. Mark whether the disturbance feature is GIS-based only, field-based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table A9 and enter rating on the SA Rank Summary Worksheet.

Imagery Date

		Source	
	Water Source	GIS	Field
☐	Artificial inlets such as channels, ditches, gullies	☐	
☐	Pumps, hoses	☐	
☐	Roads, trails that concentrate and channel water into the playa	☐	
☐	Irrigated agriculture runoff	☐	
☐	Stormwater discharges or other effluent input, culverts, pipes	☐	
☐	Dairy/ feedlot discharges	☐	
☐	Discharges from impervious surfaces adjacent to the playa	☐	
☐	Other	☐	

Table A9. Ratings for Water Source Augmentation

Rating	Description
○ 4	No artificial water sources to the PW from the surrounding LUZ.
○ 3	Evidence of occasional or small amounts of additional inflow to PW from anthropogenic sources; e.g., minimal adjacent impervious surfaces, road runoff from minimal drainage area.
○ 2	Evidence that PW receives appreciable inflow from anthropogenic sources; e.g., storm drains or local point source discharges; Roads, trails, or erosional gullies divert and concentrate runoff; impervious surfaces and/or irrigated agriculture contribute appreciable runoff into PW.
○ 1	Site is commonly inundated most or all of the time from artificial water sources; e.g., supplemental pumping; storm drains that drain extensive impervious surfaces; or industrial pipe discharges.

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

A10. Playa Watershed Connectivity

Worksheet 10. Playa Watershed Connectivity. Check watershed features that decrease inflows to PW. Include features that occur within the LUZ (500 m for playas < 8ha, 1000 meters for playas ≥ 8ha) . Mark whether the disturbance feature is GIS-based only, field based, or GIS-based and verified in the field. Provide date of imagery. Rate using Table A10 and enter rating on the SA Rank Summary Worksheet.

Imagery Date

	Feature	Source	
		GIS	Field
☐	Contour rangeland erosion control features that prevent runoff to the playa	☐	
☐	Roads, trails that interrupt, change direction and/or hold back sheet flow into the playa	☐	
☐	Earthen or stock tanks, ponds that capture surface flows upslope of the playa	☐	
☐	Active pumping of water out of the playa to the surrounding landscape	☐	
☐	Furrows and dryland agriculture that intercepts runoff to the playa	☐	
☐	Ditches, dams, berms that capture natural flows and convey flow away from the playa	☐	
☐	Other	☐	

Table A10. Ratings for Playa Watershed Connectivity

Rating	Description
○ 4	No landscape alterations that restrict or prevent natural flows into the playa from the surrounding watershed; no pumping from the playa.(0%)
○ 3	Evidence of minor restrictions of inflow to SA from surrounding watershed; e.g., agricultural restrictions or road diversions from a small portion of the watershed. (>0 - <10% of runoff affected)
○ 2	Evidence of appreciable restrictions of natural runoff into the playa; e.g., contour terracing or berms surrounding a large portion of the playa; pumps or direct withdrawals of water from the playa; multiple earthen tanks along natural draws. (≥10 - <40% of runoff affected)
○ 1	Playa is commonly dry most or all of the time from extensive land alterations in the watershed that restrict natural surface flow; e.g., contour terracing surrounding most of the playa; active pumping; multiple features that convey most of the natural surface flow away from the playa. (≥40 - 100% of runoff affected)

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

Stressors

Worksheet 11. Stressor Checklists. For each checklist below, during the field reconnaissance check each stressor whether it is absent, occupies less than 10%, 10-50%, or more than 50% of the LUZ or PW. Note that for playas less than 8 ha (20 acres), use 500 m LUZ. For playas greater than or equal to 8ha, use 1000 m LUZ. Naturally occurring disturbances (e.g. lunettes, low intensity wildlife trails) are not included on these checklists. Fill in any comments in box after Worksheet 11d.

Worksheet 11a. Land Use.

Land Use	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Residential development	☐	☐	☐	☐	☐	☐	☐	☐
Industrial/commercial development	☐	☐	☐	☐	☐	☐	☐	☐
Military training/air traffic use	☐	☐	☐	☐	☐	☐	☐	☐
Transportation corridor	☐	☐	☐	☐	☐	☐	☐	☐
Sports fields and urban parklands (golf courses, soccer fields, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Intensive row-crop agriculture	☐	☐	☐	☐	☐	☐	☐	☐
Orchards/Nurseries	☐	☐	☐	☐	☐	☐	☐	☐
Dryland farming	☐	☐	☐	☐	☐	☐	☐	☐
High intensity commercial livestock (dairy,feedlots, etc.).	☐	☐	☐	☐	☐	☐	☐	☐
Moderate enclosed livestock areas, horse paddocks.	☐	☐	☐	☐	☐	☐	☐	☐
Ranching - low intensity (livestock rangeland)	☐	☐	☐	☐	☐	☐	☐	☐
Passive recreation (bird-watching, hiking, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Active recreation (off-road vehicles, mountain biking, hunting, fishing, recreational camping)	☐	☐	☐	☐	☐	☐	☐	☐
Physical resource extraction, mining, quarrying (rock, sediment)	☐	☐	☐	☐	☐	☐	☐	☐
Biological resource extraction (aquaculture, commercial fisheries, horticultural and medical plant collecting)	☐	☐	☐	☐	☐	☐	☐	☐
Trash Dump / Land Fill	☐	☐	☐	☐	☐	☐	☐	☐
Stormwater management/detention land modifications	☐	☐	☐	☐	☐	☐	☐	☐
Wind turbine, power lines	☐	☐	☐	☐	☐	☐	☐	☐
Oil/gas pads, pumps, pipelines, holding tanks	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

Worksheet 11b. Vegetation (Biotic).								
Vegetation	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Mowing	☐	☐	☐	☐	☐	☐	☐	☐
Grazing, excessive herbivory	☐	☐	☐	☐	☐	☐	☐	☐
Excessive human visitation -trampling	☐	☐	☐	☐	☐	☐	☐	☐
Predation and habitat destruction by non-native vertebrates, including feral introduced naturalized species (domestic livestock, exotic game animals, and pet predators)	☐	☐	☐	☐	☐	☐	☐	☐
Tree/Sapling or shrub encroachment	☐	☐	☐	☐	☐	☐	☐	☐
Treatment of non-native and nuisance plant species	☐	☐	☐	☐	☐	☐	☐	☐
Pesticide application or vector control	☐	☐	☐	☐	☐	☐	☐	☐
Biological resource extraction or stocking (various)	☐	☐	☐	☐	☐	☐	☐	☐
Introduction of exotic grasses	☐	☐	☐	☐	☐	☐	☐	☐
Agricultural crops	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐

Worksheet 11c. Hydrologic Modifications.								
Hydrologic Modifications	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Point source discharges, other non-storm water discharge	☐	☐	☐	☐	☐	☐	☐	☐
Non-point source discharges (road and urban runoff, farm drainage)	☐	☐	☐	☐	☐	☐	☐	☐
Flow diversions or unnatural inflows (restrictions and augmentations)	☐	☐	☐	☐	☐	☐	☐	☐
Culverts	☐	☐	☐	☐	☐	☐	☐	☐
Excavated inlet/channel/outlet	☐	☐	☐	☐	☐	☐	☐	☐
Groundwater extraction	☐	☐	☐	☐	☐	☐	☐	☐
Earthen tanks	☐	☐	☐	☐	☐	☐	☐	☐
Center-pivot irrigation	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

Worksheet 11d. Physical Structure.								
Physical Structure (Soil/Substrate)	Land Use Zone				Playa Wetland			
	Absent	Minor <10%	Moderate 10-50%	Intense >50%	Absent	Minor <10%	Moderate 10-50%	Intense >50%
Filling or dumping of sediment or soils (N/A for restoration areas)	☐	☐	☐	☐	☐	☐	☐	☐
Grading/Compaction (N/A for restoration areas)	☐	☐	☐	☐	☐	☐	☐	☐
Plowing/Disking (N/A for restoration areas)	☐	☐	☐	☐	☐	☐	☐	☐
Resource extraction (sediment, gravel, oil and/or gas)	☐	☐	☐	☐	☐	☐	☐	☐
Vegetation management as negative impact (terracing, root plowing, pitting, drilling seed, or other practices that disturb soil surface)	☐	☐	☐	☐	☐	☐	☐	☐
Disruption of leaf litter/humus, or peat/organic layer, or biological soil crust	☐	☐	☐	☐	☐	☐	☐	☐
Excessive sediment or organic debris (e.g. excessive erosion, gullying, slope failure)	☐	☐	☐	☐	☐	☐	☐	☐
Pesticides or trace organics impaired (point source or non-point source pollution)	☐	☐	☐	☐	☐	☐	☐	☐
Trash or refuse	☐	☐	☐	☐	☐	☐	☐	☐
Disruption of clay pan	☐	☐	☐	☐	☐	☐	☐	☐
Oil/gas field dumping, bring dumping, pipeline releases	☐	☐	☐	☐	☐	☐	☐	☐
Potash mining residue, by-products	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐

Stressor Comments

Worksheet 11e. Stressor Summary.						
Stressor Summary	Land Use Zone			Playa Wetland		
	Minor	Moderate	Intense	Minor	Moderate	Intense
Total # Land Use Stressors						
Total # Vegetation (Biotic) Stressors						
Total # Hydrologic Modification Stressors						
Total # Physical Structure Stressors						
Total # Stressors						

calculate stressors

Version Date: 04/05/2018

Beware this will clear all the data you just entered. Reset Form

Schema: Playa 1.2

SA CODE: **Date:**

SA Name: **Surveyor Initials:**

Photo Point Log. AZM = azimuth compass direction of photo; GPS UTM northing and eating location.

Photo PT File	AZM	Northing	Easting	Latitude	Longitude	Description	Initial

APPENDIX B: Common Plants From Playas in the Southern High Plains of New Mexico.

This list is compiled from vegetation data gathered by Natural Heritage New Mexico botanists from playa wetland field sites in New Mexico in 2014 and 2017, during the development of NMRAM Playa Wetlands. The list is not intended to be comprehensive but rather a guide to the most likely species to be encountered and which will play a role in biotic metric scoring. Some species may have occurred in many playas, while others may have been encountered only once. For additional species accounts and information see Haukos and Smith (1997).

All species are listed alphabetically by scientific name within lifeform group (tree, shrub, sub-shrub, graminoid, or forb) following the USDA plants database nomenclature. Also included are common name, plant family, USDA Plants Symbol database code, NHNM ACRO1 database code (seven letters with three for genus, three for species epithet, and a numerical tie breaker), duration (P=perennial, A=annual/biennial), origin (E=exotic, N=native), National Wetland Status for Region 7 per the 2012 USDA Plants database, and NMRAM binary wetland code (X=no-status/upland/facultative upland/facultative/non-indicator, W=obligate/facultative wetland).

The USDA Plants symbol, duration, NMRAM binary wetland codes and origin are used on Worksheet 4.

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Trees								
Ulmus pumila	Siberian elm	Ulmaceae	ULPU	ULMPUM	P	E		X
Shrubs								
Artemisia filifolia	sand sagebrush	Asteraceae	ARFI2	ARTFIL	P	N		X
Atriplex canescens	fourwing saltbush	Chenopodiaceae	ATCA2	ATRCAN	P	N		X
Cylindropuntia imbricata	tree cholla	Cactaceae	CYIM2	CYLIMB	P	N		X
Ephedra torreyana	Torrey's jointfir	Ephedraceae	EPTO	EPHTOR	P	N		X
Mimosa aculeaticarpa var. biuncifera	catclaw mimosa	Fabaceae	MIACB	MIMACUB	P	N		X
Prosopis glandulosa	honey mesquite	Fabaceae	PRGL2	PROGLA	P	N	FACU	X
Yucca glauca	soapweed yucca	Agavaceae	YUGL	YUCGLA	P	N		X
Sub-shrubs								
Artemisia frigida	fringed sagewort	Asteraceae	ARFR4	ARTFRI	P	N		X
Gutierrezia sarothrae	broom snakeweed	Asteraceae	GUSA2	GUTSAR	P	N		X
Opuntia macrocentra	purple pricklypear	Cactaceae	OPMA8	OPUMAC	P	N		X
Opuntia phaeacantha	tulip pricklypear	Cactaceae	OPPH	OPUPHA	P	N		X
Thymophylla acerosa	pricklyleaf dogweed	Asteraceae	THAC	THYACE	P	N		X
Graminoids								
Aristida adscensionis	sixweeks threeawn	Poaceae	ARAD	ARIADS	A	N		X
Aristida divaricata	poverty threeawn	Poaceae	ARDI5	ARIDIV	P	N		X
Aristida purpurea	purple threeawn	Poaceae	ARPU9	ARIPUR	P	N		X
Bothriochloa barbinodis	cane bluestem	Poaceae	BOBA3	BOTBAR	P	N		X
Bothriochloa laguroides ssp. torreyana	silver beardgrass	Poaceae	BOLAT	BOTLAGT	P	N		X
Bouteloua barbata	sixweeks grama	Poaceae	BOBA2	BOUBAR	A	N		X

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Graminoids cont.								
Bouteloua curtipendula	sideoats grama	Poaceae	BOCU	BOUCUR	P	N		X
Bouteloua eriopoda	black grama	Poaceae	BOER4	BOUERI	P	N		X
Bouteloua gracilis	blue grama	Poaceae	BOGR2	BOUGRA	P	N		X
Bouteloua hirsuta	hairy grama	Poaceae	BOHI2	BOUHIR	P	N		X
Buchloe dactyloides	buffalograss	Poaceae	BODA2	BUCDAC	P	N	FACU	X
Carex spp.	sedge	Cyperaceae	CAREX	CAREX	P	N		W
Chloris verticillata	tumble windmill grass	Poaceae	CHVE2	CHLVER	P	N		X
Chloris virgata	feather fingergrass	Poaceae	CHVI4	CHLVIR	A	N		X
Cyperus esculentus	chufa flatsedge	Cyperaceae	CYES	CYPESC	P	N	FACW	W
Cyperus odoratus	fragrant flatsedge	Cyperaceae	CYOD	CYPODO	P	N	FACW+	W
Digitaria pubiflora	western witchgrass	Poaceae	DIPU9	DIGPUB	P	N		X
Digitaria sanguinalis	hairy crabgrass	Poaceae	DISA	DIGSAN	A	N	FACU	X
Distichlis spicata	inland saltgrass	Poaceae	DISP	DISSPI	P	N	FAC, FACW	W
Echinochloa crus-galli	barnyardgrass	Poaceae	ECCR	ECHCRU	A	E	FACW	W
Eleocharis acicularis	needle spikerush	Cyperaceae	ELAC	ELEACI	A	N	OBL	W
Eleocharis macrostachya	pale spikerush	Cyperaceae	ELMA5	ELEMAC	P	N	OBL	W
Eleocharis palustris	common spikerush	Cyperaceae	ELPA3	ELEPAL	P	N	OBL	W
Eleocharis spp.	spikerush	Cyperaceae	ELEOC	ELEOCH	U	N		W
Elymus canadensis	Canada wildrye	Poaceae	ELCA4	ELYCAN	P	N	FAC	X
Elymus elymoides	bottlebrush squirreltail	Poaceae	ELEL5	ELYELY	P	N		X
Eragrostis cilianensis	stinkgrass	Poaceae	ERCI	ERACIL	A	E	FACU+	X
Eragrostis pectinacea	tufted lovegrass	Poaceae	ERPE	ERAPEC	A	N	FAC	X
Erioneuron pilosum	hairy woollygrass	Poaceae	ERPI5	ERIPIL	P	N		X
Hordeum pusillum	little barley	Poaceae	HOPU	HORPUS	A	N	FAC	X
Juncus spp.	rush	Juncaceae	JUNCU	JUNCUS	P	N		W

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Graminoids cont.								
Leptochloa fusca ssp. fascicularis	bearded sprangletop	Poaceae	LEFUF	LEPFUSF	A	N	FACW	W
Lycurus phleoides	common wolfstail	Poaceae	LYPH	LYCPHL	P	N		X
Muhlenbergia arenacea	ear muhly	Poaceae	MUAR	MUHARE	P	N		X
Muhlenbergia arenicola	sand muhly	Poaceae	MUAR2	MUHARE2	P	N		X
Muhlenbergia torreyi	ring muhly	Poaceae	MUTO2	MUHTOR	P	N		X
Munroa squarrosa	false buffalograss	Poaceae	MUSQ3	MUNSQU	A	N		X
Panicum capillare	witchgrass	Poaceae	PACA6	PANCAP	A	N	FAC	X
Panicum hallii	Hall's panicgrass	Poaceae	PAHA	PANHAL	P	N	FACU	X
Panicum obtusum	vine mesquite	Poaceae	PAOB	PANOBT	P	N	FAC	X
Panicum virgatum	switchgrass	Poaceae	PAVI2	PANVIR	P	N	FAC+	X
Pascopyrum smithii	western wheatgrass	Poaceae	PASM	PASSMI	P	N	FAC-	X
Paspalum distichum	knotgrass	Poaceae	PADI6	PASDIS	P	N	FACW	W
Pleuraphis mutica	tobosa	Poaceae	PLMU3	PLEMUT	P	N		X
Schedonnardus paniculatus	tumblegrass	Poaceae	SCPA	SCHPAN	P	N		X
Schoenoplectus acutus	hardstem bulrush	Cyperaceae	SCAC3	SCHACU	P	N	OBL	W
Schoenoplectus pungens	common threesquare	Cyperaceae	SCPU10	SCHPUN	P	N		X
Schoenoplectus tabernaemontani	softstem bulrush	Cyperaceae	SCTA2	SCHTAB	P	N	OBL	W
Setaria leucopila	streambed bristlegrass	Poaceae	SELE6	SETLEU	P	N		X
Sorghum bicolor	sorghum	Poaceae	SOBI2	SORBIC	A	E		X
Sorghum halepense	johnsongrass	Poaceae	SOHA	SORHAL	P	E	FACU+	X
Sporobolus airoides	alkali sacaton	Poaceae	SPAI	SPOAIR	P	N	FAC	X
Sporobolus cryptandrus	sand dropseed	Poaceae	SPCR	SPOCRY	P	N	FACU-	X
Tridens muticus	slim tridens	Poaceae	TRMU	TRIMUT	P	N		X
unidentified graminoid	unidentified graminoid	Poaceae	2GRAM	UNIDG				

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Forbs								
Amaranthus crassipes	spreading amaranth	Amaranthaceae	AMCR	AMACRA	A	E	FAC	X
Amaranthus palmeri	carelessweed	Amaranthaceae	AMPA	AMAPAL	A	N	FACU	X
Amaranthus powellii	Powell's amaranth	Amaranthaceae	AMPO2	AMAPOW	A	N	FACU	X
Amaranthus retroflexus	redroot pigweed	Amaranthaceae	AMRE	AMARET	A	N	NI	X
Amaranthus spp.	amaranth	Amaranthaceae	AMARA	AMARAN	A			X
Ambrosia confertiflora	weakleaf bur ragweed	Asteraceae	AMCO3	AMBCON	P	N		X
Ambrosia grayi	woollyleaf bur ragweed	Asteraceae	AMGR5	AMBGRA	P	N		X
Ambrosia psilostachya	Cuman ragweed	Asteraceae	AMPS	AMBPSI	P	N	FAC	X
Artemisia carruthii	Carruth's sagewort	Asteraceae	ARCA14	ARTCAR	P	N		X
Artemisia dracunculus	tarragon	Asteraceae	ARDR4	ARTDRA	P	N		X
Asclepias latifolia	broadleaf milkweed	Asclepiadaceae	ASLA4	ASCLAT	P	N		X
Asclepias subverticillata	whorled milkweed	Asclepiadaceae	ASSU2	ASCSUB	P	N	FACU	X
Astragalus spp.	milkvetch	Fabaceae	ASTRA	ASTRAG	P			X
Bacopa rotundifolia	disk waterhyssop	Scrophulariaceae	BARO	BACROT	P	N	OBL	W
Berlandiera lyrata	lyreleaf greeneyes	Asteraceae	BELY	BERLYR	P	N		X
Bidens spp.	beggartick	Asteraceae	BIDEN	BIDENS	U			X
Chaetopappa ericoides	rose heath	Asteraceae	CHER2	CHAERI	P	N		X
Chamaesyce serpens	matted sandmat	Euphorbiaceae	CHSE4	CHASER	A	N		X
Chenopodium album	lambsquarters	Chenopodiaceae	CHAL7	CHEALB	A	E	FAC-	X
Chenopodium incanum	mealy goosefoot	Chenopodiaceae	CHIN2	CHEINC	A	N		X
Chenopodium pratericola	desert goosefoot	Chenopodiaceae	CHPR5	CHEPRA	A	N		X
Cirsium ochrocentrum	yellowspine thistle	Asteraceae	CIOC2	CIROCH	P	N		X
Convolvulus arvensis	field bindweed	Convolvulaceae	COAR4	CONARV	P	E		X
Conyza canadensis	Canadian horseweed	Asteraceae	COCA5	CONCAN	A	N	FACU	X
Croton dioicus	grassland croton	Euphorbiaceae	CRDI6	CRODIO	P	N		X
Croton pottsii	leatherweed	Euphorbiaceae	CRPO5	CROPOT	P	N		X

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Forbs cont.								
Cuscuta cuspidata	cusp dodder	Cuscutaceae	CUCU2	CUSCUS	P	N	X	X
Dyssodia papposa	fetid marigold	Asteraceae	DYPA	DYSPAP	A	N		X
Engelmannia peristenia	Engelmann's daisy	Asteraceae	ENPE4	ENGPER	P	N		X
Erigeron flagellaris	trailing fleabane	Asteraceae	ERFL	ERIFLA	P	N	FAC-	X
Euphorbia davidii	David's spurge	Euphorbiaceae	EUDA5	EUPDAV	A	E		X
Euphorbia marginata	snow on the mountain	Euphorbiaceae	EUMA8	EUPMAR	A	N	FACU-	X
Gaura coccinea	scarlet beeblossom	Onagraceae	GACO5	GAUCOC	P	N		X
Glandularia bipinnatifida	Dakota mock vervain	Verbenaceae	GLBI2	GLABIP	U	N		X
Grindelia squarrosa	curlycup gumweed	Asteraceae	GRSQ	GRISQU	A	N	FACU	X
Gutierrezia sphaerocephala	roundleaf snakeweed	Asteraceae	GUSP	GUTSPH	A	N		X
Hedeoma drummondii	Drummond's false pennyroyal	Lamiaceae	HEDR	HEDDRU	P	N		X
Helenium amarum var. badium	yellowdicks	Asteraceae	HEAMB2	HELAMAB	A	N	FACU	X
Helianthus annuus	common sunflower	Asteraceae	HEAN3	HELANN	A	N	FAC-	X
Helianthus ciliaris	Texas blueweed	Asteraceae	HECI	HELCIL	P	N	FAC	X
Helianthus petiolaris	prairie sunflower	Asteraceae	HEPE	HELPET	A	N		X
Heteranthera rotundifolia	roundleaf mudplantain	Pontederiaceae	HERO5	HETROT	A	N	OBL	W
Heterotheca subaxillaris	camphorweed	Asteraceae	HESU3	HETSUB	A	N		X
Hoffmannseggia glauca	Indian rushpea	Fabaceae	HOGL2	HOFGLA	P	N	FACU	X
Hymenopappus filifolius	fineleaf hymenopappus	Asteraceae	HYFI	HYMFIL	P	N		X
Hymenoxys odorata	bitter rubberweed	Asteraceae	HYOD	HYMODO	A	N		X
Iva axillaris	povertyweed	Asteraceae	IVAX	IVAAXI	P	N	FAC	X
Kallstroemia parviflora	warty caltrop	Zygophyllaceae	KAPA	KALPAR	A	N		X
Kochia scoparia	common kochia	Chenopodiaceae	BASC5	KOCSCO	A	E	FAC	X
Lactuca serriola	prickly lettuce	Asteraceae	LASE	LACSER	A	E	FAC	X
Laennecia coulteri	conyza	Asteraceae	LACO13	LAECOU	A	N	FACW-	W

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Forbs cont.								
Lepidium densiflorum	common pepperweed	Brassicaceae	LEDE	LEPDEN	A	N	FAC	X
Linum lewisii	prairie flax	Linaceae	LILE3	LINLEW	P	N		X
Machaeranthera tanacetifolia	tanseyleaf aster	Asteraceae	MATA2	MACTAN	A	N		X
Malvella leprosa	alkali mallow	Malvaceae	MALE3	MALLEP2	P	N	FACW	W
Malvella sagittifolia	arrowleaf mallow	Malvaceae	MASA3	MALSAG	P	N		X
Marsilea vestita	Hairy pepperweed	Marsileaceae	MAVE2	MARVES	P	N	OBL	W
Melilotus officinalis	yellow sweetclover	Fabaceae	MEOF	MELOFF	A	E	FACU+	X
Mollugo cerviana	threadstem carpetweed	Molluginaceae	MOCE	MOLCER	A	N		X
Mollugo verticillata	green carpetweed	Molluginaceae	MOVE	MOLVER	A	N	FAC-	X
Nothoscordum bivalve	crowpoison	Liliaceae	NOBI2	NOTBIV	P	N		X
Oenothera caespitosa	tufted eveningprimrose	Onagraceae	OECA10	OENCAE	P	N		X
Oenothera canescens	spotted evening primrose	Onagraceae	OECA3	OENCAN	P	N	FAC	X
Persicaria bicornis	pink smartweed	Polygonaceae	PEBI4	PERBIC	A	N	FACW	W
Persicaria pensylvanica	Pink Smartweed	Polygonaceae	PEPE19	PERPEN	A	N	FACW	W
Phyla cuneifolia	frogfruit	Verbenaceae	PHCU3	PHYCUN	P	N	FACW	W
Phyla nodiflora	Frog fruit	Verbenaceae	PHNO2	PHYNOD	P	N	OBL	W
Picradeniopsis woodhousei	Woodhouse's bahia	Asteraceae	PIWO	PICWOO	P	N		X
Polygonum ramosissimum	knotweed	Polygonaceae	PORA3	POLRAM	A	N	FAC, FACW	W
Portulaca oleracea	common purslane	Portulacaceae	POOL	POROLE	A	N	FAC	X
Portulaca pilosa	kiss me quick	Portulacaceae	POPI3	PORPIL	A	N		X
Proboscidea louisianica	Ram's horn	Pedaliaceae	PRLO	PROLOU	A	N	FACU	X
Psoralidium tenuiflorum	slimflower scurfpea	Fabaceae	PSTE5	PSOTEN	P	N		X
Quincula lobata	Chinese lantern	Solanaceae	QULO2	QUILOB	P	N		X
Ratibida columnifera	upright prairie coneflower	Asteraceae	RACO3	RATCOL	P	N		X

Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Forbs cont.								
Ratibida tagetes	green prairie coneflower	Asteraceae	RATA	RATTAG	P	N		X
Rorippa sinuata	spreading yellowcress	Brassicaceae	ROSI2	RORSIN	P	N	FACW	W
Rumex crispus	curly dock	Polygonaceae	RUCR	RUMCRI	P	E	FACW	W
Sagittaria longiloba	longbarb arrowhead	Alismataceae	SALO2	SAGLON	P	N	OBL	W
Salsola tragus	prickly Russian thistle	Chenopodiaceae	SATR12	SALTRA	A	E	FACU	X
Salvia reflexa	lanceleaf sage	Lamiaceae	SARE3	SALREF	A	N		X
Senecio flaccidus var. flaccidus	threadleaf ragwort	Asteraceae	SEFLF	SENFLAF	P	N		X
Senecio spartioides	broom groundsel	Asteraceae	SESP3	SENSPA	P	N		X
Solanum elaeagnifolium	silverleaf nightshade	Solanaceae	SOEL	SOLELA	P	N		X
Solanum rostratum	buffalobur nightshade	Solanaceae	SORO	SOLROS	A	N		X
Sphaeralcea angustifolia	copper globemallow	Malvaceae	SPAN3	SPHANG	P	N		X
Sphaeralcea coccinea	scarlet globemallow	Malvaceae	SPCO	SPHCOC	P	N		X
Sphaeralcea incana	gray globemallow	Malvaceae	SPIN2	SPHINC	P	N		X
Suckleya suckleyana	poison suckleya	Chenopodiaceae	SUSU2	SUCSUC	A	N	NI	X
Symphyotrichum ascendens	western aster	Asteraceae	SYAS3	SYMASC	P	N		X
Symphyotrichum expansum	southwestern annual saltmarsh aster	Asteraceae	SYEX	SYMEXP	A	N	OBL	W
Tetraclea coulteri	Coulter's wrinklefruit	Verbenaceae	TECO	TETCOU	P	N		X
Thelesperma filifolium	stiff greenthread	Asteraceae	THFI	THEFIL	P	N		X
Thelesperma megapotamicum	Hopi tea greenthread	Asteraceae	THME	THEMEG	P	N		X
Thelesperma simplicifolium	Slender greenthread	Asteraceae	THSI	THESIM	P	N		X
Tidestromia lanuginosa	wooly tidestromia	Amaranthaceae	TILA2	TIDLAN	A	N		X
Tribulus terrestris	puncturevine	Zygophyllaceae	TRTE	TRITER	A	E		X
Typha domingensis	southern cattail	Typhaceae	TYDO	TYPDOM	P	N	OBL	W
unidentified forb	unidentified forb	unknown	2FORB	UNIDF				

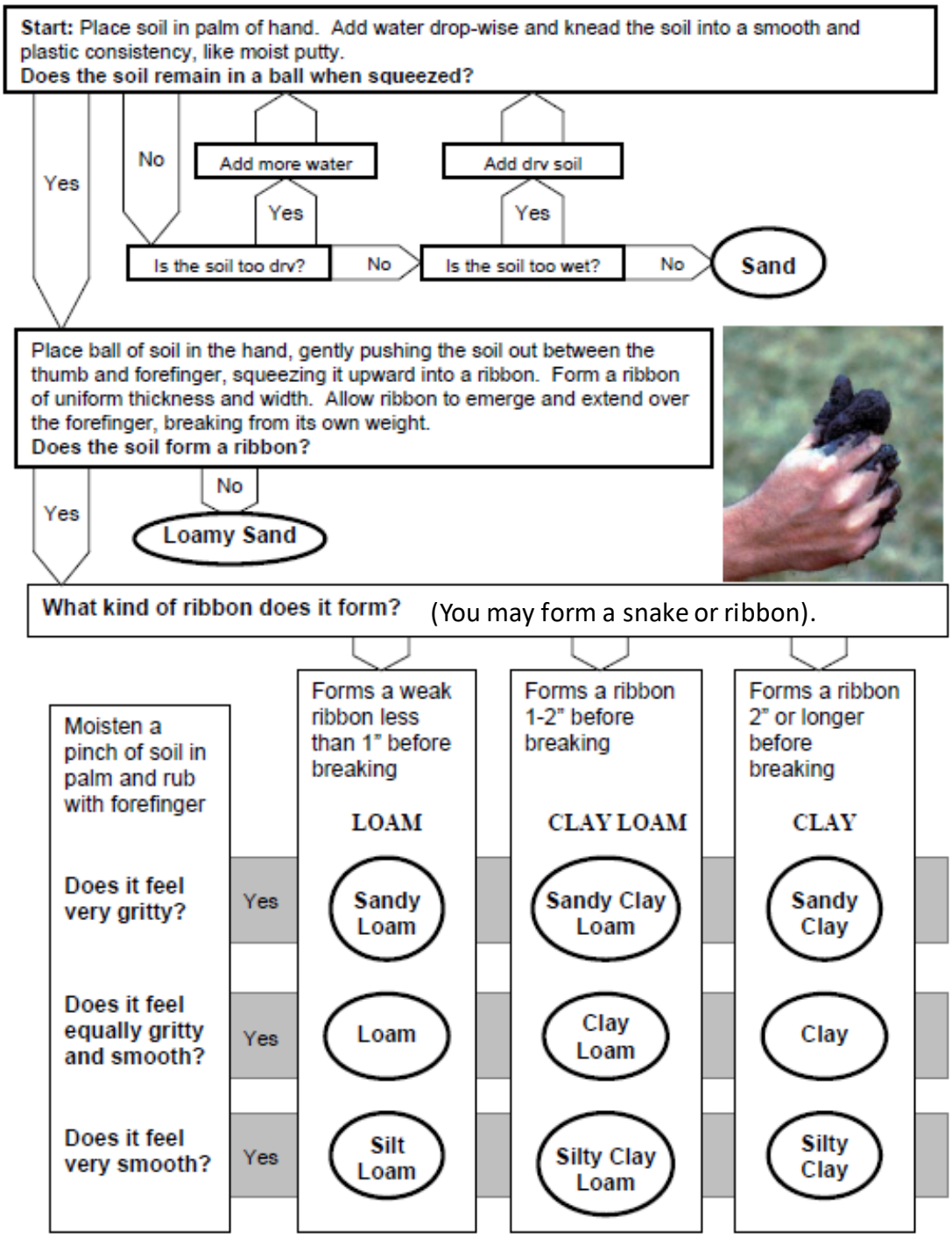
Appendix B. NMRAM common plants from playas in the Southern High Plains of New Mexico (November 2017).								
NM Species Name	**NM Common Name**	**Family**	**USDA Plants Symbol**	**NHNM ACRO1**	**Duration**	**Origin**	**National Wetland Status Region 7**	**NMRAM Binary Wetland Code**
Forbs cont.								
Verbena bracteata	bigbract verbena	Verbenaceae	VEBR	VERBRA	P	N	FAC	X
Vernonia marginata	plains ironweed	Asteraceae	VEMA2	VERMAR	P	N	NI	X
Vicia americana	American vetch	Fabaceae	VIAM	VICAME	P	N	NI	X
Vicia ludoviciana	Louisiana vetch	Fabaceae	VILU	VICLUD	A	N		X
Xanthisma spinulosum	lacy tansyaster	Asteraceae	MAPI	XANSPI2	P	N		X
Xanthisma texanum	Texas sleepydaisy	Asteraceae	XATE	XANTEX	A	N		X
Xanthium strumarium	rough cocklebur	Asteraceae	XAST	XANSTR	A	N	FAC	X
Zinnia grandiflora	Rocky Mountain zinnia	Asteraceae	ZIGR	ZINGRA	P	N		X

APPENDIX C. NMRAM Playa Wetlands Soil Guidelines.

These guidelines are provided for evaluating soil texture, soil color, and playa clay pan sediment intrusion for the NMRAM Playa Wetlands Soil Condition Index (A8) metric.

Soil Texture By Feel

From Colorado State University http://www.ext.colostate.edu/mg/gardennotes/214.pdf



Evaluating soil color and basin floor clay sediment intrusion for Soil Condition Index metric

1. Evaluating Soil Color. Collect a representative sample from the layer of the playa CBF core in question using a soil knife. Divide the sample in half; each part should be of sufficient volume for describing the soil color and describing the soil structure. First, observe a fresh face and do not crush the sample. Then moisten the sample and describe the moistened soil matrix. The matrix generally makes up more that 50% of the soil sample. Note mottling or irregularities in the comments box for that layer. Second, mix the sample and texture the soil according to soil texture instructions above. Then use the Munsell Soil Color Book to determine the soil color of the mixed sample. When determining the color of the sample, use a moist soil sample, evaluate the color with the sun behind you, and without sunglasses. Match the soil sample to the color tiles in the book and record hue, value and chroma on Worksheet 8 of Appendix A.

2. Estimating Sediment Intrusion in the Basin Floor Clay. If the texture of the layer is a clay (falling in the clay column of the soil texture instructions above), the color is determined to have a value of 3 or less and a hue of 2 or less, the layer is greater than or equal to 10 cm thick, and is the first layer encountered with these qualifications from the surface, then it is determined to be the basin floor clay laver. Using the second sample half, estimate the amount of sediment included in the basin floor clay layer sample. Visually determine which part of the sample is clay aggregate and which part is sediment covering the aggregate or filling soil fractures and pockets. If this is >30% sediment and the layer is found within 20cm of the soil surface, subtract 0.5 from the Core Raw Score and enter the result in the Modified Score box for the Core.

This is what sediment on clay aggregates may look like. Notice the reddish silt obscuring the grayer clay aggregate. When evaluating the soil structure, the aggregate will be a clay, and sediment within the sample is > 30%.

Here sediment intrusion is still evident, but less obvious, and one might conclude <30% of the clay is obscured.

APPENDIX D: Playa NMRAM Glossary of Terms*

*Note that the definitions for these terms refers to this NMRAM and are not necessarily the same as the definitions in general use.

Animal mounds/burrows: Holes and mounds created by the activity of burrowing animals.

Annulus: The area of a playa wetland in between the basin-floor edge and the upper clay pan soil-edge. The annulus begins at the change in slope at the basin edge and extends to the upper boundary of the playa wetland, generally the upper boundary of the playa lake when filled. The location of the upper edge of the annulus is estimated in the field by a visual change (edge) in vegetation and slope.

Assessment Unit (AU): Descriptive name of a specific waterbody (limited to 60 characters). Assessment units are designed to represent surface waters with assumed homogenous water quality (WERF 2007), and are generally defined by various factors such as hydrologic or watershed boundaries, water quality standards (WQS) found in 20.6.4 New Mexico Administrative Code (NMAC), geology, topography, incoming tributaries, surrounding land use/land management, etc.

Attribute: A broad class of wetland properties such as landscape context, hydrology, biology, etc., under which specific measurements of condition (metrics) might fall.

Basin Floor Clay: This term is specific to only the dark, reduced clay sediment (also known as a vertisol) that is at least 10 cm thick and has a Munsell Soil Book value of less than 4, and chroma of less than 3. Playa basin floor sediment must qualify as a clay according to feel using the texture by feel protocol included in Appendix C. Shrink/swell characteristics and/or deep cracks are common and obvious in dry, good condition playa basin floor clays. In New Mexico, many of these clays are classified as "Randall Clays" belonging to the Randall Series.

Basin Floor: Level bottom portion of the playa wetland below the annulus, generally occupied by clay pan, and flat or with gilgai topography and cracks developed by the shrink/swell properties of the clay.

Current Basin Floor (CBF): The present portion of the playa basin floor excluding recent sloping alluvial fans, artificial platforms and berms, or other disturbance features that constrain or cover the playa floor.

Historic Basin Floor (HBF): The basin floor area of the entire playa wetland occupied by clay pan below the annulus including formerly active playa basin floor which may now be covered with sloping alluvial fans, artificial platforms and berms, or other disturbance features.

Berm: Mounded soil due to human earthwork often intended to impact the flow paths of water. Also refers to mounded soil due to excavation of pits created for water retention.

Clay pan: Thick vertisol clay underlying playa basin floor.

Community Type: A repeating, classified and recognizable assemblage or grouping of plant species.

Fallow field: An area formerly plowed for agriculture that has been allowed to return to non-production vegetation. This term does not include active agricultural fields that are rested between seasons, prior to planting, or recently plowed active fields that are currently without vegetative cover.

Fill: An area where soil has been deposited by human activity, as opposed to natural processes.

Focal Area (FA): Specific area within the playa wetland (PW) as a targeted location for sampling.

Gravel pits: Pit or hole created by removal of soil for use in another location.

Gully: A steep-sided erosional channel from 1 m to about 10 m across, larger than a rill.

Historic Playa Wetland (HPW): Estimated historical extent of the playa wetland prior to impacts. Estimated based on circular, elliptical or tear drop form of overall PW and assuming a smooth margin under natural conditions.

Hydroperiod: The seasonal pattern of water levels within a wetland. Under reference conditions a playa is expected to fill and dry intermittently based on the frequency and intensity of local precipitation. Water is expected to be evenly spread across the basin floor until it has evaporated or infiltrated.

Hydrophyte: A plant species found growing in areas where soils in the rooting zone are saturated much or all of the growing season**.**

Impervious compacted surfaces: Soil surfaces that are so compacted that water runs across these surfaces rather than infiltrating.

Irrigation channel: A manipulated open channel used for transporting water to support agriculture.

Irrigation-driven salinity and mineral crusts: The build-up of salts and mineral crust on the soil surface due to irrigation. Often identified by a white crust on the soil surface, usually in a patch with a dearth of vegetation.

Land Use Index (LUI): An index of the intensity of human activity in the landscape surrounding the wetland SA based on the relative impact to wetland function.

Land Use Zone (LUZ): Boundary created for measuring the condition of surrounding land use conversions. Within a playa watershed the LUZ extends out 500m from the PW boundary for playas <8 ha and 1,000 m for very large playas ≥8 ha.

Levee: (***constructed-abandoned***) A constructed or manipulated feature intended to act like a barrier to surface flow, but is no longer functioning as intended and is no longer maintained.

(***constructed-maintained***) A constructed or manipulated feature which acts like a barrier to surface flow and is maintained.

Metric: A distinct measurable component of an attribute class, such as Exotic Annual Plant Abundance within the Biotic attribute class. Metrics measurements are the basis of the NMRAM condition score.

Micro-Basin: The basin surrounding and exclusive to an individual playa in which precipitation and runoff drains to the playa at the bottom of the basin. (See Watershed.)

Minimum Map Unit: The minimum size that a vegetation patch polygon must meet in order to be mapped for the NMRAM: This minimum size differs depending on class and subclass, and is provided in the NMRAM Field Guides.

Non-Basin-Floor-Clay Sediment: Any soil layer within the playa that does not qualify as a basin-floor clay based on texture, color, thickness or location.

Plant pedestal: An erosional feature between plant bases which causes the plant to appear elevated, as if on a pedestal.

Playa Bottom soil: See Basin Floor Clay.

Playa Wetland (PW): The Playa Wetland includes the playa basin floor and the immediate sloping perimeter up to the visual edge which approximates the upper boundary of the annulus and the expected upper boundary of the playa lake when filled. Everything outside of the PW is considered non-playa upland landscape.

Sampling Area (SA): The PW area in which field measurements for Level 2 metrics are taken.

Swale: Depressions lacking defined channels, but supporting vegetation communities that differ from the surrounding uplands, either in composition or productivity, due to increased water availability.

Vegetation Map Polygon: A created map feature of relatively homogenous vegetation which is used in evaluating some of the NMRAM Biotic metrics.

Vertical Structure: Constructed feature or woody vegetation that is close-to or within the playa and that exceeds 2 m (6ft) in height.

Vertisol: Clay-rich soils that shrink and swell with changes in moisture content. During dry periods, the soil volume shrinks, and deep, wide cracks form. The soil volume expands and the cracks disappear when the vertisol is wet.

Visual Edge: Approximates the upper boundary of the annulus and the expected upper boundary of the playa lake when filled. It is estimated based on changes in slope and vegetation.

Watershed: The area of land surrounding a playa where precipitation drains to the playa. Synonymous with drainage basin, micro-basin or catchment. Each individual playa occupies its own unique watershed.

Wrack Lines: An accumulation of debris at a high-water line which can occur along the ground, or in standing vegetation.