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

FY10 Estimates	FY10 Actual	Cumulative Accomplishment Through FY10	FY11 Approved Estimate	FY12 Proposed Estimate	FY13 Proposed Estimate	FY14 Proposed Estimate
$80,000	$58,380.22	$546,963.96	$0	$0	$0	$0

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Start Date: FY06

Expected Duration: Closed in FY10

Long-term Goal: Species research.

Conservation Measures: MNSW1 and MNSW2.

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

Purpose: The purpose of this work task is to survey MacNeill's sootywing distribution along the lower Colorado River and determine habitat requirements for the species. 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 F6 during FY09-10. Work task F6 monitors sootywing populations in restoration sites.

Project Description: The butterfly and its host plant, quail brush (*Atriplex lentiformis*), will be surveyed within the LCR MSCP boundaries. Annual surveys will cover one third of the flood plain. Surveys will record GPS coordinates of stands of quail brush. 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).

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.

Previous Activities: Sites were surveyed between Parker Dam and Imperial Dam during 2006 and between Imperial Dam and the Southerly International Boundary with Mexico during 2007. The number of adults and their behaviors (nectaring, oviposition, etc.) were counted 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 quail brush 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.

A study was completed of host-plant selection by ovipositing sootywings that began 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 influenced most by plant size and leaf nitrogen content acting simultaneously. All plants that exceeded 1.6 m in canopy radius, 64% in water content, and 3.2% in leaf nitrogen received eggs. Preliminary recommendations for restoring sootywing habitat based on our survey and study results were presented in the FY07 annual report.

Surveys were completed 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 as 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.

A comparison of nectaring frequencies was also completed for 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 sunlight. Nectarings per flower were greater on *S. verrucosum*, the species with fewer flowers per plant. Amounts of nectar remaining in heliotrope flowers after landings by adults were also measured. Compared with males, female sootywings landed on plants supporting inflorescences with more nectar. Amounts of nectar in flowers decreased after landings by females but not after landings by males.

Two studies were performed examining the habitat requirements for MacNeill's sootywing. In the first study, oviposition and larval survival were compared on *Atriplex lentiformis*, the sootywing's known host plant, and *Atriplex canescens*, a related species also found along the lower Colorado River. The numbers of ovipositions on six potted plants of each species were compared at Cibola NWR. Sootywings only oviposited on *A. lentiformis*. Larval survival was compared on the two plant species by transferring 15 first-instar larvae to three potted plants of each species. Larvae only survived on *A. lentiformis*. Oviposition and survival only on *A. lentiformis* confirms the species as the sootywing's primary host plant.

FY10 Accomplishments: We examined attraction of sootywings to *H. curassavicum* inflorescences at CVCA Phase 4 (west). Flowers on *H. curassavicum* are white with yellow centers that turn purple as flowers age. Flowers also absorb ultraviolet light. Skippers were most attracted to purple followed by yellow, then white, models. Attraction of sootywings to yellow and purple did not correspond with amounts of nectar in yellow- and purple-centered models. Blocking ultraviolet light from yellow and purple models greatly increased frequencies of responses, especially landings on models that also displayed white. Adding *H. curassavicum* inflorescences to multiple-color models did not influence attraction, suggesting that sootywings are not attracted to scent. Sootywings are attracted specifically to colors produced by heliotrope, suggesting the plant is a significant nectar-source for the butterfly.

FY11 Activities: N/A

Proposed FY12 Activities: N/A

Pertinent Reports: The 2010 Annual Report for Monitoring MacNeill's Sootywing in Habitat Creation Sites will be posted to the LCR MSCP website.

Wiesenborn, W.D. 2010. Attraction of *Hesperopsis gracielae* (Lepidoptera: Hesperiidae) skippers to *Heliotropium curassavicum* inflorescence models. Journal of the Kansas Entomological Society.

Wiesenborn, W.D., and G.F. Pratt. 2010. Visitation of heliotrope and western purslane flowers by *Hesperopsis gracielae* (Lepidoptera: Hesperiidae). Florida Entomologist 93: 260-264.