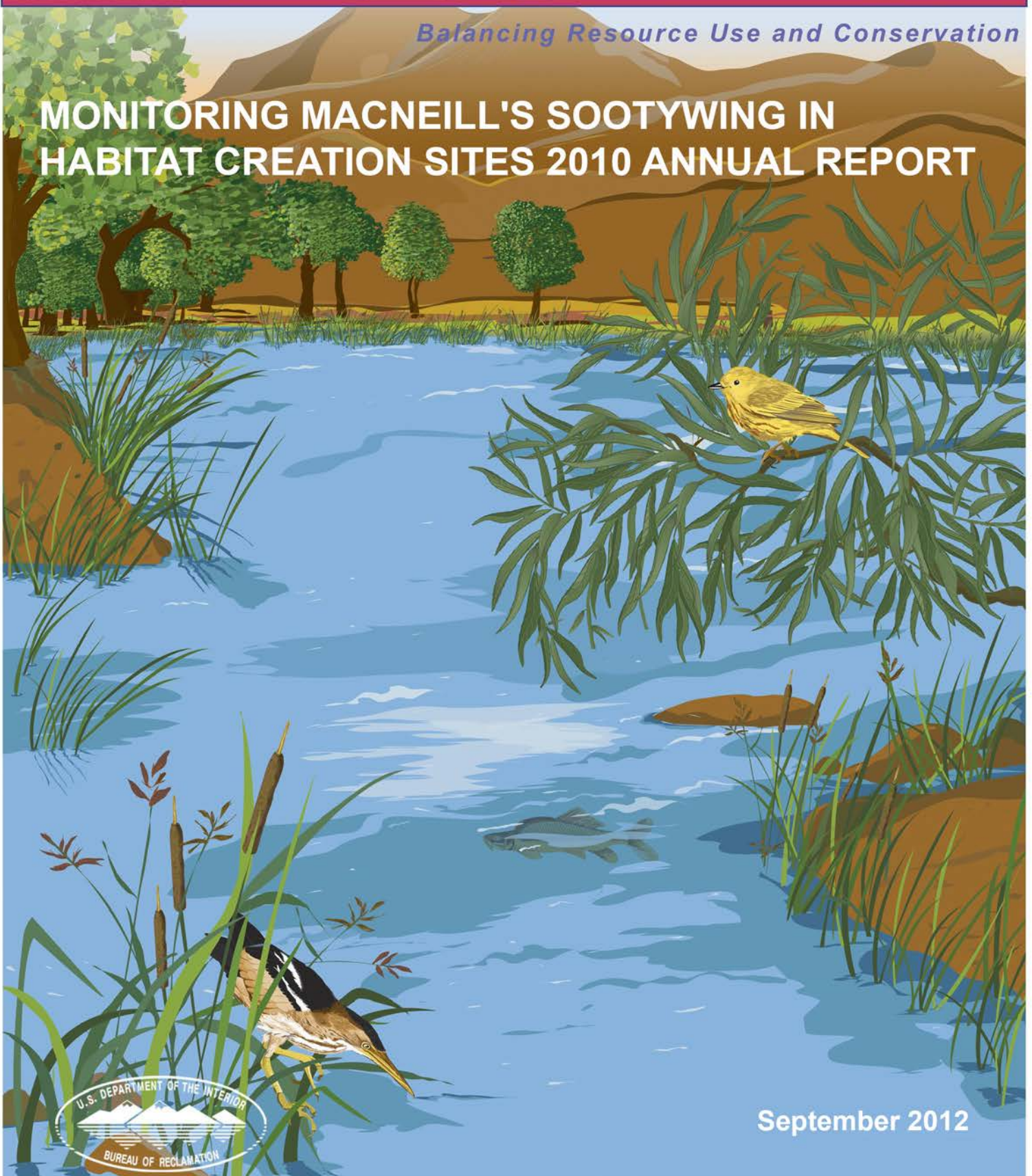




# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## MONITORING MACNEILL'S SOOTYWING IN HABITAT CREATION SITES 2010 ANNUAL REPORT



September 2012

# Lower Colorado River Multi-Species Conservation Program Steering Committee Members

## **Federal Participant Group**

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  
City of Somerton  
City of Yuma  
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  
Town of Fredonia  
Town of Thatcher  
Town of Wickenburg  
Salt River Project Agricultural Improvement and Power District  
Unit "B" Irrigation and Drainage District  
Wellton-Mohawk Irrigation and Drainage District  
Yuma County Water Users' Association  
Yuma Irrigation District  
Yuma Mesa Irrigation and Drainage District

## **Other Interested Parties Participant Group**

QuadState County Government Coalition  
Desert Wildlife Unlimited

## **California Participant Group**

California Department of Fish and Game  
City of Needles  
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  
San Diego County Water Authority  
Southern California Edison Company  
Southern California Public Power Authority  
The Metropolitan Water District of Southern California

## **Nevada Participant Group**

Colorado River Commission of Nevada  
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 MACNEILL'S SOOTYWING IN HABITAT CREATION SITES 2010 ANNUAL REPORT**

*Prepared by: Bill Wiesenborn, Wildlife Group*

Lower Colorado River  
Multi-Species Conservation Program  
Bureau of Reclamation  
Lower Colorado Region  
Boulder City, Nevada  
<http://www.lcrmscp.gov>

**September 2012**

## ABSTRACT

Habitat created in part for MacNeill's sootywing was surveyed for adult sootywings during April-September 2010. The objective of surveys was to determine if sootywings are established at restoration plots. Five plots at Cibola Valley Conservation Area (CVCA), totaling 232 acres, and three plots at Palo Verde Ecological Reserve (PVER), totaling 35 acres, were sampled. Sootywings were most abundant in the 58-acre plot at CVCA Phase 4-west, planted in March 2009, with > 200 adults counted per date during April to July along a dirt road bisecting the plot. Sootywings were absent at the near-dead, 8-acre Phase 2 plot, and low numbers of sootywings (< 8 per date) were counted at the remaining 3 CVCA quail brush plots. Sootywing populations at PVER were very low or absent. The deep-furrow irrigation used at CVCA Phase 4-west appears very effective in growing *Atriplex lentiformis* shrubs suitable as hosts for MacNeill's sootywings. We suggest deep-furrows should be used at all future plots constructed for the species. Although adult sootywings typically occur during April-September, populations in 2010 disappeared after July. This disappearance was due to drought that eliminated the skipper's perennial nectar-source, heliotrope. The population decline emphasizes the importance of maintaining adequate soil moisture during periods of low rainfall when adults are active.

## INTRODUCTION

MacNeill's sootywing, *Hesperopsis graciellae* (MacNeill), is a small (wingspread = 23 mm) dark-brown butterfly (Lepidoptera: HesperIIDae; Pyrginae) found along the lower Colorado River and near the river along its tributaries in southeastern California, western Arizona, southern Nevada, and southern Utah (MacNeill 1970, Austin and Austin 1980, Scott 1986, Nelson and Anderson 1999). The species is State listed as S1 (critically imperiled) in Nevada and S2 (imperiled) or S3 (rare or uncommon but not imperiled) in Arizona and California. Flights of *H. graciellae* occur from April to October with three generations in southern Nevada (Austin & Austin 1980) and two flights in southeastern California (April & July to October, Emmel & Emmel 1973). MacNeill's sootywing appears to require shade to tolerate the high temperatures where it lives (Wiesenborn 1999).

Larvae of sootywings feed only on quail brush, *Atriplex lentiformis* (Torrey) (Chenopodiaceae), a shrub found in dense clumps along lower Colorado River drainages (Emmel & Emmel 1973). Quail brush fixes atmospheric nitrogen (Malik et al. 1991). Female sootywings oviposit on large (radius > 1.6 m) host plants with high concentrations of water (> 64%) in branches and nitrogen (> 3.2% of dry-mass) in leaves (Wiesenborn and Pratt 2008). Sources of nectar for butterflies may limit the sootywing's distribution, because *A. lentiformis* is wind pollinated and does not produce nectar. Other plant species therefore are needed by the skipper for nectar. We have observed sootywings nectar-feeding (Figs. 1-2) on eight plant species (Pratt and Wiesenborn 2009):

Heliotrope	<i>Heliotropium curassavicum</i>	Boraginaceae	white flowers
Western purslane	<i>Sesuvium verrucosum</i>	Aizoaceae	pink flowers
Arrowweed	<i>Pluchea sericea</i>	Asteraceae	purple flowers
Alkali mallow	<i>Malvella leprosa</i>	Malvaceae	white-yellow flowers
Screwbean mesquite	<i>Prosopis pubescens</i>	Fabaceae	yellow flowers



Honey mesquite	<i>Prosopis glandulosa</i>	Fabaceae	yellow flowers
Tamarisk	<i>Tamarix ramosissima</i>	Tamaricaceae	white-pink flowers
Common purslane	<i>Portulaca oleracea</i>	Portulacaceae	yellow flowers

Heliotrope, and to a lesser extent western-purslane, is the plant most-used by MacNeill's sootywing as a source of nectar (Wiesenborn and Pratt 2010, Wiesenborn 2010). Sootywings visit flowers on heliotrope so frequently that the plant serves as a monitoring tool for the skipper.



Fig. 1. Adult MacNeill's sootywing visiting a flower on naturalized, common purslane (*Portulaca oleracea*) at CVCA Phase 4-west during 2009.



Fig. 2. Adult MacNeill's sootywing visiting a flower on tamarisk, *Tamarix ramosissima*, alongside the Colorado River near Blythe during 2008.

The objectives of this work task are to (1) survey MacNeill's sootywings at MSCP restoration sites and (2) determine if new or existing sites need to be altered to ensure sootywing establishment. This work task is integrated with three other MSCP work tasks:

- C7: Survey and Habitat Characterization for MacNeill's Sootywing
- E4: Palo Verde Ecological Reserve (PVER)
- E5: Cibola Valley Conservation Area (CVCA)

## STUDY AREAS

Five restoration plots supporting *A. lentiformis* alone or together with *Prosopis* sp. (mesquite) were surveyed during 2010. Five plots were at CVCA and three plots were at PVER:

<u>Restoration Plot</u>	<u>Planted</u>	<u>Acres</u>	<u>Description</u>
CVCA Phase 2	2007	8	entirely quail brush, flood irrigated
CVCA Phase 3	2008	6	quail brush and mesquite in deep furrows
CVCA Phase 4 west	2009	58	quail brush and mesquite in deep furrows
CVCA Phase 4 east	2009	90	quail brush and mesquite in deep furrows
CVCA Phase 5	2010	70	quail brush and mesquite in deep furrows
PVER Phase 3	2008	6	quail brush in 4 strips within alfalfa plot, flood irrigated
PVER Phase 4	2009	11	mixture of quail brush, mesquite, and native grasses, flood irrigated
PVER Phase 5	2010	18	quail brush, mesquite, and native grasses in shallow-furrows (2 plots, north and south, separated by a dirt road)

## METHODS

MacNeill's sootywings were sampled to determine if they are absent, rare (< 10 per sampling date), or abundant at the different restoration plots. We sampled transects along *A. lentiformis* plots at CVCA 7-8 times and those at PVER 7 times during April-September 2010. Surveys for adult sootywings took place primarily on plants with nectar-producing flowers, especially heliotrope. Sampling efficiency is improved by sampling flowers, because sootywings aggregate on flowers other than *Atriplex* to obtain nectar. Transects along roads (Fig. 3) were sampled, because heliotrope and other nectar-producing plants are more abundant in disturbed areas such as along roads. Adult sootywings were sampled on quail brush along transects if nectar-producing flowers were absent. Repeated sampling of the same transects allows examining population trends through time.

Sampled transects were:

<u>Restoration Plot</u>	<u>Transect Sampled</u>
CVCA Phase 2	entire west edge along road
CVCA Phase 3	entire west, south, and east edges
CVCA Phase 4 west	entire east-west dirt-road bisecting plot
CVCA Phase 4 east	entire south and east edges along roads
CVCA Phase 5	entire south edge along road
PVER Phase 3	entire west edge along drainage canal
PVER Phase 4	entire east edge along berm
PVER Phase 5	entire west edge along dirt road bordering quail brush

Plots were sampled during 0830-1500 PDT when air temperature was 26-38 °C and relative humidity was 20-24%. All plots were walked to locate adult and larval sootywings. Numbers of adult sootywings located were recorded, and any larval sootywings were noted.



Fig. 3. CVCA Phase 4-west viewed from west in 2010. Rows are planted quail brush and mesquite. Tamarisk, bordering the north and west edges, is spreading into the restoration plot. MacNeill's sootywings were sampled along dirt road extending eastwards through center of plot.



## RESULTS

### Cibola Valley Conservation Area

CVCA Phase 4-west (Fig. 4) is the only plot at either CVCA or PVER where sootywings have become well established. Adult sootywings were abundant in this plot during late April to mid-July (Fig. 5). Drought during the summer (Fig. 6) caused the sootywing's primary source of nectar, heliotrope, to die above-ground after July. This resulted in a disappearance of adult sootywings. The skipper's host plant, quail brush, remained well-watered during the drought due to irrigation.



Fig. 4. CVCA Phase 4-west during late 2010. *Atriplex lentiformis* shrubs are planted in 2-foot deep furrows.



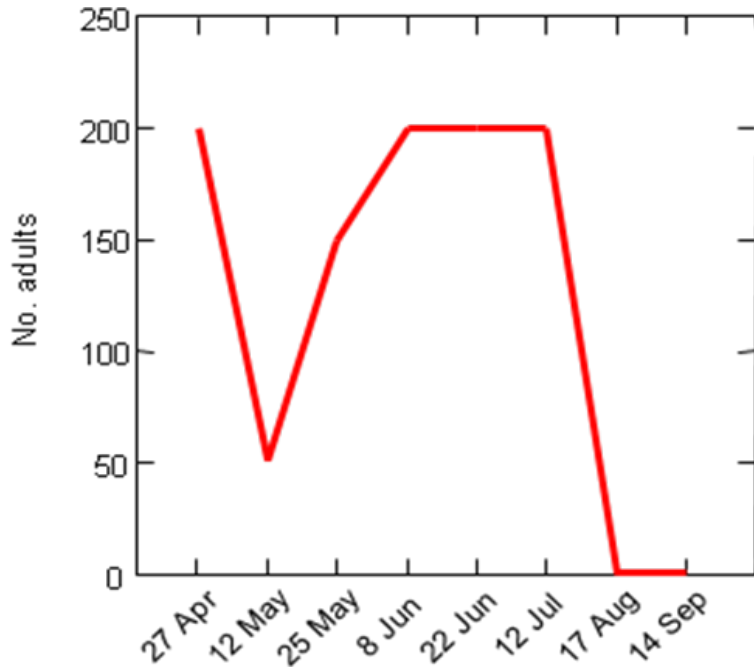


Fig. 5. Counts of adult MacNeill's sootywing along transect bisecting the CVCA Phase 4-west plot during 2010.

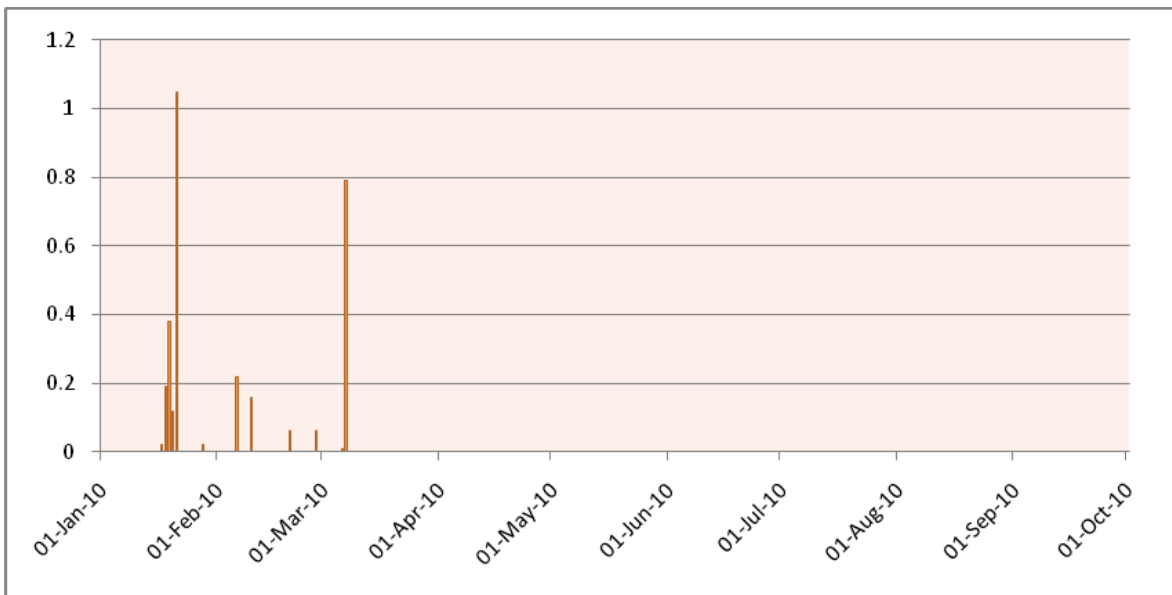


Fig. 6. Rainfall in inches at Blythe, California, during January through September 2010. Data from CIMIS station operated by California Department of Water Resources.

Low populations of adult sootywings (< 8 per date) were detected at the other CVCA quail-brush plots (Fig. 7). Sootywings were absent at Phase 2, a site containing mostly dead *A. lentiformis*. We observed a late-season upswing in sootywings at the newly-planted Phase 5. Similar to Phase 4-west, this plot contains quail brush and mesquite planted in deep furrows. Its vegetation is developing similar to Phase 4-west during 2009.

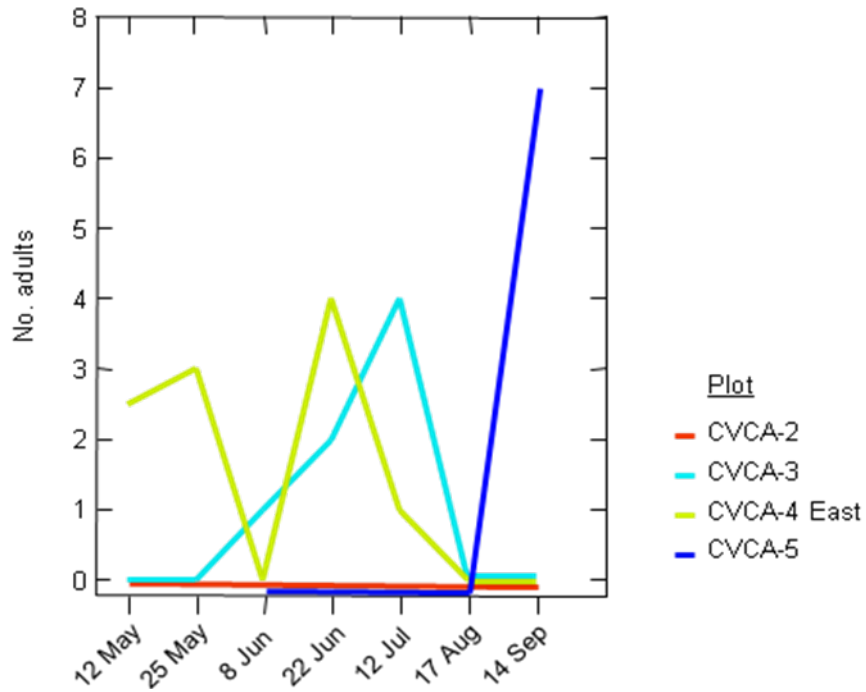


Fig. 7. Counts of MacNeill’s sootywings along transects at CVCA plots containing *Atriplex lentiformis*.

Palo Verde Ecological Reserve

Very-low populations of MacNeill's sootywings (< 3 per date) were observed at PVER (Fig. 8). Sootywings were sparse at Phase 4 (Fig. 9) and absent at Phase 3 and the newly-planted Phase 5 (Figs. 10).

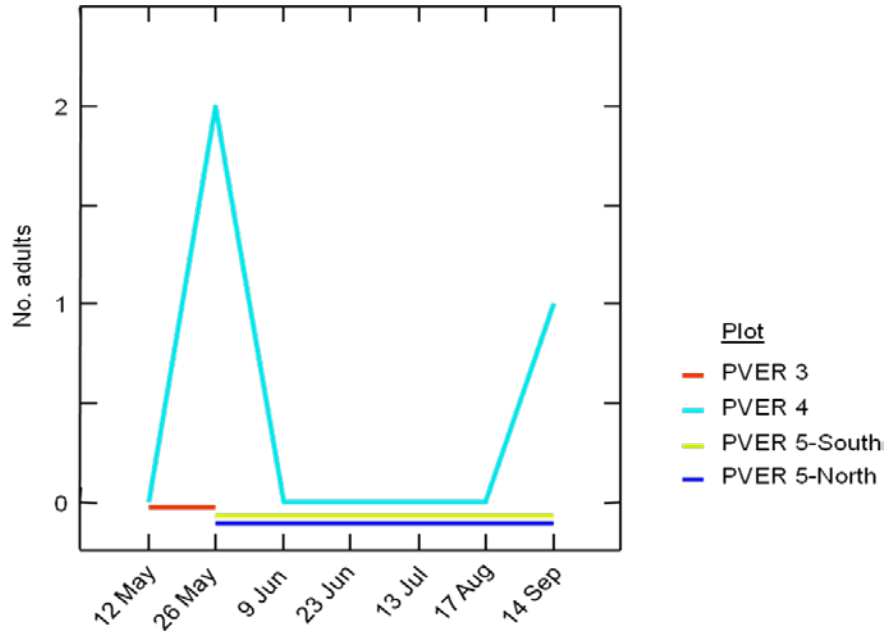


Fig. 8. Counts of adult MacNeill's sootywings along transects at PVER plots containing *Atriplex lentiformis* during 2010. Phase 5 is divided into north and south plots, separated by a dirt road.



Fig. 9. *Atriplex lentiformis* Phase 4 plot at PVER during late 2010.





Fig. 10. Quail brush, mesquite, and native grass at PVER Phase 5, planted in spring 2010.

I terminated sampling at Phase 3 after May, because the quail brush had become swamped by alfalfa and weeds. Sootywings at Phase 4 were observed flying amongst the *A. lentiformis* shrubs growing along the north edge of the plot.

## DISCUSSION

The quail brush plot at CVCA Phase 4-west remains the most successful restoration site for MacNeill's sootywings. The plot produces a large stand of host plants that are adequately watered. Volunteer heliotrope within the plot provides ample nectar for adult skippers. The drought during summer 2010 eliminated the heliotrope, and dependent sootywings, but did not affect the quality of host shrubs. The return of rainfall during winter 2010-2011 should enable heliotrope, a perennial, to regrow. Long-term affects to the sootywing population are not anticipated.

The likelihood of drought at the site emphasizes the importance of irrigation at the site. Quail brush is a riparian plant that we have planted in a non-riparian agricultural field. Irrigation will be needed to maintain adequate plant moisture-contents. *Atriplex lentiformis* that is not watered, as can be seen in a volunteer plot south of Phase 5, supports little or no butterflies.

The deep furrows at CVCA Phase 4-west have proven very successful. This same approach was used at CVCA Phase 5, and sootywings were colonizing this plot late during 2010 similar to their colonization of CVCA Phase 4-west during 2009. Deep furrows provide adequate water to the intended plants, quail brush and mesquite, while minimizing the water supply to weeds. Adequate watering of quail brush provides the plant water-content needed to produce shrubs suitable for sootywings (Wiesenborn and Pratt 2008). We suggest all future construction of *A. lentiformis* and *Prosopis* spp. plots use deep-furrow irrigation.

*Atriplex* plots at PVER continue to support little or no sootywings. This is most likely due to the absence of nectar-providing plants such as heliotrope. Sootywings may become more abundant if heliotrope volunteers within the plots. Planting narrow strips of quail brush within other plants, as at PVER Phase 3, also has not been successful, because the *Atriplex* has been crowded out.

Populations of sootywings are likely to change at each of the fields as they mature. For example, quail brush grows faster than mesquite due to its C<sub>4</sub> physiology. As plots mature, mesquite will eventually overtop the *A. lentiformis* plants, changing the vegetation structure. This likely will not decrease sootying populations, because mesquite provides shade needed by the sootying to control body temperature (Wiesenborn 1999).

Of interest continues to be the low populations of sootywings at CVCA Phase 3. This field appears to be suitable for *H. graciellae*. Additional work may be needed to clarify why sootywings are not colonizing the plot. Possible problems may include inadequate host-plant water and nitrogen contents, low nectar production by flowering plants, field isolation, or small field size.

## LITERATURE CITED

- Austin, G. T. and A. T. Austin. 1980. Butterflies of Clark County, Nevada. *Journal of Research on the Lepidoptera* 19:1-63.
- Emmel, T. C. and J. F. Emmel. 1973. The Butterflies of Southern California. Natural History Museum of Los Angeles County, Science Series no. 26.
- MacNeill, C. D. 1970. A new *Pholisora* with notes on *P. alphaeus* (Edw.) (Lepidoptera: Hesperiiidae). *Entomological News* 81:177-184.
- Malik, K. A., B. Rakhshanda, G. Rasul, K. Mahmood, and M. I. Sajjad. 1991. Associative N<sub>2</sub>-fixation in plants growing in saline sodic soils and its relative quantification based on <sup>15</sup>N natural abundance. *Plant Soil* 137: 67-74.
- Nelson, S. M., and D. C. Anderson. 1999. Butterfly (Papilionoidea and Hesperioidea) assemblages associated with natural, exotic, and restored riparian habitats along the lower Colorado River, USA. *Regulated Rivers: Research & Management* 15:485-504.
- Pratt, G. F., and W. D. Wiesenborn. 2009. MacNeill's sootywing (*Hesperopsis graciellae*) (Lepidoptera: Hesperiiidae) behaviors observed along transects. *Proceedings of the Entomological Society of Washington* 111:698-707.
- Scott, J. A. 1986. The Butterflies of North America. Stanford University Press, Stanford, California.
- Wiesenborn, W. D. 1999. Sunlight avoidance compared between *Hesperopsis graciellae* (MacNeill) (Lepidoptera: Hesperiiidae) and *Brephidium exilis* (Boisduval) (Lepidoptera: Lycaenidae). *Pan-Pacific Entomologist* 75(3):147-152.
- Wiesenborn, W. D. 2010. Attraction of *Hesperopsis graciellae* (Lepidoptera: Hesperiiidae) skippers to *Heliotropium curassavicum* inflorescence models. *Journal of the Kansas Entomological Society* 83: 288-296.
- Wiesenborn, W. D., and G. F. Pratt. 2008. Selection of *Atriplex lentiformis* host plants by *Hesperopsis graciellae* (Lepidoptera: Hesperiiidae). *Florida Entomologist* 91:192-197. Available on MSCP website under Technical Reports.
- Wiesenborn, W.D., and G.F. Pratt. 2010. Visitation of heliotrope and western purslane flowers by *Hesperopsis graciellae* (Lepidoptera: Hesperiiidae). *Florida Entomologist* 93: 260-264.