

NORTH AMERICAN BUTTERFLY ASSOCIATION

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SUCCESSFUL BUTTERFLY CONSERVATION MANAGEMENT compiled and edited by Ann B. Swengel, 2004

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Urban, suburban, and rural; north, south, east, and west: these examples of successful butterfly conservation management comprise a wide range of species, circumstances, and locations. But they all have in common that local butterfly experts studied the butterflies in their area and learned how to cater to their needs. These projects made use of long-term datasets of butterfly observation to identify species in need and to determine the course of conservation management efforts. Through articles, scientific papers, checklists, and/or NABA Butterfly Counts, these experts have shared the results of their efforts to enhance the local butterfly community, with special emphasis on species that are localized or rare in that area.

NEW JERSEY AUDUBON'S CAPE MAY BIRD OBSERVATORY CENTER FOR RESEARCH AND EDUCATION

The "Model Backyard Habitat" at the Cape May Bird Observatory Center for Research and Education has extensive gardens for butterflies, hummingbirds, hummingbird moths, bees, birds and other wildlife. In addition to the "Caterpillar Food Plant Garden," many caterpillar food plants are incorporated into the other gardens. The gardens are not tidied up in the fall, and this is explained to visitors: that in "cleaning up," next year's butterflies (mostly in immature life stages) would be discarded amongst all the plant stems. Through the winter, visitors observe wintering birds feeding on many of the seed heads left in the garden and learn that the untidy garden is intentional as a winter bird feeder. The wild-

flower/grass meadow extends around the property just beyond the "formal" gardens, which aren't formal in the typical sense. The meadow offers a complement of additional caterpillar food plants for an array of skippers and other butterflies. The meadow is mowed once each spring, to allow that plant matter to remain as long as possible but not to interfere with the next season's growth. The site has many native trees, shrubs, and vines around the edge of the meadow, as well as others integrated into the gardens, further complementing the gardens' planted host plants. Part of the property is a tidal saltmarsh, explaining the wealth of Aaron's Skippers, Saltmarsh Skippers, Broad-winged Skippers, and even Rare Skippers in the garden, all species that return to the saltmarsh to lay their eggs. Watering is minimal, if at all, to set a good example (only four times during the summer

President: Jeffrey Glassberg; Vice-President: James Springer; Secretary/Treasurer: Jane V. Scott
Directors: Brian Cassie, Fred Heath, Steven Prchal, Robert Robbins, Patricia Sutton, Guy Tudor

drought of 2001). The dragonfly pond is alive with dragonflies and damselflies, frogs, and nectaring butterflies on the blooming pickerelweed. This site attracts nesting Eastern Bluebirds and Purple Martins. As Pat Sutton, Program Director, observed early in 2003, "It's been an exciting project, that despite the drought, looked fabulous during those two years [2001 and 2002]. We use no herbicides and pesticides, because this would kill the butterflies we want to increase. We offer weekly butterfly and garden walks, and an opportunity for volunteers to work in the garden (one morning a week, spring to fall) with Karen Williams, owner of Flora for Fauna Nursery and the person who has planted and maintains our gardens for us. Our 'Model Backyard Habitat' is still evolving and not a finished product yet. We're planting as money and volunteers are available. Our gardens are not the typical picture-perfect garden, but true wildlife gardens—alive with butterflies and their caterpillars, hummingbirds, bees, a variety of ornate wasps, hummingbird moths, praying mantids, ladybugs, and more!"

For more information: Cape May Bird Observatory, Center for Research and Education, 600 Route 47 North, Cape May Court House, NJ 08210; phone 609-861-0700; www.njaudubon.org.

To visit: Open DAILY, 9:00 AM to 4:30 PM. Free / no admittance fee.

Directions from the Philadelphia area: Take Route 95 South to the Commodore Barry Bridge into New Jersey, follow Route 322 to Route 55. Take Route 55 south to Route 47 south to Route 347 south (which rejoins Route 47 just north of Dennisville). Continue south on Route 47 through Dennisville, past the turn off for Route 83, continue on Route 47 through the traffic light at Route 657 and from here the CMBO Center for Research and Education will be on your left in exactly 1 mile (just around a bend in the road). It is

surrounded by a split rail fence; a new building sits beyond a large parking lot.

Directions from the New York City area: Take the Garden State Parkway south to Exit 13 (Swainton). Turn right (west) at the bottom of the exit ramp and continue to Route 9. Turn left (south) onto Route 9 and drive a short ways to Route 646 (Goshen-Swainton Road). Turn right onto Route 646 through two stop signs. Soon after the 2nd stop sign you will intersect with Route 47 in Goshen. Turn right (north) onto Route 47 and go 1.7 miles to the CMBO Center for Research and Education which will be on your right (just around a bend in the road). It is surrounded by a split rail fence; a new building sits beyond a large parking lot.

BUENA VISTA GRASSLAND, WISCONSIN

Buena Vista Grassland is managed for the Greater Prairie-Chicken, a bird listed as endangered in Wisconsin and of conservation concern throughout its



range. This land was formerly drained and farmed, but now has reverted back to grassland vegetation composed mostly of weedy species, both native and non-native. But the animal community is quite impressive. Besides the Greater Prairie-Chicken, an outstanding array of grassland birds lives here, such as Upland Sandpiper, Henslow's and Grasshopper Sparrows, and Short-eared Owl. As for butterflies, this site hosts the largest known population in the state of the Regal

Fritillary, also listed as endangered in the state and of range-wide conservation concern.

Comprising over 14,000 acres in several tracts near each other, Buena Vista is managed in a rotation of units with a variety of management types. Cattle-grazing occurs in about 5% of the site per year, in areas penned with temporary fencing. Brushy areas are often mowed first, since the cows don't eat the mature brush nearly so much as they enjoy munching on the tender resprouts, which results in effective brush control. This grazing usually occurs over only one growing season in any given area. Then the unit is rested from grazing for at least several years. Likewise, haying and burning occur on up to 5% of the site per year, in different units each year. Brush-cutting and localized herbicide treatments of brush occur on small areas per year as well. All of these managements occur in units of about 20-120 acres scattered around the site. Thus, in any given area, treatment occurs on a relatively small scale. Plus, these treatments are not evenly mixed and matched across the site. While some units have received a mixture of management types, many other units have only been hayed, or only burned, or only grazed, or none of the above—some areas have been left idle (unmanaged) for many years, or received only localized brush management within them by cutting or herbiciding.

This combination of managements maintains open grassland (not overrun by trees and brush) in a variety of conditions (taller or shorter grass, thinner or thicker dead grass on the ground, varying amounts of brush from none to scattered bushes to thicker brush). This is beneficial to the Greater Prairie-Chicken because this bird requires different types of grassland vegetation for different functions, such as the "booming" grounds where they perform courtship displays, nesting habitat, and woody roosting habitat for winter. Other grassland bird species also benefit because

this mosaic of different vegetative structures and management histories provides different microhabitats that cater to the different preferences of the various bird species.

Even though the Regal Fritillary is the quintessential native prairie butterfly, it thrives at Buena Vista, which contains relatively little native prairie vegetation.

Despite the checkered history of the vegetation here, Buena Vista provides the essential floristic elements needed by the Regal Fritillary (violets living in a consistent grassland-type vegetation structure), although not in the typical context of intact native prairie. Most of the grassland experiences no management in a given year, so that direct mortality to the butterflies themselves is kept low. Plus the combination of management techniques used here is highly effective at maintaining grassland, by keeping brush at bay. While it remains utterly remarkable that Regal Fritillaries can thrive in degraded vegetation, these other landscape and management factors at Buena Vista clearly are effective at mitigating this vegetative factor, which is usually very unfavorable for Regal Fritillaries. The grassland management here happens to be very favorable for this butterfly, even though the management was designed for a bird, not butterflies.

Other butterfly species of note at this site include coppers: Gray, as well as Bronze and American (localized species here). The

The Regal Fritillary thrives at Buena Vista Grassland, despite the weedy and non-native vegetation and because of the favorable habitat management here.



"weediness" of the site is beneficial to these species because their caterpillar food plants are native and non-native docks, which are weedy by nature.

For more information on Regal Fritillaries:

"Regal Fritillary: Prairie Royalty" by Ann Swengel, pages 4-9 in *American Butterflies* volume 1: number 1, February 1993.

"Rearing Regals for Reintroduction: Playing the Odds But Still Losing Ground" by David Wagner, pages 19-23 in *American Butterflies* volume 3: number 2, Summer 1995.

"Help Save Regal Fritillaries" inside front cover in *American Butterflies* volume 5: number 1, Spring 1997.

"Open Habitats for Butterflies" by Ann Swengel, pages 12-20 in *American Butterflies* volume 4: number 4, Winter 1996.

"Regal Fritillary Update" inside front cover in *American Butterflies* volume 6: number 1, Spring 1998.

"Regal Fritillaries in a Tailspin: a story of East and West, DNA, and the urgent need for the conservation of a flagship species" by Barry Williams, pages 16-25 in *American Butterflies* volume 7: number 4, Winter 1999.

www.naba.org (the website of the North American Butterfly Association)

To visit: Wisconsin Department of Natural Resources, Ranger Station, P.O. Box 100, Friendship, WI 53934.

BACKYARD BUTTERFLY GARDENING IN SUBURBAN SOUTHEASTERN FLORIDA

On a lot only 90 feet by 110 feet, the Edwards family—David and Lana and their daughter Alana—have created a subtropical oasis for butterflies in the midst of the heavily populated and urbanized southeastern Florida coast. This haven where over 45 species of butterflies have been recorded began when

Alana saw a segment about butterfly gardening on ABC's former television program, "Home Show". Lana followed through on this intriguing idea when she came across an article in the local paper by Florida gardening expert Anne Kilmer, which listed what plants attracted which butterflies.

Passionvine (*Passiflora suberosa*) covers a gazebo where Zebra Heliconians and the Edwards often gather. Passionvines, as well as pipevine for Polydamas Swallowtails, drape trellises throughout the yard. In the backyard, footpaths traverse the original butterfly garden, which measures 35 feet by 25 feet. Various phases of additional gardens have been installed since then. Stinging nettle, an outstanding caterpillar food plant, is relegated to a far corner of the yard for obvious reasons.

Their yard doesn't naturally have any damp areas. So the Edwards built an ornamental pond with some boggy areas bordering it to provide the right conditions for moisture-loving plants, such as water hyssop, buttonbush, white vine, willows, canna, and pickerel weed, a great nectar flower.

Although butterflies require sunshine, it can become very hot in south Florida. In the very hottest part of the day, the butterflies may prefer areas of dappled sun. For this reason, caterpillar food plants such as passionvine occur in a variety of exposures.

This diverse haven for butterflies has arisen in a yard that was a virtual monoculture of St. Augustine sod, accomplished by people who had



Atala caterpillars feeding on coontie (*Zamia pumila*).

never done more than routine yard maintenance until inspired by butterflies. Well over 100 varieties of plants now grace their yard.

Lana's top nectar flowers include butterfly sage (*Cordia globosa*: a magnet for hairstreaks and blues), ageratum (for Queens and Soldiers), Pentas (*Pentas lanceolata*: red, hot pink, and white, more so than light pink and lavender), and several species of *Lantana*: *involucrata* (a tall shrub), *depressa* (a ground cover), and *montevidensis* (trailing). A plate of rotting fruit can attract Malachites and Red Admirals. Favorite caterpillar food plants are passionvine (for Zebra and Julia Heliconians and Gulf Fritillary), fennel (Black Swallowtail), cassias (Cloudless and Orange-barred Sulphurs), plumbago (Cassius Blue), and peppergrass and arugula (Great Southern White).

A butterfly of conservation note hosted in the Edwards' yard is the Atala. A species native to southern Florida and the Caribbean, the Atala declined and disappeared from Florida due to overharvest of its caterpillar food plant, coontie (*Zamia pumila*, a cycad), and land development. In the last several decades, the Atala has made a comeback to southern Florida, often in association with horticultural plantings of coontie.

For more information: This article is adapted and excerpted from:

"A Butterfly Garden for All (Family Reasons" by Kathy Cavanaugh Malone, pages 20-26 in *American Butterflies* volume 4: number 2, Summer 1996.

"Palm Beach County (Southeastern Florida) Regional Butterfly Gardening Brochure" by Kathy Malone with assistance from Lana and Alana Edwards, downloadable from www.naba.org.

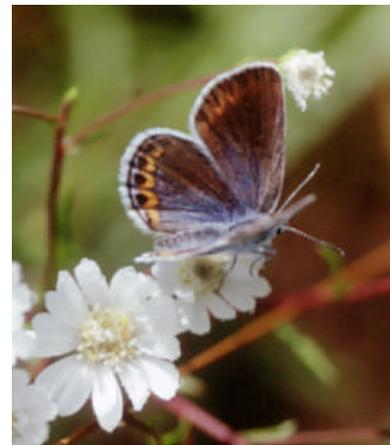
To visit: This is private home and is not open to public visitation. But area residents can join the NABA-Atala Chapter (see www.naba.org for more information on

NABA chapters) and participate in its meetings and field trips.

CREX MEADOWS, WISCONSIN

About 30,000 acres of pools, wetlands, upland barrens, and forest are managed for waterfowl and Sharp-tailed Grouse at Crex Meadows in northwestern Wisconsin. Adjoining tracts of Burnett County Forest offer additional habitat, primarily upland forests, openings, and barrens but also some marshes. One butterfly occurs in these sites that has federal legal protection as an endangered species: the 'Karner' Melissa Blue (in the naming system of the NABA checklist, a subspecies is indicated with single quotes; this butterfly is also known as the Karner Blue). The Phlox Moth (*Schinia indiana*), also known as the Phlox Flower Moth, is a small species active during the day, and has state-level protection as an endangered species.

These butterfly and moth species require unforested vegetation containing their caterpillar food: wild lupine (*Lupinus perennis*) for the 'Karner' and flower parts of the downy phlox (*Phlox pilosa*) for the moth. These wildflowers occur widely at Crex Meadows, where the management for Sharp-tailed Grouse aims for a mix of both grassy and brushy, unforested uplands through tree removal, brush-cutting, and burning. The 'Karner' Melissa Blue responds



A female 'Karner' Melissa Blue nectaring on an aster.

relatively well to the fire management, despite the

direct mortality to its immature life stages, which are typically above-ground throughout the butterfly's life cycle. This may be due to the lush response of lupine to fire and to the blue's multiple generations per year, which allows the butterfly to capitalize on the flush of lupine growth. However, it is essential that unburned habitat occupied by Karners occurs in each Karner population area at Crex Meadows each year, to avoid eliminating the butterfly population. Phlox Moths appear to have some direct protection from fire mortality, since this group of moths typically overwinters as a cocoon underground. However, fires in spring, when typically conducted at Crex, can significantly delay phlox sprouting, so that it is out of synchrony with the timing of the moth's life cycle.

To ensure protection of the Karners, federal regulations required modification of the fire management here. The managers created detailed maps of both the lupine and the results of their surveys for Karners. This ensures that too much lupine (not more than 1/3 of the area supporting lupine) does not get burned in a given year and that burned lupine



Phlox Moth (*Schinia indiana*) perching on its caterpillar food plant, downy phlox (*Phlox pilosa*).

patches have nearby unburned Karner sites (within 500 meters, or 0.3 miles), so that recolonization of burned areas occurs as rapidly as possible.

In some cases, to accomplish this, managers excluded a portion of a unit from fire when the unit was burned. The most in-

novative adjustment to the fire management regime was the establishment of permanent non-fire "refugia". In consultation with butterfly experts who had extensively surveyed the site, managers identified areas to set aside as non-fire-management zones. These areas had to be convenient logistically to exclude from fire, of course, but were also selected to be as valuable to as many localized species of butterflies and moths as possible, especially the 'Karner' Melissa Blue and Phlox Moth. These units are receiving other kinds of management such as brush-cutting, and in some cases, managers started brush-cut-only zones.

After these management changes were implemented, an overall increase in Karner numbers, and widespread occurrence of Phlox Moth, has occurred at the site over the last decade. Crex Meadows and adjoining Burnett County Forest also support populations of other barrens-associated butterflies, including Olympia Marble, Hoary Elfin, Silvery Blue, Western Tailed-Blue, Persius and Mottled Duskywings, and Dusted and Leonard's Skippers.

For more information on the 'Karner' Melissa Blue:

"Karner Blue Sing Your Purple Song" by Robert Dirig, pages 14-20 in *American Butterflies* volume 5, number 1, Spring 1997.

"Definitive Destination: Pine-Oak Barrens in Central Jackson County, Wisconsin" by Ann Swengel, pages 18-27 in *American Butterflies* volume 6, number 3, Fall 1998.

To visit: DNR Ranger Station, 325 Highway 70, P.O. Box 367, Grantsburg, WI 54840.

SCHAUS' SWALLOWTAIL IN SOUTHERN FLORIDA

Spectacularly beautiful, Schaus' Swallowtail is a Caribbean butterfly that historically reached the Florida Keys and the Miami area. It in-

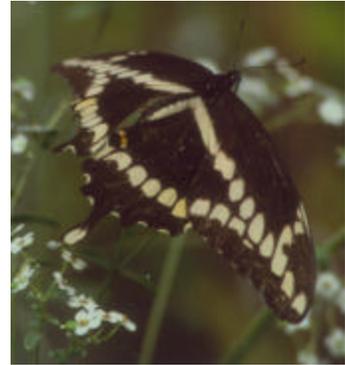
habited tropical hardwood hammocks, which are slightly elevated limestone areas with tropical deciduous trees growing on them. Dr. Thomas C. Emmel began study of this species in 1984, when the U.S. Fish & Wildlife Service (USFWS) asked his research group at the University of Florida at Gainesville to do a status survey. They found fewer than 70 adults that year, restricted to three small keys in Biscayne National Park and a tiny colony on the northern tip of Key Largo.

To research the historical range of Schaus' Swallowtail in Florida, Dr. Emmel and his team scoured scientific publications and interviewed lepidopterists. In the early 20th century, the tropical hardwood hammock on Key West had already been cleared for housing and commercial buildings, and the butterfly was extirpated there while still inhabiting the less settled Keys. The relative scarcity of collectors and naturalists in the rest of the Keys during the first half of the 20th century made it difficult for biologists to learn the details of the species' range or to learn about possible waxing and waning of local populations. The species has been thought to be near extinction in Florida before, in the late 1930s when its center of abundance was thought to be Upper and Lower Matecumbe Keys. Subsequent work in the 1950s showed that the butterfly's main stronghold was actually on Key Largo, in the almost undisturbed hammocks there. As the species was being lost from the rest of the keys and mainland Florida, hundreds could still be seen in a day by experienced observers on Key Largo through 1972. But starting in 1973, the population declined precipitously, culminating in its near loss by 1984. In 1977, it was listed as a threatened species by the USFWS, and upgraded to endangered status in 1984.

The caterpillars of Schaus' Swallowtail feed on two species of tropical trees, wild lime (*Zanthoxylum fagara*) and torchwood (*Amyris elemifera*). These are common, low-growing

trees with a wider distribution than the butterfly in the hammocks of south Florida, the Bahamas, and the West Indies. Schaus' Swallowtail adults fly in a single generation per year, starting in late April and persisting into late June. This extended flight period may be a response to the vagaries of the rainy season, which may begin in April or as late as July in drought years. With the first rains, the torchwood and wild lime trees put out a flush of new growth, on which adult females lay their eggs. The caterpillars complete development by late June or early July. The pupas then diapause (go dormant) through the hot summer and fall, and dry warm winter, until the adults emerge at the onset of the next summer's rainy season.

In trying to account for the loss of Schaus' Swallowtail from so much of its former range, the researchers looked at all the obvious factors, such as habitat destruction. South Florida's tropical hardwood hammocks are almost entirely occupied by urban and suburban development. They also looked at the influence of major storms, charting the occurrence of major hurricanes and subsequent relative abundance (or scarcity) of the species as judged from specimens in museum and private collections. Much of the species' loss in the Lower and Middle Keys was obviously correlated with habitat destruction. However, that explanation did not hold for the northern half



Because of the rarity of the Schaus' Swallowtail, the closely related but more abundant Giant Swallowtail was used in experiments to test the toxicity of pesticides on the swallowtails.

of Key Largo, where a relatively large area of tropical hardwood hammock still remained, yet the butterfly was mysteriously absent after 1972.

One possibility was some major change in the pesticide spraying program in the Florida Keys by the Monroe County Mosquito Control District. The research team learned that in 1972, the District had switched from using the pesticide Malathion to aerial application of Dibrom and truck application of Baytex. While this correlation with the decline of Schaus' Swallowtail was suggestive, it did not prove causality. With a grant from the Elizabeth Ordway Dunn Foundation of south Florida and subsequently from the DuPont Fund in Jacksonville, Dr. Emmel's research team started a series of elaborate experiments to test these and other mosquito-control pesticides against the caterpillar and adult stages of the butterflies. They chose the Giant Swallowtail as a surrogate species in these experiments, utilizing thousands of caterpillars reared for this purpose at Butterfly World. The results soon showed that the Dibrom and Baytex concentrations being sprayed in the Keys were at least 400 times more concentrated than the minimum lethal dose needed to kill a butterfly (not to mention a mosquito). In January 1991, these results were unveiled to the public and government agencies, and the use of Baytex has been discontinued (Dibrom remained in use in Florida).

The USFWS and State of Florida also asked the Monroe County Mosquito Control District to stop spraying their properties in the northern half of Key Largo, and with that halt, the butterfly rebounded. By June 1992, 6-8 small colonies were thriving on northern Key Largo, in addition to the large population left on the keys in Biscayne National Park.

Nevertheless, USFWS finally agreed with Dr. Emmel's repeated warnings that these populations occurred in so small an area that a single catastrophe could wipe out the species.

In June 1992, Emmel's team was authorized to remove 100 Schaus' Swallowtail eggs from the wild population in Biscayne National Park and form a captive breeding program at the University of Florida. During the summer, they reared nearly 50 pupas to diapause.

Just two months later, on August 24, 1992, Hurricane Andrew slammed into Biscayne National Park and the northern tip of Key Largo, destroying much of the hammock habitat and covering Biscayne Bay's islands with a saltwater storm surge. The following year, at the height of the flight season, only 17 adults were found in 2 weeks of surveys in Biscayne National Park by 8 researchers. Fortunately, more had survived to the south on Adams Key, and a few also on Key Largo. But the most Schaus' Swallowtails in Florida resided in captivity at the University of Florida.

In every natural catastrophe, there may be a silver lining. The damage wrought by Hurricane Andrew opened up the hardwood hammocks by felling most of the older trees. By June of 1993, the wild lime and torchwood trees that had not been killed were re-sprouting in lush growth that provided Schaus' females with abundant egg-laying sites.

The USFWS also strongly supported the experimental reintroduction of the butterfly to areas in the Middle and Lower Keys, by selecting proper hammocks that could serve as reintroduction sites and asking the Monroe County Mosquito Control Agency to keep these areas free of mosquito spraying during the butterfly's flight period each year. For site selection, the team mapped every caterpillar foodplant in every hammock potentially suitable for Schaus' Swallowtail in all the Keys.

But bureaucratic hurdles remained. University and state red tape delayed construction of large-scale rearing facilities, despite generous grants from Ron Boender of Butterfly World, the National Fish and Wildlife Foundation, and USFWS. During

1992-93 and again in 1993-94, most of the butterflies were reared in an apartment kitchen and private home! Finally, by early spring 1994, adequate rearing facilities were ready on campus. By May, over 1700 wild lime trees were in culture as the primary caterpillar foodplant, with over 50 torchwood trees for stimulating egg laying. Hundreds of nectar plants, including pentas, buddleias, and lantanas, were propagated as well. Approximately 1500 pupas were overwintered in the lab in 1994-95, but almost half died due to the excessive dryness in the air-conditioned laboratory. Most of the surviving pupas were placed back in to the wild, at sites within the historic range, while 90 pupas were kept at the lab for the next round of captive breeding.

After the pupas were placed in the wild in April 1995, camouflaged on tree trunks, most were eaten by small mammals as well as birds due to three unseasonable cold fronts that caused "sitdowns" of northward flying warblers. Nevertheless, some adults did emerge and reproduce, and eggs and young caterpillars were later found at the release sites.

Because so many of the released pupas did not survive, the team decided to release adults in 1996. Pupal survival in captivity also improved, because they were put outside the lab in a vented, screened greenhouse.

Bureaucratic hurdles re-appeared. No funding came from USFWS since July 1995, and the funding drought continued at the worst possible time, when maximum manpower and field expenses were encountered. With a generous donation of \$25,000 from Dr. J.D. Turner of Huntsville, Alabama, the captive breeding program could continue through the spring of 1996, generating 800 pupas for reintroduction efforts. But plans for intensive field work had to be scaled back due to lack of funds. In May 1996 the team transported the pupas to Fort Lauderdale and set up an emergency facility at Butterfly World, where a number of large, screened flight enclosures

were generously provided at no charge by Ron Boender.

When the adults emerged, they were mated in captivity and then taken to the seven sites that had been approved for releases in 1995. Lack of funding greatly curtailed efforts to monitor the results of both the 1995 and 1996 reintroductions. The State of Florida canceled their promised funding as well. The summer 1996 captive breeding work was made possible by another large grant from Dr. Turner, a small grant from the North American Butterfly Association, and personal funds from the research team itself. Fortunately, this tided the program over until March 1997, when USFWS decided to fund the captive breeding program again, and reimburse the University of Florida for funds advanced in 1996 in anticipation of USFWS funding.

During and since that particularly harrowing entanglement of red tape, the research team has persevered in recovery efforts for the Schaus' Swallowtail. Reintroductions have continued, both in the Keys over as wide a geographic scope as possible and within the historic range on the mainland. The team has also grown and planted out hundreds of Schaus' food plants both in sites used for reintroduction and in sites nearby, where natural recolonization can occur from existing populations. Efforts to enhance natural recolonization include planting nectar flowers in golf courses that occur near occupied and potential habitat. This has required an "incidental take permit" for participating groups, because an accident might inadvertently harm a Schaus' Swallowtail, which is illegal due to its endangered status. The team hopes to recommend that Schaus' Swallowtail be removed from the endangered species list in several years. This species' successful recovery from tiny populations within Biscayne National Park, and re-establishment

at reintroduction sites, show that this butterfly is a survivor. Given help to circumvent or overcome human-caused hazards such as mosquito control spraying, and restore caterpillar foodplants in its habitat, Schaus' Swallowtail is capable of bouncing back and thriving.

For more information: This article is adapted and excerpted from:

"Schaus' Swallowtail: A beleaguered aristocrat teeters on the edge of extinction in the Florida Keys" by Thomas C. Emmel, pages 18-22 in *American Butterflies* volume 2: issue 1, February 1994.

"Is Schaus' Swallowtail Finally Licked?" by Thomas C. Emmel and Jaret C. Daniels, pages 20-26 in *American Butterflies* volume 5: number 2, Summer 1997.

Keynote address by Dr. Thomas C. Emmel at the North American Butterfly Association's Biennial Members Meeting in Palm Beach Gardens, Florida, May 18-21, 2000.

Where to visit: Biscayne National Park.

Drive to Florida City, south and east of Homestead, to the park headquarters on Biscayne Bay. Take a boat out 7 miles across Biscayne Bay to Elliott Key Harbor, where the island headquarters are located. Walk along Spite Highway Trail down the central part of the island, or take the Nature Trail. From late April through early June there is a reasonable expectation of seeing Schaus' Swallowtail. Adams Key also supports an accessible hardwood hammock with a short cleared trail, where many Schaus' Swallowtail can usually be observed in season. Take plenty of mosquito repellent and wear a long-sleeved shirt, because if the rains have started, the mosquitoes will be superabundant! **Contact:** Biscayne National Park, 9700 SW 328 Street, Homestead, FL 33033-5634. (305) 230-7275.

Northern Key Largo. Drive south on US Highway 1 from Miami to its junction with

State Highway 905 in the middle of Key Largo. From there, drive north to the Card Sound Bridge Road, and then proceed north about 3/4 mile toward the Ocean Reef Club development. Just south of that private owned commercial development, you will encounter trails and old roads leading through the various state and federal tracts of hardwood hammock. These areas you can drive to are good places to see Schaus' Swallowtail from late April to early June. Males are more likely to be flying slowly and nectaring along open trails, while females prefer to fly back in the hammock most of the time.

John Pennekamp Coral Reef State Park, Key Largo. This park, located several miles south of the junction of US Highway 1 with Highway 905, includes more than 100 acres of tropical hardwood hammock in which Schaus' Swallowtail may be seen. **Contact:** John Pennekamp State Park, P.O. Box 487, Key Largo, FL 33037. (305) 451-1202.

MIRROR LAKE STATE PARK, WISCONSIN

In 1988, Ann and Scott Swengel, local volunteers, initiated butterfly surveys at Mirror Lake State Park, in south central Wisconsin, in a sandy barren dominated by little bluestem amongst scattered stands of jack pine. That first year, three localized skippers of "special concern" to the Wisconsin Department of Natural Resources were found: Cobweb, Dusted, and Leonard's Skippers. But in the next four years, these

A Dusted Skipper on a dead grass stem.



species be-came more difficult to locate, as their grassy habitat be-came more and more overgrown with trees.

Then, in 1993, Bill Klang, a science teacher from the high school in nearby Reedsburg asked the Sauk County Natural Beauty Council, on which Ann serves, about any projects suitable for their students to participate in as an Earth Day project. With the blessing of Jerry Trumm, superintendent of the state park, the council proposed to coordinate a project for them to restore the grassy habitat by reducing canopy in this pine barren.

Mindful of the constraints imposed by state park regulations and the source of volunteers, the council designed the restoration specifically to benefit the localized butterflies. The encroaching trees needed to be removed with as little disturbance as possible to the grassy habitat and its associated butterflies, so this ruled out burning the habitat (typical in midwestern restorations), as this would kill butterflies, mostly when in immature life stages. Fortunately, mature jack pines do not resprout from stumps, so cutting them down is sufficient to eliminate them. Canopy removal was targeted to get the most gain in size and connectivity of the openings with the least tree removal. But this would occur bit by bit over many years, so that the native prairie-like flora, which is composed mostly of perennial plants that spread slowly, could re-establish on its own. Opening up large areas rapidly would give weeds greater advantage over the prairie plants in re-establishment. This low-intensity but long-term approach was well suited to the source of volunteers: a busload of students for one April morning each year since 1993.



Cobweb Skipper

While the students could pull up saplings and use loppers and band saws loaned from the local office of The Nature Conservancy to

cut small pines, adult volunteers from the Beauty Council would have to chainsaw mature pines ahead of the annual work day. The cut pines could not be removed from the park, as this ran afoul of contracting regulations for timber extraction, nor would they be burned in the park, because of safety concerns. So students drag them into the shade of pine groves that aren't going to be cut down. These piles of pines subside quickly and compactly, and do not pose a significant fire hazard because of the gradual nature of the pine cutting (i.e., the piles do not start out huge). Even the stubby stumps left in the openings disintegrate in a few years.

Since the prairie-like vegetation in the barren was dominated by grasses, the project also seeds in forbs (wildflowers) suitable for butterfly nectaring. This has the side effect of adding a "constructive" activity that balances the tree removal, which is ironic for an Earth Day program! Beauty Council volunteers collect seed during summer and fall from in the park, with permission from the park, which is stored on an unheated porch until the students sow them the following April. They scratch the seeds into the soil surface of bare spots, sometimes with rakes but mostly by hand.

Native prairie vegetation has rapidly re-established in the habitat restoration where pines were cut, especially little bluestem (*Andropogon scoparius*) and rough blazingstar (*Liatris aspera*), a favorite butterfly nectar source, even where the canopy had previously been dense. No bluestem was seeded, and rough blazingstar (a slow-establishing perennial) flowered faster than possible due to regeneration from seed. This rapid floral recovery is testament to the durability of the perennial roots of prairie plants. Blazingstar, horsemint (*Monarda punctata*), birdfoot violet (*Viola pedata*), and gray goldenrod (*Solidago nemoralis*) have all flowered in areas where they hadn't been seen before, but where they'd been seeded repeatedly.

Weeds (while present, as throughout the park) have not taken over the opened areas. No doubt the gradual canopy reduction contributed to this, but the droughty, sterile soil is also relatively inhospitable to most weeds. After canopy removal, however, jack pine seedlings can pop up in large numbers, so it has been necessary to follow up with seedling removal for several years after initial clearing, until the supply of pine seeds in the soil is exhausted. This low-intensity but long-term management approach has not just "held the line" against increasing canopy, but has actually "turned back the clock" before the late 1980s in overall canopy cover.

But what about the skippers? Most likely, Leonard's Skippers were always in the project area, but have increased since the restoration began. Not until 1996 was Dusted Skipper recorded in the restored area. Since then, it's been found in the project area each year. Cobweb Skipper, the most localized of these species, was absent in the project area for many years, but at least it persisted along a nearby trail. Finally in 2002, and again in 2003, it was recorded in the project area.

This project couldn't have happened without the happy coincidence of a known need with a suitable source of volunteer manpower and coordination. But given that, this project demonstrates that a little bit of work appropriately targeted and consistently applied year after consecutive year can produce successful habitat restoration for the vegetation that also benefits local butterfly populations, yet is very economical in time and money.

For more information: "Habitat Restoration for Butterflies at Mirror Lake State Park, Wisconsin" by Ann Swengel, pages 30-31, 33 in *News of Lepidopterists' Society* volume 12, number 1, Spring 2000.

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'EL SEGUNDO' SQUARE-SPOTTED BLUE, CALIFORNIA

An unlikely haven for an endangered butterfly would be the Los Angeles International Airport (abbreviated LAX). But this is the last stronghold for the federally endangered 'El Segundo' Square-spotted Blue (according to the naming system of the NABA checklist, a subspecies is indicated with single quotes; this butterfly is also known as the El Segundo Blue). This subspecies is distinct, but its species-level association is less clear. It is part of the Square-spotted Blue species complex, which may actually comprise more than one species, such as the 'Bernardino' Square-spotted Blue, which some experts consider a distinct species that the 'El Segundo' belongs to.

There's no confusion about the most important resource the 'El Segundo' Square-spotted Blue requires to exist. Like all populations in the Square-spotted Blue complex, the lives of the 'El Segundo' revolve utterly around the flowerheads of buckwheats (*Eriogonum*), native wildflowers of the arid Southwest. But in the case of the 'El Segundo' Square-spotted Blue, the only buckwheat flowers that will do are those of the coastal buckwheat (*Eriogonum parvifolium*). It is on these flowers that 'El Segundo' Square-spotted Blues feed as caterpillars, mate and often nectar as adults, and lay their eggs. It is in the sand underneath these buckwheats that the pupas rest from late August, when the buckwheats have wilted, until mid-June of the next year, when the butterflies emerge at the onset of coastal buckwheat flowering.

As is often the case, the butterfly is more limited in habitat than its caterpillar food plant. The 'El Segundo' Square-spotted Blue has historically been restricted to the El Segundo sand dunes, which covered 3200 acres in non-continuous patches along a small strip of the southern California coast between

Santa Monica and Palos Verdes, extending from Ocean Park in the north to Malaga Cove to the south. The dunes occur between the Pacific Ocean to the west and what used to be Los Angeles coastal prairie, and now is dense urbanization, surrounding it in all other directions. Coastal buckwheat is a key indicator species of undisturbed coastal sand dunes habitat, where the sand is continuously moving and the microclimate is extremely arid. Since this is inhospitable to farming, the habitat remained relatively undisturbed until the middle of the 20th century, when urban development gobbled up almost all the dunes. Some of this development was reversed in the 1970s, when a referendum permitted condemnation and removal of 850 homes, leaving open space of degraded vegetation in what is now part of LAX. Because of the federal listing of the 'El Segundo' as endangered in 1974, and because of the political activism of environmentalists, 198 of these acres in the airport were set aside as a preserve in 1991. LAX now harbors the largest of the three extant populations of 'El Segundo' Square-spotted Blues.

Roadway re-alignment in 1975 led to re-vegetation with a wildflower seed mix that included California, or common, buckwheat (*Eriogonum fasciculatum*). This buckwheat, non-native to the El Segundo dunes but the only plant to persist from this well-intentioned but flawed planting, added a new threat to the 'El Segundo' Square-spotted Blue. The presence of California buckwheat allowed increases in populations of competing butterfly and moth species that also feed on buckwheat flowers. These other species can feed on a variety of buckwheat species. But they also have more than one generation a year, and so cannot live in places that only support coastal buckwheat, with its restricted summer flowering season. However, with the addition of California buckwheat, the season of flowering by any buckwheat increased, and

made it possible for these other butterfly and moth species to increase in the El Segundo dunes. Even without increasing the abundance of coastal buckwheat, researchers discovered that 'El Segundo' Square-spotted Blues would increase in abundance when California buckwheat was reduced, as this decreased the abundance of competing butterfly and moth species using coastal buckwheat. This is fortunate, as coastal buckwheat has, for unknown reasons, been very unlikely to re-establish itself naturally on degraded dunes.

For that reason, habitat rehabilitation at LAX included not just removal of the plants non-native to the dunes, but also active efforts to re-establish the native flora in degraded areas. Long-term population monitoring of the 'El Segundo' Square-spotted Blue also occurred, to measure how successful the habitat restoration was at helping the butterfly. 'El Segundo' abundance has increased with reduction of California buckwheat and increase in coastal buckwheat. The survey results also found fluctuations in abundance not tied directly to the abundance of the two buckwheat species. Teasing out what parts of these changes in abundance relate to buckwheat abundance, the vagaries of climatic variation, and other factors as yet unidentified, remains a challenge.

Because the 'El Segundo' Square-spotted Blue occupies so few sites that are surrounded by an environmentally degraded landscape, active restoration and ongoing management is necessary for the long-term into the future, in order for the dune ecosystem required by the 'El Segundo' to persist. Revegetation efforts have been aimed at re-establishing the variety of plants native to this habitat, which helps not just the 'El Segundo' Square-spotted Blue but also a variety of other invertebrates, including moths, weevils, a cricket, and a spider all endemic to the El Segundo dunes. As in other cases, an ongoing challenge is maintaining a

consistent program over the very long-term. Bureaucratic time frames view a few years as long-term, but for conservation of very fragile populations of localized butterflies, the time frame for habitat management and butterfly monitoring must encompass decades.

For more information: This article is adapted and excerpted from:

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