Institution Name	Program	Species	Federal / State	Contact
Butterfly World	CB/R	Schaus Swallowtail		
Detroit Zoological Institute	CB	Partula snail	SSP	Andrew Snider
Oregon Zoo	CB/R	Oregon Silverspot Butterfly Taylors Chekerspot butterfly	FE	
Roger Williams Park Zoo	CB/R/M CR/R CR/M H	American Burying Beetle/ Karner Blue Butterfly Frosted elfin/ Mexican Red Leg Tarantula	FE / SSP FE SE	Lou Perrotti
St Louis Zoo	CR/R/M CR	American Burying beetles/ Partula Snail	FE / SSP SSP	Jane Stevens

The Toledo Zoo	CB/R CB/R CB/R CB/R M	Karner Blue Butterfly/ Mitchells sytar/ Purplish copper/ Swamp metalmark/ Frosted elfin	FE FE SE SE SE	Mitch Magdich
Toronto Zoo	CR/? CR	Karner Blue Butterfly/ Mexican red leg Tarantula	FE	Tom Mason
Tulsa Zoo & Living Museum	CR/D/E 2006?	American Burying Beetle	FE	Aaron Goodwin
Woodland Park Zoo	CR CR/R	Partula Snail/ Oregon Silverspot Butterfly	SSP FE	Erin Sullivan

Toledo Zoo

The Karner blue butterfly, *Lycaeides melissa samuelis*

Programme Background

The Karner blue butterfly *Lycaeides melissa samuelis* is a resident of oak savannah, pine barren and sand barren habitats of the Midwest, mid-Atlantic and New England regions of the United States. Within these arid habitats resides its sole host plant, wild lupine *Lupinus perennis* (Dirig 1994). In the last 25 years, the butterfly has suffered a dramatic population decline throughout its range primarily from habitat loss and fragmentation. Originally native to twelve states and one Canadian province, the species is now extant in Indiana, Michigan, Minnesota, New Hampshire, New York and Wisconsin. It was placed on the U.S. Endangered Species Act in 1992. The species was reintroduced to Ohio in 1998 to a region of restored oak savannah and sand barren habitats near the western shore of Lake Erie. A recovery team was formed to spearhead the reintroduction effort. The team devised a seven part strategy for recovery: 1) host plant propagation, 2) reintroduction site selection, evaluation and management, 3) post management evaluation, 3) breeding protocol development, 4) founder selection, 5) captive breeding, 6) release, 7) monitoring. The Nature Conservancy would manage habitat restoration and of the chosen release site. Staff from The Toledo Zoo would assess the habitat to determine its suitability for reintroduction. Zoo staff were also charged with host plant propagation, captive breeding and monitoring. The recovery plan specified that first generation adult female founders would be captured and placed on potted plants for egg deposition. Larvae would be reared on the plants through the life cycle to eclosion. Second generation adults would be transported to the introduction site and released. The species is bivoltine, producing two generations per season, the first May to June, the second July to August. The species over-winters in the egg stage, hatching the following April.

Management summary
Annually from 1998 to 2002, Toledo Zoo staff captured first generation adult females from sites in Michigan. Individual females were placed in a clear plastic container that was then positioned in a cooler for transport to the Zoo. Each female was sequestered on a potted host plant covered with a cylindrical net. Adults were hand fed daily using a honey-water solution. Eggs were typically deposited on the leaves and petioles of the host after one or two days. Once hatched, larvae were closely monitored. To negate cannibalism, second instar larvae were moved to new plants so that no more than ten were on a single plant. Host plants were replaced regularly. Small pieces of pine bark were added to the soil surface of the potted plant during the final instar. Larvae would then crawl under the bark to pupate. Adults were transported to the release site in the afternoon following ecolsion. The rearing unit was enclosed in a double barrier and isolated from other invertebrates in the collection. Instruments as well as the floor, benches and other equipment were regularly disinfected.

Results
From 1998 to 2002, nearly 1700 adults were released at the Ohio reintroduction site. Since the cessation of captive breeding activities in 2002, the butterfly has expanded its range beyond the initial site and is now found throughout the 200 hectare preserve. In addition, there has been a quantified large shift in population density from the original release site to another location 1,000 meters downwind. Recent efforts by the recovery team are focusing on the preparation of additional release sites and studying ovipostion preferences of females *in situ*.
In addition the Toledo zoo is working on:
Mitchell's satyr (*Neonympha mitchellii*) - captive breeding and release – Federally endangered
Purplish copper (*Lycaena helloides*) – captive breeding and release – State endangered (Ohio)
Swamp metalmark (*Calephelis muticum*) –captive breeding and release – State endangered (Ohio)
Frosted elfin (*Incisalia irus*) – monitoring – State endangered (Ohio)

Roger Williams Park Zoo

The American burying beetle, *Nicrophorus americanus*

Programme background

American burying beetles (ABBs) are the largest *Nicrophorus* species in the United States measuring up to 37mm. For successful reproduction ABBs require a vertebrate carcass (raging between 100 – 200grams) which is buried and prepared by both male and female for use as a food source for their larvae. The historic range of the ABB was eastern and central United States (35 states) and along the southern borders of Ontario, Quebec and Nova Scotia in Canada. A serious decline in this species was noticed in the late 1800s through the mid-1900s. Now the only naturally occurring population east of the Mississippi river is found on Block Island (BI) off the southern coast of Rhode Island. West of the Mississippi River ABBs can still be found in eastern Oklahoma, Arkansas, eastern Kansas, and central Nebraska and in extreme southern South Dakota, and just recently were found in Texas. Reasons for the ABBs disappearance over 90% of its range may include the loss of carcass-base in the necessary weight range for ABB reproduction such as the passenger pigeon *Ectopistes migratorus* and the greater prairie chicken *Tympanuchus cupido*. Habitat loss, alteration, and fragmentation is causing a change in species composition resulting in greater competition for the carrion resources needed for reproduction. Other factors may include pesticides; disease; artificial lighting and bug zappers. The United States Fish and Wildlife Service (USFWS) listed the ABB as endangered in 1989 and by 1991 had completed a recovery plan for the species (Raithel 1991). The recovery plan called for the monitoring, managing and protection of existing populations, searches for additional populations and to implement a reintroduction plan using captive reared beetles.

Management summery

A pilot reintroduction and study was launched in 1990 and continued through 1993 on Penikese Island (PI), Massachusetts using beetles captive reared at Boston University (BU) by Andrea Kozol. The success of this pilot study led to a second reintroduction in 1994 on Nantucket Island (NI), Massachusetts. Roger Williams Park Zoo (RWPZ) was asked to participate in the recovery effort and received 19 male and 11 female beetles from BU that had been collected as larvae on BI. This colony was reared by RWPZ using the husbandry and breeding protocol developed by Andrea Kozol of BU (Kozol 1992). Beetles were maintained at 20 – 23 centigrade with a 12 hour light cycle. Depending on size of container used, 1 to 20 same sex sibling beetles were housed together on a moistened paper towel substrate. Newly emerged beetles are ravenous feeders and were fed heavily for the first two weeks (8-12 mealworms a day) after that feedings slow down (6-8 mealworms a day). Breeding was carried out in 11 litre plastic buckets filled soil about 5 cm from the top and covered with Plexiglas lids. A pair of beetles was placed on the surface of the soil and given an optimum size rat or quail carcass.

Results

The NI reintroduction programme continued from 1994 to 2005 with RWPZ rearing and supplying USFWS with over 2500 beetles for release on NI. The status of this population continues to be regularly monitored. This programme has shown how zoos working in

partnership with federal and local wildlife agencies can successfully meet the conservation breeding requirements of such species recovery initiatives (Amaral and Prospero 1999). In addition to providing large numbers of animals for field release, the breeding programme for this species has allowed for the collection of data on husbandry and reproductive behaviours not easily observed in the wild (Wetzel 1995). This effort has also lead to the establishment of education programmes providing public awareness of the ecosystem roles of insects and the importance of invertebrate conservation (Perrotti 2005).

Karner Blue Butterfly *Lycaeides melissa samuelis*

For the last four years, Roger Williams Park Zoo staff has also worked with the U.S. Fish and Wildlife Service USFWS and the New Hampshire Department of Fish and Game (NHFG) on a habitat restoration project for the Karner blue butterfly (Lycaeides Melissa samuelis) in Concord, New Hampshire. The focus until this time had been solely upon the efforts of our Horticulture Department to provide 200 lupine plants for the habitat restoration site. This is a vital component of the program, as lupines are the sole food source for Karner blue butterfly larva.

The zoo also agreed, however, to participate in a pilot program to see if we could be successful in assisting with the rearing of the Karner blue larva. As part of this program, the zoo received 104 butterfly larva from the state of New Hampshire for rearing. Of that number, 98 were successfully reared and returned to New Hampshire and released in the wild. This was a terrific beginning to what will become a full scale 'rearing program' at the zoo. The zoo staff is planning for a two-stage rearing and releasing of over 4,500 larva in 2006. Our Horticulture Department will also be greatly expanding their production of the lupine plants.

The Karner blue is serving as a "flagship" species for the Association of Zoos & Aquariums' Butterfly Conservation Initiative (BFCI), of which Roger Williams Park Zoo is a founding member. Recovery efforts for this species will subsequently help zoos participating in the BFCI to shape a conservation plan of action for the recovery of 21 other federally listed butterfly species.

St Louis Zoo

American Burying Beetle *nicrophorus americanus*

American Burying Beetle Conservation Center effort involves surveying the State of Missouri for *Nicrophorus americanus* and a captive breeding component to assist USFWS with potential reintroduction project(s).
Federal/State (Missouri)
Partners: USFWS, Missouri Department of Conservation, Missouri Department of Natural Resources, The Nature Conservancy.

Partula snail

Our Partula snail breeding program maintains a captive population of Partula sp.
International/Federal (USDA) /SSP
Partners: AZA, USDA

Detriot Zoological Institute

Partula snails,
International/Federal/SSP
Snails are housed in a room approximately 80 square ft. (8'x10')

Toronto Zoo

Karner Blue Butterfly *Lycaeides melissa samuelis*

The Karner Blue project has used a greenhouse space approximately 600 sq. feet in past but presently this is not being used.