Monitoring MacNeill’s Sootywing in Habitat Creation Sites

2011 Annual Report

January 2013
Lower Colorado River Multi-Species Conservation Program
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Lower Colorado River
Multi-Species Conservation Program

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Wildlife Group

Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
Lower Colorado Region
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January 2013
ACRONYMS AND ABBREVIATIONS

CVCA          Cibola Valley Conservation Area
LCR MSCP      Lower Colorado River Multi-Species Conservation Program
PVER          Palo Verde Ecological Reserve
ABSTRACT

Habitat created in part for MacNeill’s sootywing (*Hesperopsis gracielae*) was surveyed for adult sootywings during April–September 2011. 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. Abundances of sootywings significantly declined from 2010, especially at CVCA. Four sootywings were counted at CVCA Phase 4-west during 2011, down from the hundreds that were seen during 2008–10. Few sootywings also were observed at PVER; however, an increase to five adults at PVER Phase 4 occurred in September. The decline in sootywings at CVCA Phase 4-west was potentially due to two factors: (1) low leaf-water contents of *Atriplex* shrubs, the larval host plant, and (2) elimination of heliotrope plants that provide nectar to adults. Both of these limitations are due to the large size that *Atriplex* shrubs have attained. The shrubs now require more water to maintain leaf moisture, and they have crowded out heliotrope from the irrigated deep furrows. Plowing the areas between the furrows for fire control has also limited the heliotrope. PVER Phase 4 now appears to support the most sustainable population of sootywings. Establishing sootywing habitat should now shift from planting additional *Atriplex* to managing existing plots.
INTRODUCTION

MacNeill’s sootywing (*Hesperopsis gracielae*) is a small (wingspread = 23 millimeters) 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; Nelson and Anderson 1999; Pratt and Wiesenborn 2011). 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. gracielae* occur from April to October, with 2–3 flights of adults per year (Emmel and Emmel 1973; Austin and Austin 1980). 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*), a shrub found in dense clumps along lower Colorado River drainages (Emmel and Emmel 1973). Quail brush fixes atmospheric nitrogen (Malik et al. 1991). Female sootywings oviposit on large (radius > 1.6 meters) host plants with high concentrations of water (> 64 percent) in branches and nitrogen (> 3.2 percent 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 (figures 1 and 2) on eight plant species (Pratt and Wiesenborn 2009):

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Scientific Name</th>
<th>Family Name</th>
<th>Flower Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heliotrope</td>
<td><em>Heliotropium curassavicu</em></td>
<td>Boraginaceae</td>
<td>White flowers</td>
</tr>
<tr>
<td>Western purslane</td>
<td><em>Sesuvium verrucosum</em></td>
<td>Aizoaceae</td>
<td>Pink flowers</td>
</tr>
<tr>
<td>Arrowweed</td>
<td><em>Pluchea sericea</em></td>
<td>Asteraceae</td>
<td>Purple flowers</td>
</tr>
<tr>
<td>Alkali mallow</td>
<td><em>Malvella leprosa</em></td>
<td>Malvaceae</td>
<td>White-yellow flowers</td>
</tr>
<tr>
<td>Screwbean mesquite</td>
<td><em>Prosopis pubescens</em></td>
<td>Fabaceae</td>
<td>Yellow flowers</td>
</tr>
<tr>
<td>Honey mesquite</td>
<td><em>Prosopis glandulosa</em></td>
<td>Fabaceae</td>
<td>Yellow flowers</td>
</tr>
<tr>
<td>Tamarisk</td>
<td><em>Tamarix ramosissima</em></td>
<td>Tamaricaceae</td>
<td>White-pink flowers</td>
</tr>
<tr>
<td>Common purslane</td>
<td><em>Portulaca oleracea</em></td>
<td>Portulacaceae</td>
<td>Yellow flowers</td>
</tr>
</tbody>
</table>

Heliotrope, and to a lesser extent western-purslane, is the plant most used by MacNeill’s sootywings as a source of nectar (Wiesenborn and Pratt 2010; Wiesenborn 2010). Sootywings visit flowers on heliotrope so frequently that the plant can serve as a monitoring tool for the skipper.
Figure 1.—Adult MacNeill’s sootywing visiting a flower on heliotrope, *Heliotropium curassavicu*m, at Havasu National Wildlife Refuge during 2009. Note the hooked-end of the antennae, characteristic of skippers (family Hesperiidae).

Figure 2.—Adult MacNeill’s sootywing on an inflorescence of heliotrope, *Heliotropium curassavicu*m, on Cibola Island within Cibola National Wildlife Refuge during 2008. This area was destroyed in the Three Slashes Fire during 2011.
The objectives of this work task are to (1) survey MacNeill’s sootywings at Lower Colorado River Multi-Species Conservation Program (LCR 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 LCR 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 2011. Five plots were at CVCA and three plots were at PVER.

<table>
<thead>
<tr>
<th>Restoration plot</th>
<th>Planted</th>
<th>Acres</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVCA Phase 2</td>
<td>2007</td>
<td>8</td>
<td>Entirely quail brush, flood irrigated</td>
</tr>
<tr>
<td>CVCA Phase 3</td>
<td>2008</td>
<td>6</td>
<td>Quail brush and mesquite in deep furrows</td>
</tr>
<tr>
<td>CVCA Phase 4-west</td>
<td>2009</td>
<td>58</td>
<td>Quail brush and mesquite in deep furrows</td>
</tr>
<tr>
<td>CVCA Phase 4-east</td>
<td>2009</td>
<td>90</td>
<td>Quail brush and mesquite in deep furrows</td>
</tr>
<tr>
<td>CVCA Phase 5</td>
<td>2010</td>
<td>70</td>
<td>Quail brush and mesquite in deep furrows</td>
</tr>
<tr>
<td>PVER Phase 3</td>
<td>2008</td>
<td>6</td>
<td>Quail brush in four strips within alfalfa plot, flood irrigated</td>
</tr>
<tr>
<td>PVER Phase 4</td>
<td>2009</td>
<td>11</td>
<td>Mixture of quail brush, mesquite, and native grasses, flood irrigated</td>
</tr>
<tr>
<td>PVER Phase 5</td>
<td>2010</td>
<td>18</td>
<td>Quail brush, mesquite, and native grasses in shallow furrows</td>
</tr>
<tr>
<td>Sum</td>
<td></td>
<td>267</td>
<td></td>
</tr>
</tbody>
</table>

**METHODS**

We sampled *A. lentiformis* plots at CVCA 7–8 times and those at PVER 7 times during April–September 2010. We sampled plots by counting adult sootywings along transects (figure 3) within or adjacent to plots. Sampled areas were:
<table>
<thead>
<tr>
<th>Restoration plot</th>
<th>Transect sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVCA Phase 2</td>
<td>Entire west edge along road</td>
</tr>
<tr>
<td>CVCA Phase 3</td>
<td>Entire west, south, and east edges</td>
</tr>
<tr>
<td>CVCA Phase 4 west</td>
<td>Entire east-west dirt road bisecting plot</td>
</tr>
<tr>
<td>CVCA Phase 4 east</td>
<td>Entire south and east edges along roads</td>
</tr>
<tr>
<td>CVCA Phase 5</td>
<td>Entire south edge along road</td>
</tr>
<tr>
<td>PVER Phase 3</td>
<td>Entire west edge along drainage canal</td>
</tr>
<tr>
<td>PVER Phase 4</td>
<td>Entire north edge along berm</td>
</tr>
<tr>
<td>PVER Phase 5</td>
<td>Entire south edge along dirt road bordering quail brush</td>
</tr>
</tbody>
</table>

Sootywing adults flying around *A. lentiformis* shrubs or landing on flowers on other plants, primarily *H. curassavicum*, were counted. Plots were sampled during 0845–1230 Pacific Daylight Time when the air temperature was 24–36 degrees Celsius and the relative humidity was 22–45 percent.
RESULTS

Cibola Valley Conservation Area

Sootywing populations decreased severely at CVCA from 2008–10. A total of 11 sootywings were observed, mostly at CACA Phases 4-west and 4-east (figure 4). For comparison, approximately 1,430 sootywings were counted on eight dates at the same CVCA plots during 2010 (2010 F6 Annual Report).

![Graph showing counts of MacNeill’s sootywings along transects at CVCA plots containing Atriplex lentiformis.](image)

Figure 4.—Counts of MacNeill’s sootywings along transects at CVCA plots containing *Atriplex lentiformis*.

Two factors have contributed to the MacNeill’s sootywing’s decline:

1) *Atriplex* host plants are not being irrigated adequately to provide leaf-water contents (> 64 percent) needed for larvae to develop and survive. This problem has been increased by the large size the plants have attained. As plants become larger, more water is needed to maintain adequate leaf moistures. This can be seen at CVCA Phase 3. Plants receiving
supplemental water from road runoff are large and dense (figure 5) and support leaves that are large and blue-green (figure 6). Plants within rows are smaller and less dense (figure 7) and support small, gray leaves (figure 8). All of the sootywings at CVCA Phase 4-west were seen within a single clump of *A. lentiformis* (figure 9). These shrubs appeared dark blue-gray, indicating adequate leaf-water content for larval development, whereas other *A. lentiformis* at the site were dry and light gray.

2) Flowering plants, mostly heliotrope, that provide nectar for adult butterflies has been crowded out from the furrows by *Atriplex*. Nectar sources also have been eliminated by removal (disking) of weeds between furrows and around the borders of plots for fire control (figure 10). Low rainfall during 2011 (figure 11) contributed to the absence of volunteer heliotrope between the rows of *Atriplex*.

Figure 5.—*Atriplex lentiformis* shrubs growing along the road on the west side of CVCA Phase 3.
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Figure 6.—Closeup of foliage on shrub shown on figure 5.

Figure 7.—\textit{Atriplex lentiformis} shrubs growing along a deep furrow in CVCA Phase 3.
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Figure 8.—Closeup of foliage on shrub shown on figure 7.

Figure 9.—East end of transect at CVCA Phase 4-west during 2011. All of the sootywings observed at this phase during 2011 were flying around this moist clump of large *Atriplex lentiformis* shrubs.
Figure 10.—Area between rows of mesquite and quail brush at CVCA Phase 4-west disked to remove weeds for fire control.

Figure 11.—Rainfall in inches at Blythe, California, during January through September 2011. The only significant rainfall (1.06 inches total) was during February 18–20. Data from California Irrigation Management Information System station operated by California Department of Water Resources.
Only one other adult sootywing was seen at CVCA, in Phase 3 (see figure 4). Sootywings were absent at Phase 2, a site containing mostly dead *A. lentiformis*, and at Phase 5.

### Palo Verde Ecological Reserve

Low populations of MacNeill’s sootywings (< 6 per date) were observed at PVER (figure 12). Eight sootywings were seen at Phase 4 (figure 13), one at Phase 5, and none at Phase 3. A localized, convective storm at PVER during September appeared to increase nectar production, primarily on alfalfa, and sootywing activity at Phase 4. Flooding from this storm damaged the levee access road and prevented sampling Phase 5.

![Figure 12.—Counts of adult MacNeill's sootywings along transects at PVER plots containing *Atriplex lentiformis* during 2011.](image)
DISCUSSION

Sootywings are now rare or absent within *Atriplex* plots at CVCA and PVER, a severe decline from 2010. The skipper’s two habitat requirements, host plants with high leaf-water content for larvae and sources of nectar for adults, may not be sufficient at either site. The exception during 2011 was PVER Phase 4. This plot was receiving adequate water, and alfalfa was providing nectar for adults. Alfalfa is a marginal nectar source, however, as it produces legume-shaped flowers that are visited more by bees than butterflies.

The decline of sootywings at CVCA coincided with the destruction of the largest sootywing population we detected during the species’ survey (Pratt and Wiesenborn 2011). This locality was within Cibola National Wildlife Refuge at Cibola Island, an area of farmland restored to mesquite and quail brush. The area was completely destroyed in the Three Slashes Fire in early September 2011. The two largest sootywing populations in the Blythe area, Cibola Island and CVCA Phase 4-west, are now mostly devoid of the species.

Water contents of *Atriplex* shrubs and abundances of nectar-producing plants will both need to be increased to re-establish sootywing populations at CVCA Phase 4-west. Plants providing nectar, especially heliotrope, may volunteer within the plowed strips between rows of *Atriplex*. This is dependent on rainfall,
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as the strips do not receive irrigation. Volunteer heliotrope will need to be preserved from plowing. Irrigating Atriplex at CVCA enough to produce adequate leaf moisture is more of a problem due to the large size of the shrubs and the limited water availability.

The one optimistic note is the increasing sootywing population at PVER Phase 4. Water is not an issue at this site, and nectar sources, albeit of marginal quality, are available. If the population of sootywings at PVER Phase 4 can be maintained and increased, it can serve as a supply of skippers for PVER Phase 5, which lies immediately to the north.

The areal extent of A. lentiformis at CVCA and PVER (267 acres) now exceeds the LCR MSCP’s requirement for sootywing habitat (222 acres). Attention should now be focused on managing restoration sites to produce sustainable populations of the skipper. This includes irrigating Atriplex adequately for larvae and establishing nectar-producing plants for adults.
LITERATURE CITED


Wiesenborn, W.D. 1999. Sunlight avoidance compared between Hesperopsis gracielae (MacNeill) (Lepidoptera: Hesperiidae) and Brephidium exilis (Boisduval) (Lepidoptera: Lycaenidae). Pan-Pacific Entomologist 75(3):147–152.

