

## Work Task C7: Survey and Habitat Characterization for MacNeill's Sootywing

| FY08 Estimates | FY08 Actual | Cumulative Accomplishment Through FY08 | FY09 Approved Estimate | FY10 Proposed Estimate | FY11 Proposed Estimate | FY12 Proposed Estimate |
|----------------|-------------|--|------------------------|------------------------|------------------------|------------------------|
| \$160,000      | \$88,573.21 | \$359,180.21                           | \$145,000              | \$80,000               | \$0                    | \$0                    |

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**Start Date:** FY06

**Expected Duration:** FY10

**Long-term Goal:** Species research

**Conservation Measures:** MNSW1

**Location:** Floodplain of entire lower Colorado River, dependent on permission by landowners.

**Purpose:** The purpose of this work task is to survey the MacNeill's sootywing distribution along the lower Colorado River and determine its habitat requirements. Results from MNSW1 will be used to accomplish MNSW2, which creates habitat for the species.

**Connections with Other Work Tasks (past and future):** Results of this study will be used in future work tasks to create habitat for MacNeill's sootywing under work tasks in Section E. This work task will be phased out and replaced by work task F6 during FY09-10. Work task F6 monitors habitat created for sootywings.

**Project Description:** The butterfly and its host plant, quailbush (*Atriplex lentiformis*), will be surveyed within the LCR MSCP boundaries. Preliminary annual surveys will cover one third of the flood plain. Surveys will record GPS coordinates of stands of quailbush and estimate the plant's area of coverage. Species will be detected as eggs, larvae, pupae, or adults on host plants and as adults on nearby nectar sources. Surveys will be conducted during April to October when adults are intermittently present (2-3 generations occur per season). GPS coordinates will be recorded.

The species habitat requirements will be determined concurrent with surveys by measuring site factors affecting sootywing presence or absence and density. Possible site factors are:

1. plant water and nitrogen content
2. plant species used as nectar sources
3. availability of nearby nectar sources (distances, amounts)
4. area of *A. lentiformis* stands
5. elevation and latitude

**Previous Activities:** We surveyed between Parker Dam and Imperial Dam during 2006 and between Imperial Dam and the SIB during 2007. We counted numbers of adults and their behaviors (nectaring, oviposition, etc.) on eight dates monthly from April to October at Cibola NWR during 2007. One flight of adults was observed, peaking at the end of June. The most common behavior observed was flying within quailbush plants. Adults were found feeding at flowers of six plant species: heliotrope, sea purslane, tamarisk, honey mesquite, alkali-mallow, and arrowweed. Heliotrope was the most frequent nectar source during spring, and tamarisk was the most frequent nectar source during summer. A seventh plant species used for nectar (the weedy succulent, *Portulaca oleracea*) was identified south of Yuma.

We completed a study of host-plant selection by ovipositing sootywings begun in 2006 at Cibola NWR. The effects of plant size (canopy radius), plant water content, and leaf water content on host acceptance were tested. Percentages of plant water and leaf nitrogen were positively correlated. Acceptance of plants was most-influenced by plant size and leaf nitrogen-content acting simultaneously. All plants ( $n = 9$  of 39 plants sampled) that exceeded 1.6 m in canopy radius, 64% in water content, and 3.2% in leaf nitrogen received eggs. We presented preliminary recommendations for restoring sootywing habitat based on our survey and study results in the FY07 Annual Report.

**FY08 Accomplishments:** We completed our preliminary survey for sootywings and their host plants by surveying between the Muddy River inflow into Lake Mead and Parker Dam during 2008. In total, 102 localities were identified supporting stands of host plants. GPS coordinates for these sites were entered into the Geographic Information System. Sootywings were found at 54 of the host-plant localities.

We also completed a comparison of nectaring frequencies on potted *Heliotropium curassavicum* (heliotrope) and *Sesuvium verrucosum* (sea purslane) plants. Nectarings per plant did not differ between plant species, but flowers were more often visited in open sun than in shade. Nectarings per flower were greater on *S. verrucosum*, the species with fewer flowers per plant. We measured amounts of nectar remaining in heliotrope flowers after landings by adults. Female sootywings landed on plants supporting inflorescences with more nectar than did males. Amounts of nectar in flowers decreased after landings by females but not by males. Work and expenditures by the cooperator has been delayed and thus the work has been extended to February of 2010.

MacNeill's sootywing skippers diapause (overwinter) as mature larvae. We examined the effects of moisture on diapause-termination (continued development to pupae). Nineteen diapausing larvae were collected on December 3, 2007 at Blythe, Yuma, and El Centro and brought into the laboratory at Boulder City on January 22, 2008. Seven of the larvae were placed in water for 10 minutes, with the remainder kept dry. We monitored their daily development to pupae and to adults. All larvae developed to pupae, regardless of wetting, during January 25 to February 13, 2008. Wetting likely had no effect on diapause-termination, because larvae instead responded to higher air temperatures inside the laboratory. Development periods from mature larvae to pupae (2-22 days) varied greatly, whereas development time from pupae to adults (14-18 days) was more constant. Environmental factors that trigger emergence of adults during spring remain unknown.

**FY09 Activities:** Fall and winter during FY09 will be spent analyzing data collected during summer 2008, including the survey results, and writing reports. Activities during spring and summer will include:

1. Importance of amino acids in nectar in flowers selected by sootywings. This is a follow-up to our examination of the importance of nectar sugar content.
2. Importance of shade in sootywing thermoregulation. We will attempt to monitor body temperatures of sootywings in the field using an infrared thermometer.
3. Other potential projects are a) predation and parasitism of sootywing larvae, and b) patterns of dispersion by sootywings among host plants and nectar sources (i.e., how far do sootywings move around?)

**Proposed FY10 Activities:** Fall and winter during FY10 will be spent analyzing data collected during summer 2009, including the survey results, and writing reports. Activities during FY10 will cease when the Cooperative Agreement with UC Riverside expires. Most work during this period will consist of analyzing data collected during summer 2009 and writing reports.

**Pertinent Reports:** Wiesenborn, W.D., and G.F. Pratt. 2008. Selection of *Atriplex lentiformis* host plants by *Hesperopsis graciellae* (Lepidoptera: Hesperiiidae). Florida Entomologist 91:192-197.