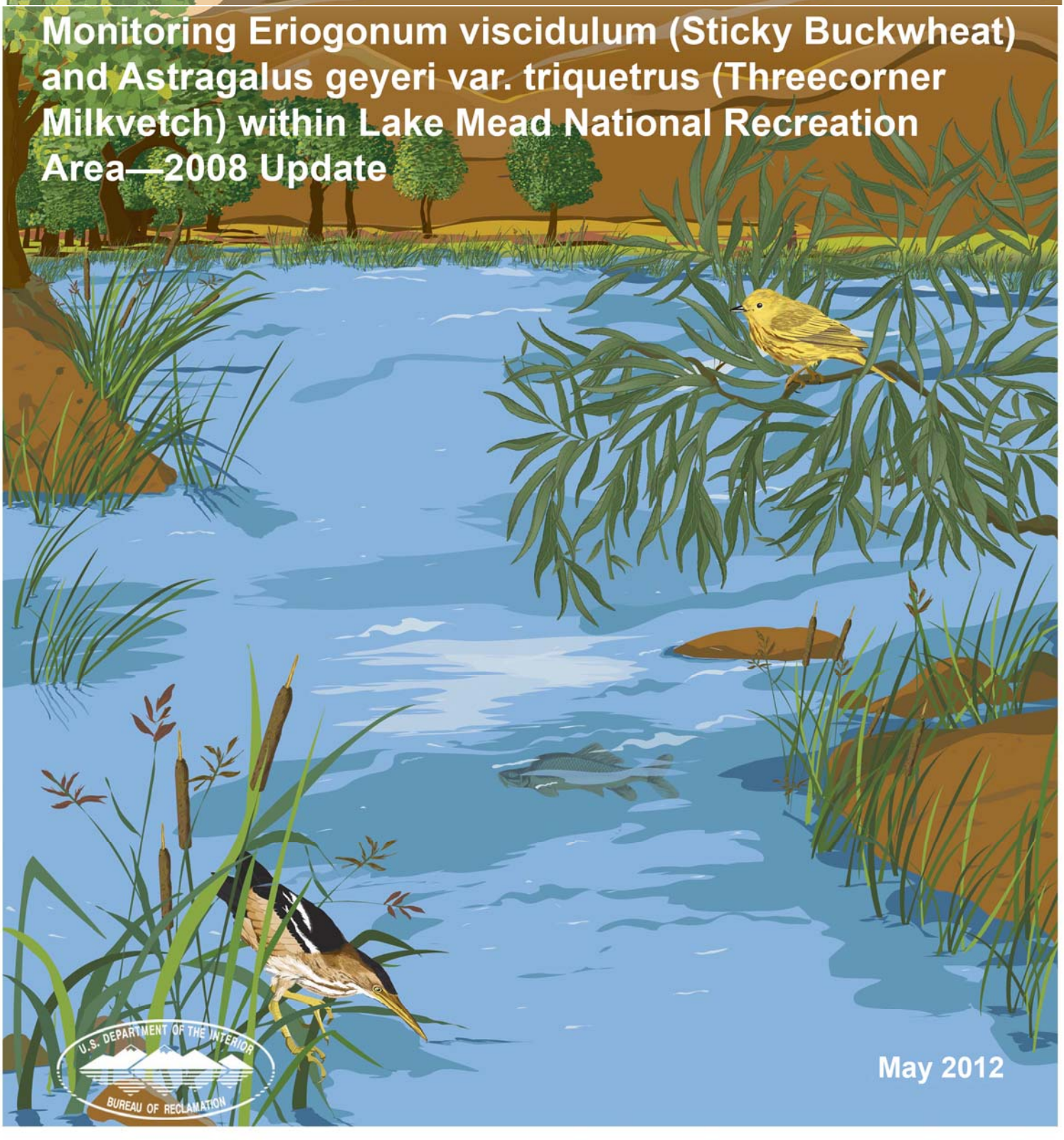
Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation



Monitoring Eriogonum viscidulum (Sticky Buckwheat) and Astragalus geyeri var. triquetrus (Threecorner Milkvetch) within Lake Mead National Recreation Area—2008 Update

May 2012

Lower Colorado River Multi-Species Conservation Program
Steering Committee Members

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Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
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Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
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Unit "B" Irrigation and Drainage District
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Yuma County Water Users' Association
Yuma Irrigation District
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Other Interested Parties Participant Group

QuadState County Government Coalition
Desert Wildlife Unlimited

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California Department of Fish and Game
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Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
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Nevada Department of Wildlife
Southern Nevada Water Authority
Colorado River Commission Power Users
Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy

Lower Colorado River
Multi-Species Conservation Program

Monitoring *Eriogonum viscidulum* (Sticky Buckwheat) and *Astragalus geyeri* var. *triquetrus* (Threecorner Milkvetch) within Lake Mead National Recreation Area—2008 Update

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Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada
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Introduction

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a coordinated, comprehensive, long-term multi-agency effort to conserve, monitor, and manage populations and habitat of covered species. The goals of the LCR MSCP are to avoid, minimize, and fully mitigate impacts on 26 covered species and their habitat, contribute to the recovery of listed covered species, and reduce the likelihood for future listing of non-listed covered species. Two rare plant species occur within the covered areas designated in the LCR MSCP, *Eriogonum viscidulum* (sticky buckwheat) and *Astragalus geyeri* var. *triquetrus* (threecorner milkvetch). The LCR MSCP conservation measures for these species are to support existing sticky buckwheat and threecorner milkvetch conservation programs, and with implementation of these measures the LCR MSCP will help ensure that the existing abundance of the species in and adjacent to the LCR MSCP planning area is maintained or increased (LCR MSCP 2004).

Eriogonum viscidulum (Sticky Buckwheat)

Sticky buckwheat is an annual plant endemic to Clark and Lincoln Counties in southern Nevada and Mojave County in northwestern Arizona. Sticky buckwheat is listed as a critically endangered species in the state of Nevada, is on the Bureau of Land Management (BLM) sensitive species list, is listed on the Nevada Natural Heritage Programs Sensitive List (ranks G2 S2-defined as imperiled), and is a covered species under two local conservation plans: the LCR MSCP administered by the Bureau of Reclamation, and the Clark County Multiple Species Habitat Conservation Plan administered by Clark County, Nevada (Bangle 2005a).

Sticky buckwheat has a geographic distribution associated with a sedimentary deposit called the Muddy Creek Formation (Niles et al. 1995). This formation is widely exposed in the hills along the Overton Arm, Virgin Basin, and Boulder Basin sections of the Lake Mead National Recreation Area (LMNRA), and extends northward along the Virgin River valley and westward along the Muddy River and Meadow Valley Wash. Weathered sediments from this formation, redeposited as aeolian or fluvial sand, provide the substrate upon which threecorner milkvetch is found (Niles et al. 1995).

In the mid-1990s, Niles et al. (1995) conducted an inventory of all known locations of sticky buckwheat, as well as searches for additional localities within LMNRA and adjacent regions of Nevada and Arizona. From this inventory effort, valuable knowledge was gained about the overall distribution and status of sticky buckwheat populations. Of the 22 locations where sticky buckwheat was located, 20,020 plants were recorded. Since the extensive surveys of Niles et al., surveys for sticky buckwheat have been geographically limited and only select sites have been monitored; thus, no systematic assessments of populations across the range of this species have occurred in recent years (Bangle 2005a).

Astragalus geyeri var. triquetrus (Threecorner Milkvetch)

Astragalus geyeri var. *triquetrus* (threecorner milkvetch) is a rare, sand-loving, annual plant endemic to Clark and Lincoln counties in southern Nevada, and Mojave County in northwestern Arizona. This species is listed as a critically endangered species in the state of Nevada, is on the BLM sensitive species list, is listed on the Nevada Natural Heritage Programs Sensitive List (ranks G2 S2-defined as

imperiled), and is a covered species on two local conservation plans: the LCR MSCP administered by the Bureau of Reclamation, and the Clark County Multiple Species Habitat Conservation Plan administered by Clark County, Nevada (Bangle 2005b).

The northern and eastern-most distributions of this species are at Sand Hollow Wash in Lincoln County and at Coon Creek in Mojave County. Threecorner milkvetch reaches a southern extension at Sandy Cove on the north shore of the Boulder Basin (LMNRA) and a western extension at Dry Lake Valley in Clark County. The highest concentration of populations is found in the Mormon Mesa area of Clark County on BLM land (Niles et al. 1995).

Threecorner milkvetch has a geographic distribution associated with a sedimentary deposit called the Muddy Creek Formation (Niles et al 1995). This formation is widely exposed in the hills along the Overton Arm, Virgin Basin, and Boulder Basin sections of LMNRA and extends northward along the Virgin River valley and westward along the Muddy River and Meadow Valley Wash. Weathered sediments from this formation, redeposited as aeolian or fluvial sand, provide the substrate upon which threecorner milkvetch is found (Niles et al.1995).

In the mid-1990s, Niles et al. (1995) conducted surveys of all known and potential locations of threecorner milkvetch within LMNRA and adjacent regions of Nevada and Arizona. Niles et al. identified 19 threecorner milkvetch sites. Since then, surveys have been geographically limited. Other partial surveys conducted since then have located new populations, but no thorough assessment has been completed at the time of this report.

Monitoring and Sampling Objectives

Based on data gathered from the 2007 pilot year studies of sticky buckwheat and threecorner milkvetch, new monitoring methods were developed to increase the power and reduce variability in the data (Bangle, 2007a, b) by adjusting the size and shape of the sampling units.

The objective of the monitoring is to assess the status of select populations of sticky buckwheat and threecorner milkvetch and to gain a greater understanding of the important abiotic and biotic factors that influence population condition. The specific objectives for the monitored populations occurring on NPS lands within Clark County are:

1. Maintain the current density (within 30% of the baseline measurement calculated from a year of average to above average rainfall) over the next 10 years. The sampling objective is to be 80% sure of detecting a 30% change in density of sticky buckwheat and threecorner milkvetch in average or above average rainfall years.

2. Correlate the abiotic factors of rainfall, temperature, relative humidity, and soil chemistry, with the density (measured in average to above average rainfall years) of sticky buckwheat and threecorner milkvetch.

3. Detect changes in species richness and cover of native and non-native plant species over the next 10 years, for species richness and for species cover within 30% of the first measurement taken in average to above average rainfall years. The sampling objective is to be 80% sure of detecting a 30% change in species richness and cover of native and non-native plant species in average or above average rainfall years.

Methods

Sampling Design (Sticky Buckwheat)

Two sticky buckwheat populations (Lime Wash and Glory Hole) were randomly selected for annual monitoring. Only three populations were included in the selection process because other historical and/or known locations did not meet the criteria for monitoring or were not resurveyed for status assessments before the current monitoring began. All three sites are in close proximity to each other and are located along the eastern shoreline of the Overton Arm of LMNRA. We determined that two sites in this area would be sufficient to represent the area.

Due to the nature of the habitat, terrain, and location of sticky buckwheat plants at these sites, a systematic sampling approach for monitoring sticky buckwheat was used. One 50 m × 100 m macroplot was placed at each site. Each macroplot location was selected using a stratified random approach by placing a "virtual grid" (in Arcmap) over known habitat after which random numbers were generated and a point selected (within the virtual grid). This random point translated to the high water corner (left end when facing the lake) of the macroplot. Ten transects (1m × 100 m) were laid perpendicular to the shoreline using a random start along the high water edge of the macroplot. Seven quadrats (1m × 10 m) were placed along each transect, skipping 5 meters between each quadrat for a total of 70 quadrats per site.

Within each quadrat, all plant species were recorded including foliar cover of all species, rock/gravel cover, and presence/absence of cattle/burro trails and/or dung. Any additional observations of threats and/or disturbances were noted. Sticky buckwheat spatial distribution within the macroplot was estimated by recording number of sticky buckwheat plants within each subplot (1 m^2) on a field map. Dead plant material from saltcedar and Russian thistle was recorded in one "litter" category. GPS coordinates and compass bearings were recorded at each high water corner of the macroplot and at each transect start. Trampled and/or chewed plants of any plant species within the plots were noted.

Sampling Design (Threecorner Milkvetch)

One threecorner milkvetch population (Sandy Cove) was selected for monitoring in 2008. A grid-cell sampling approach was used. Eight 36 m × 36 m temporary grids will be placed each year in the same locations and will include three separate dune areas (~one hectare total area). Each grid location was selected randomly (using stratified random approach) by placing a "virtual grid" (in ArcMap) over known habitat after which random numbers were generated to select a coordinate within the virtual grid. Each coordinate translated to the southwest corner of each grid and once on site, a compass bearing for each direction was recorded and GPS coordinates for the three additional corners were recorded, including easting, northing, elevation, and level of accuracy. Eighteen quadrats (6 m ×12 m) were delineated within the grid and data collected included threecorner milkvetch individual counts and locations for spatial patterning, plant species composition, and estimates of foliar cover for each species.

Individual GPS coordinates were not recorded for spatial analyses. Instead, threecorner milkvetch locations were recorded by marking plants on a field map of each quadrat, thus, showing spatial arrangement across each grid. The field maps were digitized in the office after the field season was complete. Plant community data were collected in 2008 and will be collected for two consecutive years

and then subsequently in years of average to above average rainfall. All live annuals, perennial herbs, shrubs and trees were recorded.

Results and Observations

Detailed results will be provided upon completion of the current project (2009). Interested parties may contact LCR MSCP Ecologist, Dianne Bangle, at dbangle@usbr.gov.

Sticky Buckwheat

Annual species including sticky buckwheat show large variations in abundance from year to year. It is likely these fluctuations are due to annual temperature and precipitation conditions. Winter annuals typically respond to increased seasonal rainfall by germinating at higher densities. In 2008, 4,708 individuals were recorded and mapped within the macroplot at Lime Cove and 126 individuals at Glory Hole. Figure 1 shows how sticky buckwheat was spatially distributed at Lime Cove.

Sticky buckwheat plants showed signs of trampling and grazing from trespass cattle and burros. We also observed sticky buckwheat herbivory by sphinx moth caterpillars (*Celerio lineata*) that were experiencing a population boom in 2008. The caterpillar was abundant and we observed them chewing branch tips off for several species including sticky buckwheat. The effect of the caterpillars on sticky buckwheat is unknown. The sphinx moth is an important pollinator of several plant species in the Mojave Desert.

Sticky buckwheat was threatened by invasive plant species, including *Brassica tournefortii* (Sahara mustard), *Tamarix* sp. (saltcedar), *Salsola* sp. (Russian thistle), and *Schismus* sp. (Mediterranean grass). Glory Hole had higher abundances of these species than Lime Cove, especially *Tamarix* sp. and *Salsola* sp. The middle to lower tiers of the draw down zone at Glory Hole had dense stands of *Tamarix* and *Salsola* including litter from previous years. Sticky buckwheat plants occurred above high water down to approximately the middle tiers of the drawdown zone and are not known to colonize areas with dense vegetation.

Threecorner Milkvetch

The timing and amount of rainfall in the 2007-2008 growing season was suitable to produce a significant threecorner milkvetch germination event. In 2008, 3,968 individuals were recorded and mapped within the monitoring grids on Sandy Cove. An example of how this species was spatially distributed within a grid is shown in Figure 2.

It is currently unknown what environmental factors affect threecorner milkvetch success within each population. Winter annuals typically respond to increased seasonal rainfall by germinating at higher densities. Our observations in recent years support this, but more data from this long-term monitoring project are necessary to effectively correlate environmental factors such as rainfall and temperature to increased germination of threecorner milkvetch.

Threats to this site included invasions of Sahara mustard and Mediterranean grass. These species can establish extensive populations, potentially outcompeting natives for resources or stabilizing the dunes making habitat unsuitable for threecorner milkvetch and other endemic sand-loving plants. The National Park Service has been controlling Sahara mustard on Sandy Cove since 2003, and it appears that their efforts may be benefiting the threecorner milkvetch population in that fewer Sahara mustard plants occur on the dunes than on the surrounding areas, but no quantitative study has been conducted to support this.

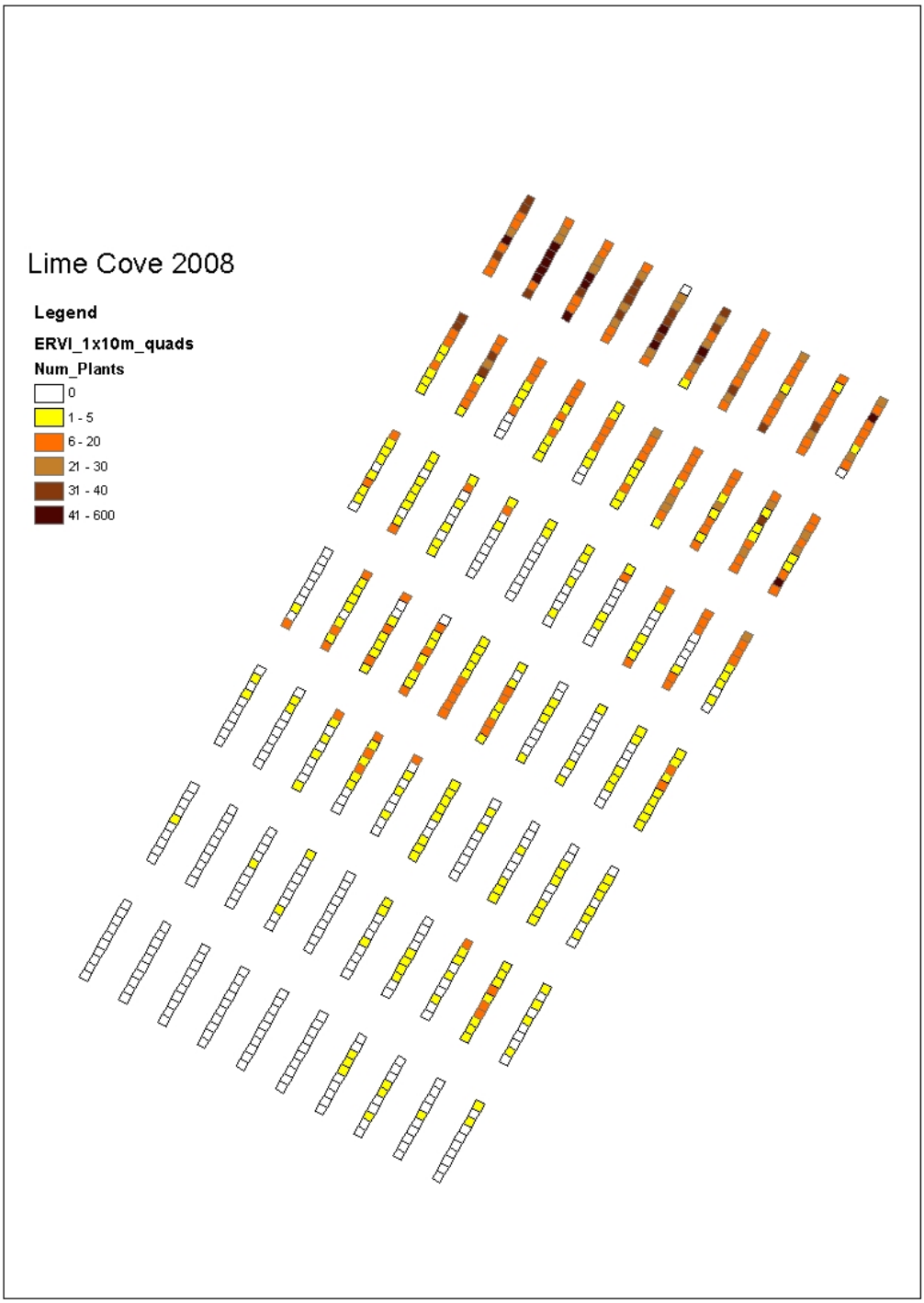

Figure 1. Spatial distribution of *Eriogonum viscidulum* at Lime Cove. The entire macroplot is shown.

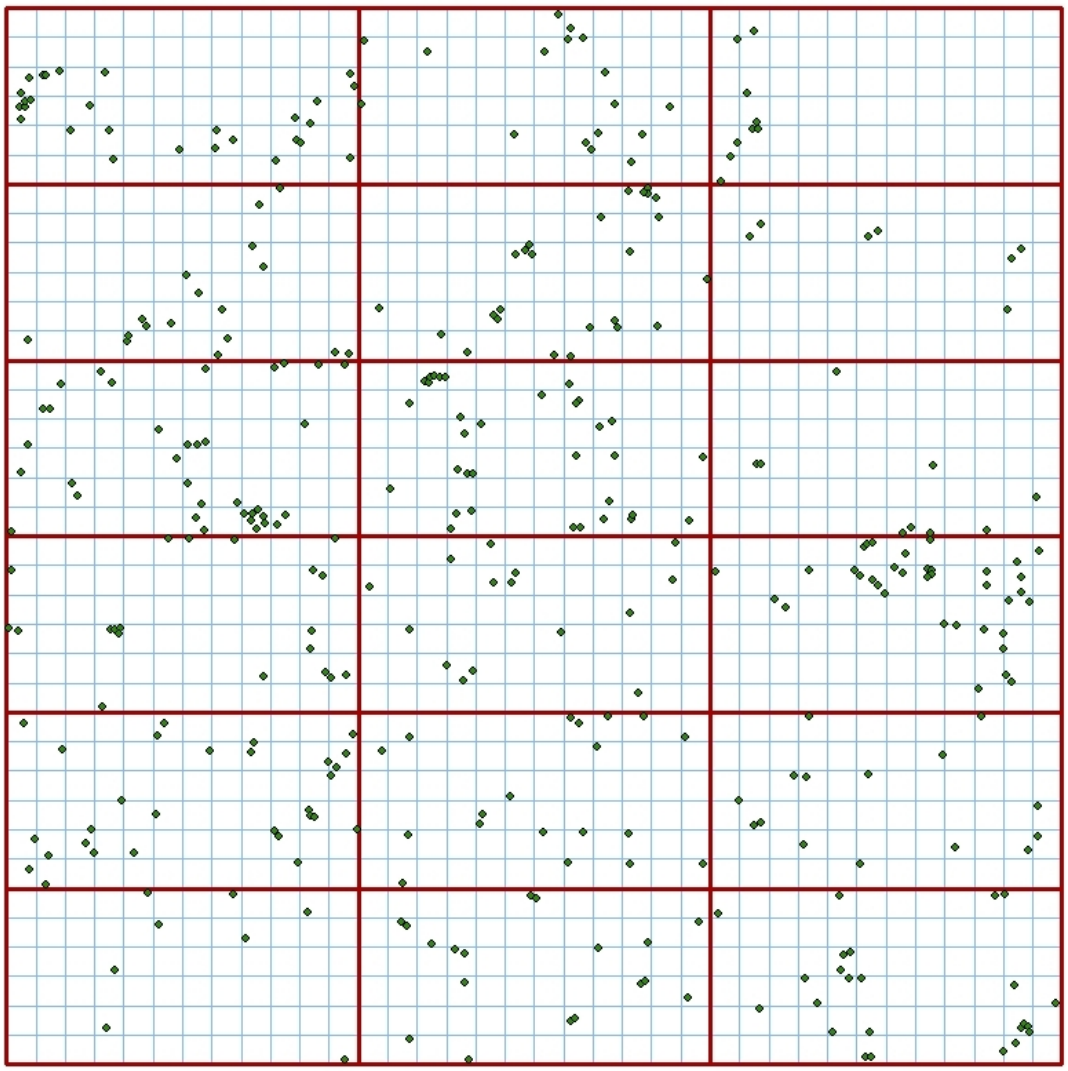

Figure 2. Spatial distribution of *Astragalus geyeri* var. *triquetrus* on Sandy Cove. Grid 5 is shown.

Discussion

One threat to sticky buckwheat that requires further evaluation is the seemingly increased presence and damage done by trespass cattle on the eastern side of the Overton Arm area. Almost every plot had cattle tracks present and every survey day researchers encountered or observed cattle in the area. On two occasions researchers needed to scare the cattle off in order to access the site. Glory Hole was especially affected in that the beaches and sandy areas smelled intensely of cattle urine and were covered with cattle dung.

Large areas of the dunes supporting threecorner milkvetch around Sandy Cove were covered with Mediterranean grass, which appeared to be stabilizing the active portions of the dunes. If Mediterranean grass continues to spread, this invasive species may eventually alter the loose sand habitat enough that declines in the threecorner milkvetch population may occur. Invasive species of annual grasses are a major factor in stabilizing sand sheets and dune habitats throughout the range of threecorner milkvetch (TNC, 2007).

Abiotic data will be collected beginning in 2009 at each site including collecting soil chemistry, ambient temperature, relative humidity, and rainfall.

Recommendations

We recommend hiring seasonal field crews such as the Nevada Conservation Corp or American Conservation Experience Corp to assist with data collections in order to complete the work within a two-week time frame. Restricting the time frame for data collection minimizes variability in cover assessments as well as misidentifications of annual plants because of change in phenology. An ideal monitoring time frame needs to be established and maintained each year for both rare plant species in order to establish a true trend over time.

We also recommend investigating how trespass cattle are impacting sticky buckwheat populations and their habitat. Plus, invasive species research is needed to determine methods for Mediterranean grass control in rare plant habitats and how controlling this species will affect sticky buckwheat or threecorner milkvetch populations. Control protocols should also be developed for saltcedar and Sahara mustard in rare plant habitat.

Literature Cited

Bangle, D. 2005a. Report on *Eriogonum viscidulum* (Sticky buckwheat) monitoring (1997-2005) within Lake Mead National Recreation Area. Unpublished report to Clark County Multiple Species Habitat Conservation Plan from the National Park Service, Lake Mead National Recreation Area. Boulder City, NV. 27 pages.

Bangle, D. 2005b. Report on *Astragalus geyeri* var. *triquetrus* (threecorner milkvetch) monitoring (2000-2005) within Lake Mead National Recreation Area. Unpublished report to Clark County Multiple Species Habitat Conservation Plan from the National Park Service, Lake Mead National Recreation Area. Boulder City, NV. 24 pages.

Bangle, D. 2007a. Monitoring protocols for *Eriogonum viscidulum* in Clark County, NV, 2005-NPS-535-P. 6 pages.

Bangle, D. 2007b. Monitoring protocols for *Astragalus geyeri* var. *triquetrus* in Clark County, NV, 2005-NPS-535-P. 6 pages.

Lower Colorado River Multi-species Conservation Program. 2004. Lower Colorado River Multi-species Conservation Program, Volume II: Habitat Conservation Plan. Final. December 17. (J&S 00450.00) Sacramento, CA.

The Nature Conservancy. 2007. A Conservation Management Strategy for nine low elevation rare plants in Clark County, Nevada. Nevada Field Office Reno, NV. TNC 2007.

Niles, W. E., P. Leary, J. S. Holland, and F. H. Landau. 1995. *Astragalus geyeri* var. *triquetrus* (Three-cornered milkvetch) and *Eriogonum viscidulum* (Sticky buckwheat) in Lake Mead National Recreation Area and adjacent regions of Nevada and Arizona. Report to Lake Mead National Recreation Area. Unpublished report to National Park Service, Lake Mead National Recreation Area, Boulder City, NV. (74 pages).