INSTITUTE of Museum and Library SERVICES

Creating a Nation of Learners

Dear Colleague:

Summer, 2006

Enclosed please find sample narratives, schedules of completion, and summary budgets from eleven successful applications from the 2006 IMLS Conservation Project Support (CPS) grant competition.

The attached samples were selected because they demonstrate how museums with different conservation needs successfully developed projects that addressed those needs. We feel these narratives are logically and clearly presented, and give sufficient information to support the request.

This packet contains samples that represent different types of conservation projects from both living and non-living collections. They emphasize the overall institutional conservation perspective, the involvement of conservation professionals in all phases of the project, and the importance of the project as the highest institutional priority for collections care.

In addition, there are three samples of funded education components. We hope that these samples give you the impetus to partner with your staff educators to develop your own creative way to educate the general public about your conservation project.

No endorsement by IMLS of any personnel, conservation facilities, private firms, or conservation procedures and methods identified in the narratives should be assumed.

I hope that these sample narratives will be useful to you as models for structuring a proposal for your conservation needs. IMLS Office of Museum Services program staff is available at (202) 653-4789 or at imlsinfo@imls.gov, and will be happy to discuss any questions you have as you develop your proposal.

The application deadline for the 2007 Conservation Project Support grant program is:

October 1, 2006

Applications for CPS are available from the IMLS Web site (www.imls.gov), or by calling us at 202-653-4789. We look forward to receiving your application.

Sincerely,

Mary Estelle Kennelly

Mary Estelle Kennelly
Associate Deputy Director for Museum Services
IMLS

1800 M Street NW •• 9th Floor •• Washington, DC 20036-5802 •• 202-653-IMLS (4657) •• Fax 202-653-4625 •• www.imls.gov

CONSERVATION PROJECT NARRATIVE

1. What is the design of the project?

The Morton Arboretum proposes to conduct an environmental survey of the 500 acres of natural wooded areas within its 1,700-acre facility, as well as another 189 acres from the adjacent Hidden Lake Forest Preserve leased from the Forest Preserve District of DuPage County; and to craft a conservation management and research plan for those areas. The Arboretum will elicit patterns of land use histories throughout the wooded natural areas and will relate them with successional changes to vegetation structure, composition, richness, cover, and soil profile. Thorough analyses of historic vegetation, past and present land use practices, and current vegetation will provide insight into how these communities have changed through time and will provide the basis for planning conservation efforts within the natural areas, in order to recover biotic communities severely impacted by European settlement era and post-settlement era land uses. The results of the survey project will build on the efforts of the Arboretum to conserve natural areas not only on its property but also throughout the Chicago region and the Upper Midwest.

In 1925, an Arboretum botanist conducted a floristic survey of its wooded areas, documenting a rich and diverse flora totaling 490 species. A 1987 ecological survey conducted by another Arboretum researcher was the first assessment of the East Woods, and noted a decline in vegetation integrity and diversity. Now the Arboretum proposes a two-year survey that will provide a clear understanding of all historical land-use activities – such as tree harvesting, agriculture, grazing, and even small-scale mining – within these wooded areas, and their current condition. This survey utilizes analytical methods developed by the Arboretum's regionally recognized Plant Conservation Biologist, Marlin Bowles, and will be managed by the Arboretum's first Manager of Natural Resources, Kurt Dreisilker, aided by state-of-the-art technology. The result of this survey will be thorough documentation of Illinois native flora to help the Arboretum conserve its natural areas, determine best management practices, and provide a foundation for natural resources management shared with regional and national land managers. The project team will be composed of seven Arboretum staff members, chosen for their specific areas of expertise, augmented by Applied Ecological Services, Inc., an ecological consulting and contracting firm. The firm was selected through competitive bidding based on its 30 years of experience performing vegetation-sampling projects in a wide variety of habitats, including woodland and savanna. The team will pursue the following three objectives:

Objective #1: Land use history compilation.

Mr. Dreisilker will supervise four experienced volunteers who will research and compile historical land-use data, using the archives and resources of the Sterling Morton Library and regional libraries. They will review relevant journals, maps, documents, and recorded interviews of former staff members. It will take 360 hours to conduct this research from May to July 2006.

After compiling the archival information, the Research Assistant/geographic information system (GIS) Specialist, Jeannette McBride, a seasonal assistant, and volunteers will digitize historical maps and overlay them with current GIS information. This will reveal historical property acquisitions, scientific studies, and government land surveys for further analysis in Objective #2. It will take 150 hours during August 2006 to complete this activity.

Then Ms. McBride and the seasonal assistant will overlay their results of the GIS digitization with global positioning system (GPS) mapping for natural area conservation planning. This activity will take approximately 450 hours to complete from September to October 2006. Then they will analyze the data and prepare a summary of their findings. This will take 180 hours to complete from November 2006 to January 2007.

Objective # 2: Current vegetation analysis.

The Arboretum will conduct a vegetation analysis to properly identify and characterize each plant community. The result will be a detailed analysis of GPS-referenced permanent plots of the vegetative structure, species richness, canopy cover, and herbaceous ground cover within the natural areas. These plots will provide permanent reference points for future analysis.

At the same time that the historical data collection described in Objective #1 is underway, Andrew Hipp, Ph.D., the Plant Systematist and Herbarium Curator for the Arboretum, along with Mr. Bowles, Mr. Dreisilker, and Ms. McBride, will randomly select 500 circular nested plots to study. Trees will be sampled in 0.025-hectare circular

plots, shrubs in 0.001-hectare circular plots, and the herbaceous layer in one-square meter plots. This will take 30 hours during May 2006 to complete.

Once the team selects the plots, Ms. McBride and the seasonal assistant will refer to GPS coordinates to install permanent field markers. This will take 450 hours to complete during May and June 2006.

The Arboretum will contract Applied Ecological Services, Inc., for 810 hours of service to conduct a vegetation analysis of the natural areas. This firm will follow the analytical methods developed by Mr. Bowles. This activity will take place during July and August 2006, then again in April and May 2007, to fully sample the herbaceous layer.

Mr. Bowles will analyze all data gathered by Applied Ecological Services, Inc., from June to November 2007.

Dr. Hipp will verify all newly sampled species, and Herbarium staff will voucher specimens and incorporate them into its Herbarium and *vPlants* databases. This web-based database is easily accessible by the public. It will take 30 days to verify the samples and six months for documentation during the sampling period identified above.

A research assistant and a seasonal temporary employee will collect canopy cover measurements when conditions are optimal for data gathering at each plot. This will require 450 hours from June to August 2006.

Objective #3: Natural resources management planning.

Utilizing the historical and present-day information compiled earlier, the project team will meet from December 2007 to February 2008 to create a conservation management and research plan for the wooded natural areas. The plan will prescribe various management activities such as burning, canopy thinning, species introductions, invasive species control, and hydrological manipulations. This plan will enable and prescribe further scientific experimentation within the areas to improve management practices for historically heavily impacted wooded natural areas.

By February 2008, the team will compile a report of their findings. This report will prioritize conservation issues and establish an action plan for future natural resources management within the Arboretum. In March/April 2008, the project team will present the action plan to the Arboretum President for review.

Over the years, the Arboretum has continued to address the conservation needs for its living collections and identified specific areas that require environmental improvements. The Arboretum's Living Plant Collections Master Plan outlines permanent land usage for the entire property, including the consolidation of the natural areas to minimize fragmentation of the landscape. In addition, the Arboretum's annually updated Conservation Plan for Collections and Natural Areas – which includes living plant collections, herbarium, library, art collections, and natural areas – identifies natural areas conservation as the institution's highest curatorial priority.

Rolling glacial terrain of these natural areas offers diverse upland and lowland biotic communities on environments with varying slope, aspect, soils and hydrological characteristics. Concern over the health of the oak woodlands is one of the primary reasons for undertaking this project. Fire suppression resulting from landscape fragmentation, invasive species inundation, altered hydrology, and historic land-use patterns continue to affect the ecological integrity of these natural areas. The significant impact of various past land-use practices will provide valuable insight on how these natural areas developed.

The Arboretum intends to maximize the plant diversity and long-term sustainability of its wooded habitats. Today, there is increased shade from sapling density with subsequential loss of canopy species regeneration. This contributes to decreased richness in the herbaceous layer of the woodlands. Further, some species recorded in the woodlands of 1925 do not exist today, including endangered *Geranium bicknellii* (northern crane's bill), *Zanthoxylum americanum* (common pricklyash); other species such as *Heracleum lanatum* (cowparsnip) and *Veronicastrum virginicum* (Culver's root) occurred in far greater quantities in 1925 than they do today, indicating a historically more open structure to the natural areas. The resulting losses to the local genetic reservoir are significant. Invasive species and altered hydrological processes (e.g., remnant drain tiles from past agriculture) also present major threats to the health and sustenance of the flora and fauna. This project will map current and historical activities, provide guidance for canopy thinning, track burning activities since they began in 1962, prescribe future burn regimes, and complete strategic planning efforts by charting community structure within all wooded natural areas.

Conservation of collections and of biodiversity are of highest priority to the Arboretum's pursuing its mission, which includes "*...to learn how to grow them* (trees) *in ways that enhance our environment.*" The proposed

environmental survey is in keeping with the Arboretum's Collections Master Plan and the initiatives of the Chicago Wilderness consortium, which includes over 170 public and private organizations working together to protect, restore, study, and manage the natural ecosystems of the Chicago region for the benefit of the public, and of which the Arboretum was a founding member.

2. What are the proposed conservation methods and why are they conservationally sound?

The Arboretum is focusing on its wooded areas, based on a survey conducted in the winter of 1987 that notes their decline. The proposed survey project takes an innovative approach to conservation by analyzing the historical land-use practices as well as current vegetation, and combining them with existing surveys of soil and hydrology. The creation of best management practices or model for this type of environmental survey is an emerging field of study in which the Arboretum intends to make increasingly significant contributions.

Until recently, little has changed in the data collection methods for such surveys. Mr. Bowles, a nationally recognized conservation researcher, designed the analytical methods for this project from methodology he created in the 1990s to conduct the Illinois Natural Areas Inventory, utilizing randomly selected plots. The survey will document vegetation types and determine changes over time. Mr. Bowles' analytical methods are now widely used by conservation biologists to conduct historical assessments and restore natural communities in the region. The GPS technology will provide detail that did not exist earlier to pinpoint sites under the forest canopy and to upload aerial photographs to augment the analytical tools. It is because of Mr. Bowles' analytical methods and the availability of the modern GPS technology that the Arboretum can undertake this comprehensive and unique conservation project.

The project team has significant experience in living plant conservation and survey design. The team will use the resources of the Arboretum, including the Sterling Morton Library and Herbarium databases, as well as GPS and GIS, to ensure reliable compilation of information. There are no safety issues relating to this project.

3. What is the object(s), historic structure(s), or specimen(s) that is the focus of this project?

The focus of this project is to survey 500 acres of wooded natural areas within and 189 acres adjacent to the Arboretum. Within this area, there are oak woodlands and savannas, as well as pockets of wooded ephemeral and permanent wetlands. This project supports the mission of the Arboretum: *"to collect and study trees, shrubs, and other plants from around the world, to display them across naturally beautiful landscapes for people to study and enjoy, and to learn how to grow them in ways that enhance our environment. Our goal is to encourage the planting and conservation of trees and other plants for a greener, healthier and more beautiful world."* Healthy and sustainable wooded environments represent an essential objective within that overall goal.

The proposed survey project complements the efforts of the Biodiversity Recovery Plan of the Chicago Wilderness Consortium, and the Arboretum constitutes significant portion of the region's open lands. The Arboretum was active in the development of this plan and is a participant in its implementation. According to the Plan as summarized for wooded lands in "Conservation of Wooded Lands in the Chicago Wilderness Region: A Model Policy", the biodiversity of the region is threatened due to fragmentation of the landscape, fire suppression, invasive species inundation, and altered hydrological processes, all of which pertains to the Arboretum (see final attachment to the application). Chicago Wilderness prioritized conservation concerns for natural areas and states that virtually all of the wooded habitats in the region are in very poor condition.

The Arboretum leases 189 of the 400 acres of Hidden Lake Forest Preserve, directly adjacent to the largest extent of the Arboretum's wooded areas, from the Forest Preserve District of DuPage County. As a condition of the lease, the Arboretum will manage this property by improving the quality of woodland, wetland, and stream communities; will conduct research and/or the planting of species on this property to enhance its environmental quality; and will make its findings available to others.

4. How does the project relate to your museum's ongoing conservation activities?

The curation and care of the various collections at The Morton Arboretum is sound. They include living plant collections; preserved plant specimens in the Herbarium; books, art, and other reference materials in the Sterling Morton Library; and the natural areas, both wooded and the successfully restored 100-acre Schulenberg

Prairie and Savanna. These collections were identified in the Trust Indenture that established the Arboretum in 1922 that specifies the collections should be "conveniently arranged for study." The Arboretum has a long-standing commitment to professional management, managed growth, and sound stewardship of its collections. Policies exist for the various collections specifying their management, guidelines for acquisition, and safeguards for their care and conservation. Despite this commitment and policies, conservation needs develop as the scope and use of the collections grow: living collections mature, environmental changes occur, facilities age, and use has an impact. These and other factors create an ongoing need for assessment and conservation of the collections at the Arboretum. Curation and conservation of the natural areas is of high priority, in order that they be managed as well and as strategically as the Arboretum's other collections, which have had more long-standing, focused attention.

In 2004, the Arboretum hired Mr. Dreisilker as its first Manager of Natural Resources to manage its natural areas in order to promote the structure and function of its biotic communities, which once dominated the Chicago region. This project will strengthen these efforts by providing a solid foundation for future conservation actions. These actions include maximizing indigenous species and community diversity, controlling invasive species, encouraging natural disturbance regimes, restoring hydrological processes, and utilizing current scientific knowledge while fostering further research in natural resources management.

The proposed environmental survey is a top priority of the Arboretum's Conservation Plan for Collections and Natural Areas, which provides the Arboretum with a long-term strategic framework for improving, enhancing, and expanding the existing collections. This project will provide the baseline data needed for proper conservation efforts of these natural areas. It will also establish the precedent to thoroughly understand environmental history, ecological conditions, and past management practices in order to plan the restoration of plant communities. The completed survey also will serve as a guide for regional and national land managers that face similar conservation-related issues.

The Arboretum is currently developing an institution-wide long-range strategic plan. The vision statement for this plan reads: "*We will be a renowned center of tree expertise, inspiring the world to plant and protect trees.*" Two of the four goals of the plan are: sustained natural wooded environments and conserved tree diversity. To achieve these goals, the conservation of the natural areas at the Arboretum and their plant collections are of fundamental importance. Thoughtfully managed natural areas will be available for long-term ecological research, outreach interpretation for visitors and constituents, and as a resource for professionals to study best practices in natural lands management.

The Arboretum invests approximately $2.29 million of its annual $19.5 million budget toward conservation of its collections. Recent and current conservation activities include: Schulenberg Prairie and Savanna, one of the nations oldest-restored prairies with 100 acres containing nearly 350 species native to prairies and savannas of Illinois (1962-present); Willoway Brook, an EPA Section 319-funded project, a model example of current techniques for streambank stabilization techniques (2001) and Tributary Stabilization Projects (2004); Heritage Trail (1996-present); *ex-situ* conservation within collections and natural areas (ongoing); and Meadow Lake restoration and environmentally-friendly parking lot (2001-2004). These activities demonstrate a long-term commitment to conservation.

The proposed environmental survey project builds upon previous projects, including the IMLS funded National Leadership Grant (2001) for the *vPlants* plant diversity database. The Arboretum has received IMLS conservation grants for the following projects: Soil Survey Project (1986); General Survey of Hidden Lake Parcel (1989); General Survey of South Perimeter Collections (1990); Conservation of Collections Acquisition Journals (1992); Restoration of Tile Drainage System in Oak Collection (2001); and Development of Geographic Information System (2002). These projects helped the Arboretum conserve information in its plant records system, establish the Conservation Nursery, complete a topographic map of its collections, gain better understanding of the natural ecosystems within the Arboretum, install a tile drainage system in the Oak Collection, and develop a GIS-based mapping system.

5. What are the anticipated benefits of this project?

The Arboretum collections have broad significance for its external users, who include green industry professionals, researchers, plant breeders, municipal foresters, conservationists, students, educators, and the general

visiting public. Its collections have become valuable resources for these groups, including researchers worldwide who have requested plant material from the collections to research DNA sequencing, medicinal properties, and rhizosphere bioremediation of soil contamination. Many visitors come to the Arboretum to study urban horticulture, landscape design, botany, and natural history.

The proposed environmental survey will help the Arboretum to: 1) conserve and enhance the structure and function of the wooded natural areas within the designated acreage, 2) maximize indigenous species for the appropriate communities, 3) control invasive species, 4) encourage natural disturbance regimes, and 5) utilize current scientific knowledge while promoting further research in natural resources management. This project will analyze the historical context of 700 acres of wooded natural areas to fully understand their development since the first public land survey for DuPage County was conducted in 1821. It will assemble historical land use practices and provide a vegetation analysis of current conditions within the wooded areas into one, easily referenced database.

The results of the survey project will build on the efforts of the Arboretum to conserve natural areas not only on its property but also throughout Chicago and the Upper Midwest. It will especially make an impact on the Forest Preserve District of DuPage County and other counties, Illinois state parks, conservation districts, and natural area management associations. The proposed survey project complements the efforts of the Biodiversity Recovery Plan of the Chicago Wilderness Consortium.

The Arboretum's Conservation Plan provides strategic direction for collections development, management, and conservation including natural areas on the property. The Arboretum's natural areas are situated to reduce fragmented communities across the landscape, creating optimal conditions for *in-situ* conservation of local populations' gene pools. Throughout its history, the Arboretum has conducted many conservation-based activities within the natural areas, including the restoration of prairie, invasive species removal, and hydrological restoration. However, these activities were pursued independently and not as part of an overarching conservation plan.

The results of this survey project will: enable staff members to prioritize conservation efforts; encourage healthy and sustainable plant communities; conserve some of the most valuable plant communities and species within the Chicago region; provide baseline data for long-term research on ecology and restoration; inform staff members and external users such as land management professionals; enable future collaboration among Chicago Wilderness Consortium members regarding biodiversity conservation; protect areas with rare, threatened, and endangered species from the threats of invasive species; and locate and conserve local germplasm for many species within the natural areas at the Arboretum. Additional benefits include continued professional development for staff; increased visitor and volunteer participation; and subsequent increased interpretive signage within the natural areas.

This project will suggest improved methodology for natural area conservation throughout the country. The Arboretum natural areas' diversity of abiotic conditions and past land uses are representative of severely impacted natural areas throughout eastern and Midwestern North America; so what the Arboretum learns will be of broad applicability and interest. The Arboretum will share this newly gained knowledge with the Forest Preserve District of DuPage County and the 170 institutional members of the Chicago Wilderness Consortium, and will disseminate its findings through a number of publications, including peer-reviewed journals, community outreach publications, natural conservation organizations, and Chicago-based magazines and newspapers. In addition, the Arboretum will share its experience with natural areas land managers through its website, newsletters, and at professional meetings and conferences. Other organizations that will receive information include the Natural Areas Association, the Society for Ecological Restoration International, and many Upper Midwest state native plant societies.

6. How will the applicant ensure that ongoing museum operations are not inhibited by these project activities?

Each of the team members involved with the proposed survey will commit an important but prescribed amount of time to the project so as not to interfere with their operational responsibilities. As the project manager, Mr. Dreisilker will devote approximately 80 percent of his time to the survey, and will ensure adherence to timelines and tasks; his work on this project fits within the scope of his job responsibilities. The Arboretum will contract with Applied Ecological Services, Inc. for a significant portion of the project. The design of this program will not hinder visitors from access to the natural areas.

7. How does the project budget support the project goals and objectives?

This conservation survey is a labor-intensive project. The requested IMLS grant will support the fees of Applied Ecological Services, Inc., the firm chosen to do the vegetation sampling; the additional hours required of Ms. McBride, who is part-time; the hours of data analysis required of Mr. Bowles, who is largely supported by extramural funding for conservation-related projects; salaries for temporary seasonal employees; and a hand-held GPS, and galvanized steel field stakes marking the plots. The Arboretum project team, under the direction of Mr. Dreisilker and Dr. Hamilton calculated the number of hours to achieve each objective as outlined based on previous experience and in consultation with Applied Ecological Services, Inc. The budget uses the required number of hours to complete each task and objective, taking into consideration a three-percent annual increase in salaries for personnel, plus the actual costs for equipment.

8. What are the qualifications and responsibilities of the project personnel?

Clement Hamilton, Ph.D., Vice President of Arboretum Programs and Director of Research, will oversee the necessary collaboration among personnel in research, collections, and other departments; and will contribute his expertise in ecology and systematics to work in all three objectives of the project. **Kris Bachtell**, Director of Collections and Grounds, will have administrative oversight for the project. He will make sure that each step in the project meets its intended goals and the entire project is completed as scheduled. **Kunso Kim**, Curator of Living Collections, will ensure that the project's results support implementation of the institution's collections plans. His past experience includes extensive collections management and renovation of the plant records system at the Norfolk Botanical Garden to install a collection database and mapping system. **Kurt Dreisilker**, Manager of Natural Resources, will lead the development and implementation of the survey project. He will plan, coordinate, and implement all components of this project including its design, timeline, hiring of contractors/volunteers, and budget. All contracted assistance, including volunteers, will report to him. **Marlin Bowles**, Plant Conservation Biologist, will analyze vegetation data collected by Applied Ecological Services, Inc. He joined the Arboretum in 1996. He is a leading ecologist and natural historian in the region and has served on federal recovery planning teams for four US listed plant species, edited the book *Restoration of Endangered Species,* and published numerous papers on vegetation ecology and endangered plant species. **Andrew Hipp, Ph.D.**, Plant Systematist and Herbarium Curator, will select 500 circular plots within the 700-acre natural area for study; verify voucher specimens; and oversee Herbarium work. He has published several papers in peer-reviewed journals, reports, and field guides on plant diversity. **Jeannette McBride**, Research Assistant/GIS Specialist, will create and design maps based on notes compiled from the research conducted by volunteer research assistants. She will collect GPS coordinates of necessary map features and field stakes. She will also map features and compile attribute data, import computer aided design (CAD) drawings to use as layers with collections datasets, and manipulate records from the collections database to create maps of plant specimens. **Four volunteer archive assistants** will research, process, analyze, and prepare documents, including maps, journals, transcripts, and other relevant forms to understand historic land-use patterns throughout the natural areas. They will report to the Manager of Natural Resources and work at specified times to coordinate tasks. The team of assistants will work closely with staff of The Sterling Morton Library and the contracted GIS Specialist. **Applied Ecological Services, Inc.,** will be the contractor that will conduct the vegetation survey of all plots within the natural areas and input the data into a database. They are based in Brodhead, Wisconsin, and have a local office in West Dundee, Illinois. Their staff of scientists and project managers have expertise and experience in ecological assessments, research, biological inventories, and environmental monitoring. A team of highly qualified ecologists will sample the vegetation within the oak savannas and woodlands. **Two research assistants and seasonal temporary employees** will survey the Herbarium for existing spontaneous specimens, collect and process new voucher specimens and do data entry; prepare labels; and take canopy measurements.

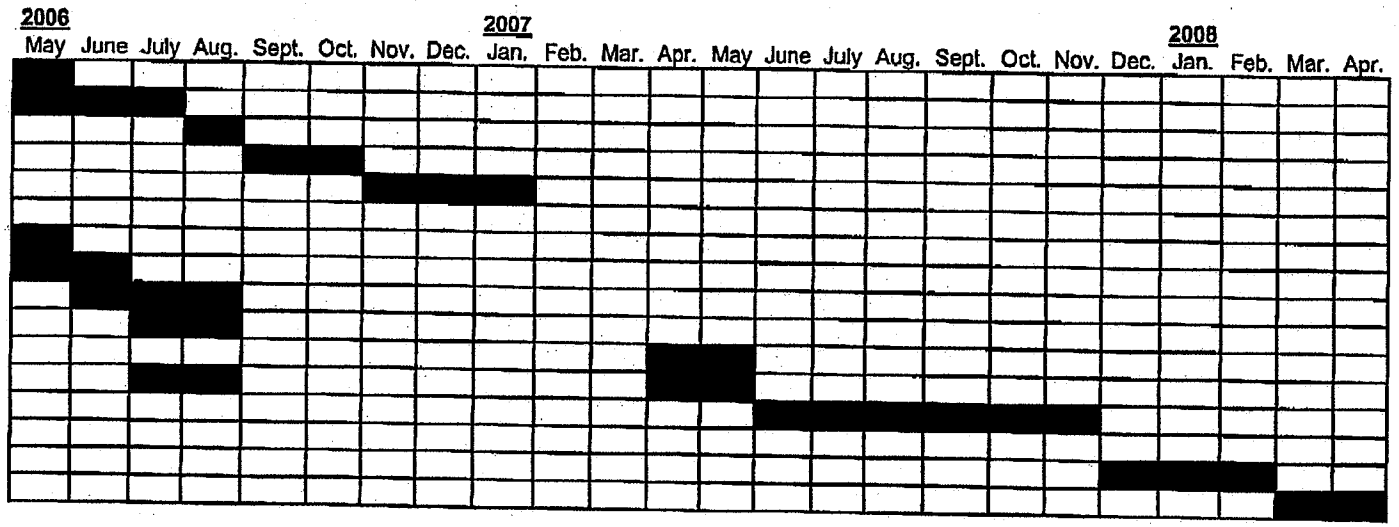
Project Timeline May 2006-April 2008

Objective

1 **Land Use History Compilation**
- Planning/purchasing equipment
- Archive search and data entry
- GIS compilation
- GPS activities
- Data analysis

2 **Vegetation Analysis**
- Planning/Purchasing Equipment
- Plot establishment w/ GPS
- Canopy cover measurements
- Sampling herbaceous, shrub, and tree layers
- Sampling spring herbaceous layer
- Collect voucher specimens
- Data analysis

3 **Natural Resources Management Planning**
- Project review, analysis, strategic planning
- Presentation of action plan to Arboretum President



Project Budget Form

SECTION 1: SUMMARY BUDGET, CPS AND EDUCATION COMPONENTS

Name of Applicant Organization The Morton Arboretum

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

DIRECT COSTS

	IMLS	Cost Share	Total
SALARIES & WAGES	$34,421	$107,716	$142,137
FRINGE BENEFITS	$6,849	$26,929	$33,778
CONSULTANT FEES	$71,345	$0	$71,345
TRAVEL	$0	$0	$0
MATERIALS, SUPPLIES & EQUIPMENT	$12,669	$150	$12,819
SERVICES	$250	$0	$250
OTHER	$0	$0	$0
TOTAL DIRECT COSTS	$ 125,534	$ 134,795	$ 260,329
INDIRECT COSTS	$ 24,466	$ 108,354	$ 132,820
		TOTAL PROJECT COSTS	$ 393,149

AMOUNT OF COST SHARE $ 243,149

AMOUNT OF IN-KIND CONTRIBUTIONS $ 0

TOTAL AMOUNT OF COST SHARE (CASH & IN-KIND CONTRIBUTIONS) $ 243,149

AMOUNT REQUESTED FROM IMLS, INCLUDING INDIRECT COSTS $ 150,000

PERCENTAGE OF TOTAL PROJECT COSTS REQUESTED FROM IMLS 38.15 %
(MAY NOT EXCEED 50%)

Have you received or requested funds for any of these project activities from another federal agency?
(Please check one) ☐ Yes ☑ No

If yes, name of agency _____

Request/Award amount _____

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET

Year ☑ 1 ☐ 2 ☐ 3 – **Budget Period from** 5 / 1 / 06 **to** 4 / 30 / 07

Name of Applicant Organization The Morton Arboretum

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

SALARIES AND WAGES (PERMANENT STAFF)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
Attachment A	( )				
	( )				
	( )				
	( )				
		TOTAL SALARIES AND WAGES	$ 17,056	62,120	79,176

SALARIES AND WAGES (TEMPORARY STAFF HIRED FOR PROJECT)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
Attachment A	( )				
	( )				
	( )				
	( )				
		TOTAL SALARIES AND WAGES	$ 9,800	0	9,800

FRINGE BENEFITS

Rate		Salary Base	IMLS	Cost Share	Total
25.0	% of $	79,176	4,264	15,530	19,794
8.0	% of $	9,800	784	0	784
	% of $				
		TOTAL FRINGE BENEFITS	$ 5,048	15,530	20,578

CONSULTANT FEES

Name/Type of Consultant	Rate of Compensation (Daily or Hourly)	No. of Days (or Hours) on Project	IMLS	Cost Share	Total
Applied Ecological Ser.	Attached	747.0	65,891	0	65,891
	TOTAL CONSULTANT FEES		$65,891	0	65,891

TRAVEL

From/To	Number of: Persons	Number of: Days	Subsistence Costs	Transportation Costs	IMLS	Cost Share	Total
None	( )	( )					
	( )	( )					
	( )	( )					
	( )	( )					
			TOTAL TRAVEL COSTS		$ 0	0	0

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET CONTINUED

Year ☑ 1 ☐ 2 ☐ 3

MATERIALS, SUPPLIES AND EQUIPMENT

Item	Method of Cost Computation	IMLS	Cost Share	Total
GPS - Trimble ProXH		10,419	0	10,419
Pipe and caps for plots		2,250	0	2,250
Herbarium supplies		0	150	150
TOTAL COST OF MATERIALS, SUPPLIES, & EQUIPMENT		$ 12,669	150	12,819

SERVICES

Item	Method of Cost Computation	IMLS	Cost Share	Total
Printing & Copying		125	0	125
	TOTAL SERVICES COSTS	$ 125	0	125

OTHER

Item	Method of Cost Computation	IMLS	Cost Share	Total
None				
	TOTAL OTHER COSTS	$ 0	0	0
	TOTAL DIRECT PROJECT COSTS	$ 110,589	77,800	188,389

INDIRECT COSTS

Check either item A or B and complete C. (See section on Indirect Costs, pages 3.6–3.7.)

Applicant organization is using:

☐ A. An indirect cost rate which does not exceed 15 percent of modified total direct costs charged to IMLS.

☑ B. Federally negotiated indirect cost rate (see pages 3.6–3.7).

United States Department of Agriculture
Name of Federal Agency

Expiration Date of Agreement

Rate base amount 51.02 % of $ 188,389 = $ 96,116

	IMLS	Cost Share	Total
C. TOTAL INDIRECT COSTS	$ 21,553	74,563	96,116

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET

Year ☐ 1 ☑ 2 ☐ 3 – **Budget Period from** 5 / 1 / 07 **to** 4 / 30 / 08

Name of Applicant Organization: The Morton Arboretum

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

SALARIES AND WAGES (PERMANENT STAFF)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
Attachment B	( )				
	( )				
	( )				
	( )				
		TOTAL SALARIES AND WAGES	$ 7,034	45,596	52,630

SALARIES AND WAGES (TEMPORARY STAFF HIRED FOR PROJECT)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
Attachment B	( )				
	( )				
	( )				
	( )				
		TOTAL SALARIES AND WAGES	$ 531	0	531

FRINGE BENEFITS

Rate		Salary Base	IMLS	Cost Share	Total
25.0	% of $	52,630	1,759	11,399	13,158
8.0	% of $	531	42	0	42
	% of $				
		TOTAL FRINGE BENEFITS	$ 1,801	11,399	13,200

CONSULTANT FEES

Name/Type of Consultant	Rate of Compensation (Daily or Hourly)	No. of Days (or Hours) on Project	IMLS	Cost Share	Total
Applied Ecological Ser.	Attached	63.0	5,454	0	5,454
		TOTAL CONSULTANT FEES	$5,454	0	5,454

TRAVEL

From/To	Number of: Persons	Days	Subsistence Costs	Transportation Costs	IMLS	Cost Share	Total
None	( )	( )					
	( )	( )					
	( )	( )					
	( )	( )					
			TOTAL TRAVEL COSTS		$ 0	0	0

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET CONTINUED

Year ☐1 ☑2 ☐3

MATERIALS, SUPPLIES AND EQUIPMENT

Item	Method of Cost Computation	IMLS	Cost Share	Total
None				
TOTAL COST OF MATERIALS, SUPPLIES, & EQUIPMENT		$ 0	0	0

SERVICES

Item	Method of Cost Computation	IMLS	Cost Share	Total
Printing & Copying		125	0	125
	TOTAL SERVICES COSTS	$ 125	0	125

OTHER

Item	Method of Cost Computation	IMLS	Cost Share	Total
None				
	TOTAL OTHER COSTS	$ 0	0	0
	TOTAL DIRECT PROJECT COSTS	$ 14,945	56,995	71,940

INDIRECT COSTS

Check either item A or B and complete C. (See section on Indirect Costs, pages 3.6–3.7.)

Applicant organization is using:

☐ A. An indirect cost rate which does not exceed 15 percent of modified total direct costs charged to IMLS.

☑ B. Federally negotiated indirect cost rate (see pages 3.6–3.7).

United States Department of Agriculture
Name of Federal Agency

Expiration Date of Agreement

Rate base amount 51.02 % of $ 71,940 = $ 36,704

	IMLS	Cost Share	Total
C. TOTAL INDIRECT COSTS	$ 2,913	33,791	36,704

1. WHAT IS THE DESIGN OF THE PROJECT? Our project will focus on the development and refinement of husbandry and breeding techniques for two critically endangered wetland butterfly species: the Mitchell's satyr, *Neonympha m. mitchellii*, and the swamp metalmark, *Calephelis muticum*. Our goals are to: 1. Research optimal conditions for *ex-situ* oviposition in *Neonympha* and *Calephelis*. 2. Determine optimal rearing techniques for *Neonympha* and *Calephelis* that balance survival with high larva production. 3. Determine larval feeding preferences and host plant fidelity for *Neonympha* (*Carex* sp.) and *Calephelis* (*Cirsium sp.*) larvae. 4. Develop the methodology to reproduce conditions of overwintering *Neonympha* and *Calephelis* larvae at our zoo. 5. Develop conservation breeding techniques for adult *Neonympha* and *Calephelis* butterflies. Experimental design, set-up, and project supervision will be the primary responsibility of Peter J. Tolson, PhD, Director of Conservation for The Toledo Zoo (TTZ). Tolson will devote 20% of his total work effort/yr. specifically to this project; a total of 30 % of work effort/yr. will be devoted to wetland butterfly activities for the duration of the project. Aiding in the project will be Mitchell L. Magdich, BS, Curator of Education of TTZ. Magdich will aid in supervision and implementation of this research, especially when Tolson is absent. Magdich will devote 10 % of his total work effort/yr. specifically to this research; a total of 10 % of work effort/yr. will be devoted to wetland butterfly activities over the duration of the project. A Research Technician hired for the project, Candee L. Ellsworth, BA, will be responsible for maintenance and manipulation of experimental and control group *Neonympha* and *Calephelis* eggs, larvae, pupae, and adults as well as care of host plants and associated forbs. She will devote 50% of total work effort/yr. specifically to this project. An additional 50% of work effort/ yr. will be devoted to other wetland recovery activities over the duration of the project. Ellsworth will carry out all experimental tasks under the supervision of Tolson and Magdich, both of whom will aid with activities as needed. A full-time summer research fellow from Wellesley College or TTZ and a full-time seasonal (May-August) worker will provide additional assistance to Ellsworth.

Task I: Determine optimal conditions for oviposition in *Neonympha* and *Calephelis* butterflies in a conservation breeding setting. In this task we will be manipulating two variables thought to be important in selection of oviposition sites by *Neonympha* and *Calephelis* butterflies: host plant selection and composition of small forbs used for oviposition that are microsympatric with host plants in the field. Although we determined that our *Neonympha* model, *Satyrodes eurydice*, oviposits readily on *Carex*, recent evidence suggests that *Neonympha* may actually prefer small forbs for oviposition (1,2). Similarly selection of oviposition sites by *Calephelis* appears to be complex, involving more than adequate humidity and the host plant (see below). We propose to explore this complexity. As the following experiments require travel from the Zoo, Tolson, Magdich, and Ellsworth will share responsibility for all experiments.

Experiment 1: Structural aspects of *Neonympha* oviposition sites. A minimum of six adult mated female *Neonympha* (dictated by our FWS permit) will be placed in individual 30 x 60 cm polyethylene tubs covered with polyester netting and planted with tussock sedge, *Carex stricta* and the primary forbs associated with it in the wild as determined by our previous IMLS-sponsored research: clearweed, *Pilea pumila*, Joe-Pye weed, *Eupatorium maculatum,* marsh shield fern, *Thelypteris palustris,* and tall meadow rue, *Thalictrum polygonum*. Selection of the plants used as oviposition sites, as well as oviposition height from substrate level and part of plant selected (leaf surface, petiole, stem, orientation, etc.) will be quantified for each female and analyzed for statistical significance using discriminant function analysis (3). Forbs will be collected in June-July 2006-07 at Liberty Fen (LF) in Jackson County MI, and the Barry State Game Area (BSGA) in Barry Co., MI for use as potential oviposition platforms. This activity will require four round trips of 420 mi./ month to the BSGA, and three round trips of 178 mi. / month to LF in June-July 2006-07. It will be performed concurrently with task I, experiment 2 at LF, and task II, exp. 1.

Experiment 2: Structural aspects of *Calephelis* oviposition sites. Our current IMLS work with *Calephelis* indicates that oviposition site selection is much more complex than anticipated and will require more analysis than consideration of temperature and humidity data. We propose two simple tests to answer these two questions: 1. Is one **species** of *Cirsium* (thistle) preferentially selected over another? 2. Are *Cirsium* surrounded by forbs selected over isolated plants? A minimum of six adult mated female *Calephelis*, (dictated by our Michigan DNR permit) will be placed in 1 x 2 m polyethylene tubs (*Cirscium* grows too large to be planted in smaller containers with associated forbs) covered with polyester netting and planted with of two species of thistles, *Cirscium muticum* and *C. altissimum*, and the forbs associated with them in the wild: shrubby cinquefoil, *Potentilla fructicosa*, sickle-leaved aster, *Chrysopsis falcata*, and lobelia, *Lobelia siphilitica*. Species of the thistles used as oviposition sites will be quantified for each female and compared for statistical significance using one-way ANOVA (3). We also propose to quantify the age of *Cirscium* selected, distance from center of leaf rosette, whorl # of rosette, oviposition site on leaf, spine density/ cm^2 and canopy cover. We will use wild oviposition sites as our control. This activity will require three round trips of 178 mi. to LF, Jackson, MI, and three round trips of 160 mi. to the LNGA in July-August 2006-07. The July activity at LF will be performed concurrently with task I, experiment 1.

Task II. Determine larval feeding preferences and host fidelity for *Neonympha* and *Calephelis* larvae. Recent literature (4-8) reflects the confusion related to determination of the host plant(s) used by

Neonympha. Although *Carex stricta* is suspected as the primary host plant, other species may be used as well (in fact, in 2005, we observed *Neonympha* larvae feeding on an unidentified **grass** and are in the process of identifying this plant). We will conduct feeding trials for selected species of *Carex* as requested by the Mitchell's Satyr Working Group (MSWG). Sedges in flower are needed for identification and most species are not commercially available or are misidentified by growers, making collection from the wild necessary. Tolson, Magdich, and Ellsworth will share responsibility for this task. A similar experiment will be performed for *Calephelis*, testing selection of *Cirsium* species and 1st or 2nd year rosettes.

Experiment 1: Selection of *Neonympha* larval host plants. A minimum of twenty *Neonympha* eggs (10 each for two trials) will be placed in the center of an open square of *Carex* shoots (with a different potential host species of *Carex* at each corner) in 30 x 60 cm polyethylene tubs covered with polyester netting. Numbers of hatching *Neonympha* larvae selecting each *Carex* species will be quantified and analyzed using one-way ANOVA (3). *Carex* will be collected in June-July in 2006-07 at the BSGA or LF. Larval trials will commence in late July-August in 2006-07. Because of the difficulty of identifying *Carex* w/o flowers, precise timing in finding flowering *Carex* is essential. Accordingly, we have allocated more effort for this task *Carex diandra*. *C. lasiocarpa*, *C. sterilis*, and *C. stricta* will be tested in 2006; *C. aquatilis*, *C. lacustris*, *C. prairea*, and *C. stricta* in 2007.

Experiment 2: Selection of *Calephelis* larval host plants. In a concurrent experiment for *Calephelis*, a minimum of ten eggs will be placed in the center of an open square of 1st and 2nd year rosettes of both *C. altissimum* and *muticum* in 1 x 2 m polyethylene tubs covered with polyester netting. After hatching, numbers of larvae selecting each plant will be quantified and analyzed using one-way ANOVA (3). We will also quantify feeding location: age of *Cirscium* selected, distance from center of leaf rosette, whorl # of rosette, feeding site on leaf, and spine density of leaf (spines/ cm^2) and compare these data to a wild control group of larvae at LF and LNGA as noted above in task I experiment 2. Larval trials will be held in late July-August in 2006-07. Control data collection will occur during the same periods.

Experiment 3: Host plant fidelity of *Neonympha* larvae. After initial plant selections are made by the larvae in experiment 1, 3rd instar *Neonympha* larvae will be marked with a dot of non-toxic fluorescent paint, each color corresponding to a code representing the initial host plant selected. Larvae will then be randomly transferred to a different host plant species, but will have the opportunity to return to the original plant selected. Once again, numbers of *Neonympha* larvae selecting each plant will be quantified to determine host plant fidelity and analyzed using one-way ANOVA (3).

Experiment 4: Host plant fidelity of *Calephelis* larvae. After initial plant selections are made by the larvae in experiment 2, 3rd instar *Calephelis* larvae will be marked with a dot of non-toxic fluorescent paint, each color corresponding to a code representing the initial host plant selected. Larvae will then be randomly transferred to a different host plant species or life stage, but will have the opportunity to return to the original plant selected. Once again, numbers of *Calephelis* larvae selecting each plant will be quantified to determine host plant fidelity and analyzed using one-way ANOVA (3).

Task III: Determine larval rearing strategies for *Neonympha* and *Calephelis* that balance survival with high larval production. In this task we propose to refine techniques originally used for *Satyrodes* (our model for *Neonympha* in our previous IMLS sponsored research) and attempt to adapt them for use with the more delicate and endangered *Neonympha*, once again testing rearing enclosures that accommodate the high mobility of these larvae and their tendency to drop from the host plant when disturbed (8). Enclosures must provide for their safety (especially from drowning) in the semi-aquatic environment necessary for their host plants yet provide adequate humidity. We also propose to refine our techniques for *Calephelis* developed in our previous IMLS research. We will continue to use techniques to enhance larval survival used successfully in our work with the purplish copper, eyed brown, and Karner blue butterflies, e.g. fertilization of host plants, use of a misting system, etc. (9,10).

Experiment 1- *Neonympha* rearing containers- After hatching, larvae will be placed on host plants at densities of five larvae/ host plant and will be transferred to a new plant if a particular host plant becomes denuded. *Neonympha* larvae will be raised under two experimental regimes. In the first trial, five groups of five larvae will be placed on *Carex sp.* (determined by experiment 1) rooted in a saturated sand/ peat mixture in a 2-gallon pot and covered with polyester netting. In the second trial, larvae will be placed at the same spatial density and soil mixture as trial 1, but will be raised in 30 x 60 cm polyethylene tubs framed with 1"x 1" Corners Limited aluminum tubing covered with polyester netting - to determine if the ability for greater movement and host plant selection will reduce/ deter attempts to escape the rearing enclosure. In the 3rd trial, larvae will be placed individually in 6 x 10 cm polyethylene containers with a polyester mesh top and fed with fresh daily cuttings of *Carex* placed on H_2O-saturated paper toweling. Survival each group will be quantified and statistically compared with one-way ANOVA (3).

Experiment 2- *Calephelis* rearing containers- After hatching, larvae will be placed on host plants at densities of five larvae/ host plant and will be transferred to a new plant if a particular host plant becomes denuded. *Calephelis* larvae will also be raised under two experimental regimes. In the first trial, larvae will be placed at the same spatial density and soil mixture as experiment 1, but will be raised in 1 x 2 m polyethylene tubs framed with 1"x 1" Corners Limited aluminum tubing covered with polyester netting (the host plant grows too large for smaller enclosures). In the 2nd trial, larvae will be placed individually in 6 cm x 10 cm polyethylene containers with a polyester mesh top and fed with fresh daily cuttings of *Cirsium* placed on H_2O-saturated paper toweling. Survival of each group will be quantified and statistically compared by t-testing (3). The architecture of the host plant of *Calephelis*- tightly-packed whorls of leaves- makes it difficult to detect small spiders that prey on the minute 1st and 2nd instar larvae. The ability to rear larvae in containers- if we can prevent dessication and mold- would significantly reduce predation of captive-reared larvae- a very serious problem we encountered in our current IMLS-sponsored wetland butterfly research.

Task 4. Develop breeding protocols for *Neonympha* and *Calephelis*. We will use the successful techniques developed for the *Satyrodes* model under our previous IMLS grant as a starting point (9). Adults will be hand fed daily using a 10% solution of raw honey. Hand-feeding was shown to greatly extend adult longevity in both adult oak savanna and wetland butterflies in previous IMLS- sponsored research (9,10). Observations of adult feeding in *Neonympha* are extremely rare, although in Virginia they have been reported to nectar on *Asclepias incarnata* (6). We will provide a slurry of mammal dung for all male butterflies to supply salts and other essential nutrients. Adults will be mated in 1 x 2 x 1.5 m netted enclosures with host plants and forbs. This is a very simple experiment to determine if the techniques developed for *Satyrodes* under our previous IMLS grant will work with *Neonympha* and *Calephelis*. If possible, we will compare multiple pairing with single-pair matings with both species. Group makeup will depend on the numbers and sex ratios of the cohort of both species that successfully overwinter from the 2005 season. Fecundity/fertility of females will be quantified and compared between groups w/ Mann-Whitney U testing (3). Wild-mated females will be used as controls. Ellsworth, Tolson, and Magdich will share this task, which will be carried out at TTZ in July 2006-08.

The natural cycles of *Neonympha* and *Calephelis* and their host plants are used as the basis for our schedule of completion. This strategy has served us well in the past. Activities commence in the early spring as germination of the host plants begin and continue into late spring as the first larvae break diapause. Development continues through late spring/ early summer as *Neonympha* and *Calephelis* larvae move into their later instars. In late June-July the first *Calephelis* and *Neonympha* adults appear, mate, and fly into early August. Data collection will continue through winter for over-wintering larvae. We anticipate a minimum of two scientific publications, two popular articles, and a new edition of our Wetland Butterfly Manual as the result of this research. By virtue of their high degree of endangerment, our long term commitments to local butterflies, and the delicacy of the target species, this project has unequivocally emerged as **TTZ's greatest conservation priority.** The Zoo research facilities housing butterflies include a 35' x 60' polyhouse with an 8' x 35' free-flight mating area, renovated with new netting and polyfilm in 2005, and adjacent indoor conservation facilities on the Zoo grounds housing environmental chambers and refrigeration units. Facilities are protected by 8' perimeter chain link fencing and 24-hr. security. There is no public access to this site. Butterflies are protected from spiders and other predators by netting over each individual pot housing eggs, larvae, pupae, or adults. All experimental pots and tubs are checked every two days for insect health, plant rotation, and removal of any potential predators. All plants are checked daily for watering. Insects in containers will be checked, fed, and cleaned daily. Housekeeping functions of this area are the responsibility of the project staff and facilities are kept clean and orderly. A fully equipped maintenance facility with trained staff is adjacent to the polyhouse for support of butterfly operations.

2. WHAT ARE THE PROPOSED CONSERVATION METHODS AND WHY ARE THEY CONSERVATIONALLY SOUND? With funding from IMLS and the ODNR, we collected two years of environmental data continuously in habitats of *Calephelis*, *Lycaena*, *Neonympha*, and *Satyrodes* (9). We were unable to find *Calephelis* at the last two recorded sites in Ohio and the species is now considered extirpated from the state. However, we were able to collect data from an extant site in MI, the Lost Nation Game Area (LNGA), where we propose to continue our research. These data provided the baseline information that allowed us to successfully breed, rear, and overwinter *Satyrodes* and *Lycaena* and will hopefully allow us to do the same with *Calephelis* and *Neonympha*. Our strategy of applying an understanding of the natural processes relating to survival, fertility, and fecundity in the wild to conservation breeding is sound, and we propose once again to use this approach. Our methods of using netted containers to rear larvae, breed adults, and conduct feeding experiments have been extremely effective, reliable, and efficient and provide a high degree of safety for our butterflies. During our last

round of IMLS-sponsored research, we demonstrated, with great success, the reliability and efficiency of mass-rearing **thousands** of wetland butterflies for release or conservation breeding, using pairs or groups of reproductive butterflies or larvae in individual tubs or large pots containing living host plants. We specifically utilized *Satyrodes* as a model for *Neonympha* as it is closely related, sympatric, uses the same host plant, and also overwinters as a larva. With an animal as critically endangered as *Neonympha*, we believed it was appropriate to use a model species to develop rearing and over-wintering techniques that could be later used, with modification, for a more imperiled species. We are now ready to test these techniques with *Neonympha*; **this proposed research evolves naturally from our earlier studies.** Our experimental approach to these problems was developed in consultation with and vetted by the FWS, MDNR, MSWG, the AZA BFCI and TITAG (see letters of endorsement), and the **tasks we propose to accomplish are specifically mentioned as high priority research for *Neonympha* in the federal Mitchell's Satyr Recovery Plan** (4). Sedges for larval studies and forbs selected for oviposition were chosen from those naturally occurring in fens supporting *Neonympha*, present a variety of structural features, and were selected by FWS and MNFI. Given the penchant for mobility in these larvae and their susceptibility to predation in large planted enclosures, we believe there is a need to experiment with much more restrictive housing in containers. Experiments will be performed concurrently when possible- saving time and effort. The appearance of different stages in the life cycle: eggs, larvae, pupae, and adults, dictate the timing of experiments. Butterflies are ideal experimental subjects due to their ease of manipulation and limited space requirements. Our butterfly production allows large sample sizes for statistical treatment of data, usually t-tests, Mann Whitney U tests, and ANOVA for multivariate tests (3).

3. WHAT IS THE OBJECT (S) HISTORIC STRUCTURE (S), OR SPECIMEN (S) THAT IS THE FOCUS OF THIS PROJECT? The objects of this research are two endangered species of wetland butterflies, the Mitchell's satyr, *Neonympha mitchellii*, and the swamp metalmark, *Calephelis muticum*. We currently hold ca. 20 *Neonympha* and 10 *Calephelis* larvae at the Zoo, with permits to collect additional animals. Both species are vanished elements of the unique wetland butterfly fauna of Northern Ohio. *Neonympha* was extirpated from the state in 1957, a victim of the relentless draining of fens, bogs, and other wetlands that soon followed the expansion into the Western Reserve at the turn of the 19th century (11,12). It is extant in several disjunct localities in Michigan and Indiana in low numbers that make it particularly vulnerable to stochastic extinction processes. *Calephelis* was designated as an Ohio S1 species- critically endangered in the state, but it now appears to be extirpated. Both species are lost relicts of the Great Black Swamp that extended from the western Lake Erie marshes into the unique swales of the Oak Openings region of Northwest Ohio. Work in our region of Ohio has special relevance to the conservation of Ohio's biota by virtue of the fact it has more endangered species than any other locality in the state. The wetland butterflies were part of the fabric of the Great Black Swamp, which once included Toledo. Butterflies have very high public appeal and have a special place within the psyches of most people who value our native biodiversity. During Zoo butterfly outreach programs, our older audience consistently mentions the butterfly abundance and diversity they observed in their youth, lament its loss, and ask what can be done to bring it back. The FWS, the AZA, and several conservation partners share this concern, and in 2001 launched the Butterfly Conservation Initiative (BFCI), a comprehensive program to recover the 22 species of endangered U.S. butterflies. TTZ was a founding member of that coalition, and this project is a component of that partnership effort and is endorsed by the BFCI, FWS, the Ohio Department of Natural Resources (ODNR), the Michigan Department of Natural Resources (MDNR), the Michigan Natural Features Inventory (MNFI), and the AZA Terrestrial Invertebrate TAG. The conservation of the flora and fauna of Northwestern Ohio is particularly well suited to our mission, which is **"...to promote wildlife and its conservation through excellence in animal management, educational programs, and scientific activities..."** The regional flora and fauna are extremely popular with the residents of Lucas County. Because of our prior successes with both oak savanna and wetland butterflies, local butterflies are now a **significant part of our institutional identity** with our public and our peers.

4. HOW DOES THE PROJECT RELATE TO YOUR MUSEUM'S ONGOING CONSERVATION ACTIVITIES? Our Conservation Master Plan is specifically designed to support our mission, and emphasizes that "**New conservation programs will be developed to serve local conservation priorities** for both plants and animals..." This project reflects that philosophy. We posit that we have a special responsibility to conserve the animals and plants of our community, and this institutional value is a cornerstone of our conservation programs. Our programs incorporate research as part of a stepwise, scientific process, with each experiment building on prior findings. This proposed research builds on our past successful experimentation with wetland butterflies (developed from programs for oak savanna butterflies), which have unequivocally emerged as **TTZ's greatest conservation priority.** In fact, more Zoo resources have been devoted to local wetland butterfly conservation than any other conservation project in the history of our institution. Currently, our Zoo devotes $144,401 to wildlife conservation activities. In 2003 Tolson was invited to become a member of the Michigan Mitchell's Satyr Working Group and the TTZ was officially sanctioned to develop captive breeding and rearing protocols for *Neonympha* using *Satyrodes* as a model- a project supported by IMLS CP grant IC-03-04-0121. With this

grant we developed the horticultural/ propagation protocols for *Carex* and *Cirsium*, and after our success with *Satyrodes*, permits were granted by the FWS and the MDNR to bring in *Calephelis* and *Neonympha* for conservation breeding. IMLS CP grants IC-90032-99 and IC-03-02-0049-02 allowed us to answer several critical questions related to KBB fecundity and longevity. Implementation of this **IMLS-sponsored research allowed us to achieve record levels of adult longevity, egg production, hatching success of 2nd brood eggs, and eclosure success in 2001 and fertility and fecundity in 2002-03 and the first conservation breedings of the purplish copper and northern eyed brown**. The program was so successful that it was used as a national model for butterfly conservation in a BFCI workshop given by the AZA and FWS for potential butterfly conservation partners in 2002, and is one of the nuclei of the AZA professional development course on butterfly husbandry in which Magdich and Tolson are instructors. Our wetland butterfly work follows a string of conservation successes for U.S. endangered species, including a comprehensive program of captive breeding, recovery, and reintroduction for the Mona and Virgin Islands boa. **IMLS support played a pivotal role in the implementation of this program** (CP grants IC-70095-87, IC-90453-89). IMS/ IMLS-sponsored research has led to publication of numerous research papers and a book by the Project Director. In fact, TTZ has won national recognition for its conservation programs with **six AZA Conservation Awards in the past ten years**, including the North American Conservation Award in 2003 for the Oak Savanna Butterfly Conservation Program.

5. WHAT ARE THE ANTICIPATED BENEFITS OF THIS PROJECT? Acquisition of these data will **solve immediate, critical problems of husbandry in our wetland butterfly collection**. Behavior of *Neonympha* and *Calephelis* is very different from any butterflies that we have previously worked with. They are much more mobile, plastic in host plant selection, delicate, and difficult to overwinter. They are much more sensitive to dehydration, and the growth habit of their host plants makes them more vulnerable to predation in captivity. Both are much more difficult to hatch and rear than other butterflies we have worked with (2,8). In initial *Neonympha* rearing experiments sponsored by the FWS, newly hatched caterpillars disappeared from rearing enclosures due to unknown causes (8), raising critical concerns about larval movements and adequate confinement (8), and much has yet to be learned about larval biology (although both species are hypothesized to enter diapause and overwinter in the 4th or 5th instar [4-7]). To quote from the FWS Mitchell's Satyr Recovery Plan: **"Very little is understood about the ecological requirements, life history, and population structure of the Mitchell's satyr...the biology of over-wintering larvae is unknown, although they are hypothesized to enter diapause in the 4th or 5th instar. A solid understanding of these basic parameters is required to fully protect the species from extinction."** We are committed to finding solutions to these problems, as these data are critical. Determining optimal conditions for adult butterflies, larvae, and eggs will result in greater numbers of butterflies, which in turn will increase the demographic stability and increase the probability of the long-term Zoo survival of *Neonympha* and *Calephelis*.

Any research dedicated to increasing over-winter survival of larvae will benefit other zoo butterfly programs that depend on the overwintering of larvae for their conservation programs. Typically, over winter losses of larvae are severe (13). This information would benefit many other institutions that wish to initiate wetland butterfly conservation breeding programs through the AZA BFCI. The **techniques we developed for the KBB are being used as a model** for other endangered butterflies through the BFCI. In addition to developing protocols for assuring the long-term viability of our wetland butterfly collection, we will publish a new edition of our husbandry manual for wetland butterflies (10), similar to the one we developed and published for the KBB as a result of IMLS grant IC-90032-99. This manual will be distributed *gratis* to other institutions that wish to breed wetland butterflies in captivity. The results of our latest research will be published in peer- reviewed journals and presented at scientific meetings. We communicate the results of our research to our audience in electronic and hard copy editions of Safari, our membership publication, and through special programs. In the future, results from this research can be used to help augment the numerous precarious populations of the wetland butterflies in the wild, or to restore them to states from which they have been extirpated. Additionally, our research findings will be incorporated into the curriculum of the AZA husbandry course (Tolson and Magdich are both instructors for this course). Our landscape management efforts for wetland butterflies, undertaken in partnership with The Nature Conservancy, include direct participation in restoration and replanting of habitat for wetland and other butterflies. These activities in turn indirectly benefit other wetland species of the Oak Openings, such as the state endangered spotted turtle and blue-spotted salamander.

6. HOW WILL THE APPLICANT ENSURE THAT ONGOING MUSEUM OPERATIONS ARE NOT INHIBITED BY THESE PROJECT ACTIVITIES? The required institutional contribution will not negatively affect our other operations. Funding for conservation project support, including this project, is provided each year in the budget of the Conservation Department. These allocations have significantly increased each year for the past several years and are currently at record levels for our department, including a 45.4 % increase over FY 2004. Our direct mail appeal, the Animal Rescue and Conservation Fund, has resulted in additional revenue for conservation activities, allowing us to increase our commitment to conservation projects in each of the past five years. Cash matches of $31,200 provided by

the ODNR and $7,560 provided by an anonymous foundation will augment TZG and IMLS funding of the project. *In situ* conservation activities are embraced as a normal part of our staff responsibilities. Since 1992, both Tolson and Magdich have devoted summer activities to butterfly conservation almost exclusively. Magdich will aid in supervision of this project during any absences of the Project Director, so there will be minimal impact on other conservation projects. A technician hired specifically for the project will conduct experimental manipulations, monitoring, and provide care for the experimental groups throughout the year. Once again, the research is designed so that a number of experiments will be performed concurrently, thus improving efficiency. A member of the research team will always be on grounds or available when travel away from the facility is needed. This arrangement has always worked well in previous research with oak savanna and wetland butterflies.

7. HOW DOES THE PROJECT BUDGET SUPPORT THE PROJECT GOALS AND OBJECTIVES? The budget was developed by Tolson from our previous experience in rearing and breeding wetland butterflies under IMLS-funded field and propagation research from 2002- present and by consultation with the ODNR, MNFI, and the federal MSWG. The caging systems we propose have proven themselves in past research and give excellent value without sacrifice of durability. Plant supplies are purchased after consultation with our Horticulture Department. We canvassed several suppliers to obtain the most economical price for our supplies and materials and purchase equipment directly from the manufacturer when possible to reduce mark-up. We use local sources for bulk supplies due to the high cost of shipping these items (e.g. mulch, soil, etc.). Our caging equipment was selected for quality, reliability, and cost-effectiveness- priced by a direct quote from the manufacturer. We used off-the-shelf prices for common items. We attempted to be as frugal as possible without jeopardizing experimental design and quality. We saved significant funds by using husbandry and horticultural equipment from our previous IMLS sponsored research- and are keeping equipment expenditures to a minimum. Our soil mixes, however, must be replaced each year to reduce parasite and predator loads, and we need additional, larger enclosures to accommodate the growth habit of our host plants and the special needs of *Calephelis* and *Neonympha*. The position of Research Technician is justified by our critical need for close monitoring of equipment and butterflies of all life stages during the course of this study. Our technician wages were developed in consultation with the AZA BFCI and the ODNR, who will provide the cash match to fund this position. We have designated this position as salaried due to the long hours necessary for this project. We will use the services of Research Fellows and a seasonal worker to aid the Research Technician in the summer when the workload will be the highest. Travel to field locations is necessary to use wild controls for our experiments and to collect plants that are not commercially available. We use the federal mileage reimbursement rate of $0.485/ mi to calculate auto transportation costs and GSA per diem rates for subsistence costs. The nexus provided by the AZA national meeting is the perfect opportunity for Ellsworth to share research results with the BFCI and her peers in other zoos. We used the lowest commercially available airfares in air travel calculations, and GSA rates for per diem and lodging.

8. WHAT ARE THE QUALIFICATIONS AND RESPONSIBILITIES OF THE PROJECT PERSONNEL? The project will utilize the skills of Peter J. Tolson, PhD, TTZ Director of Conservation, Mitchell L. Magdich, TTZ Curator of Education, a Research Fellow and a seasonal worker dedicated to the project, and Candee L. Ellsworth, a ½ time Research Technician hired specifically for the project. Design, experimental set-up, and project supervision will be the responsibility of Tolson, who will also aid in implementation. Magdich will aid in supervision and implementation of this project, especially when Tolson is not present. Ellsworth will be responsible for maintenance and manipulation of experimental and control groups as well as care of host plants and equipment. These tasks include feeding, watering, predator removal, weeding enclosures, and preparations for breeding and overwintering. The Fellow and the seasonal worker will aid Ellsworth in care of butterflies, larvae, pupae, and eggs and host plants while maintaining the research facilities. All conservation staff has experience with the environmental systems and research equipment and butterfly husbandry from previous oak savanna and wetland butterfly conservation projects. Tolson and Magdich have a long history of successful conservation breeding and fieldwork with endangered butterfly species and were awarded Conservation Colleague Awards in 1998 by The Nature Conservancy for their work with the KBB. Both also received USFWS Endangered Species Program awards in 2000 for their work with this and other endangered U.S. Species. Both are instructors in the AZA BFCI butterfly conservation course. Our group effort led to TTZ receiving the AZA North American Conservation Award in 2003 for Oak Savanna butterfly conservation. Magdich has an intimate knowledge of the butterfly and plant communities of the Oak Openings and has long been associated with the ODNR as a result of his surveys for the KBB and the wild lupine. Tolson is best known for work with West Indian boas, for which he has won both the AZA Bean Award and the AZA Conservation Awards for TTZ. He has worked with Magdich on recovery of oak savanna butterflies for the past 15 years. There are several university students with butterfly experience available for seasonal work related to wetland butterfly husbandry and experimentation as well as Ellsworth, who has been instrumental in the supervision of five different research fellows and seasonal workers in the propagation and care of wetland butterflies and host and nectar plants.

1. WHAT IS THE DESIGN OF THE EDUCATION COMPONENT?

The staff of the Education Department of The Toledo Zoo (TTZ) plans to develop a curriculum that concentrates on the conservation of the federally endangered Mitchell's satyr butterfly (*Neonympha m. mitchellii*). The development of this material will complement and coincide with conservation and recovery efforts planned for this species by the Zoo's Conservation and Research Department. The curriculum would likewise supplement endangered butterfly education materials that were developed for the Ohio state endangered purplish copper (*Lycaena helloides*) and swamp metalmark (*Calephelis muticum*) butterflies under IMLS 2004 Conservation Project Support Grant IC-03-04-0121. Ultimately, the goal of the project is to raise the awareness of elementary school teachers and students regarding the Mitchell's satyr and the fen habitats where the species resides.

As in our previous education effort for wetland butterflies, the theme for the curriculum is "Beautiful Butterflies are Vanishing from Our Wetlands!" The sub-themes are "I'm Starving!", "I'm Homeless!" and "Does Anyone Care?" The theme and sub-themes attempt to create a blend of tangible and intangible messages, providing a balanced presentation that makes the information relevant and provocative to elementary school children. Two of the sub-themes address factors key to the survival of the butterfly. "I'm Starving!" addresses the nutritional needs of the larvae and adult butterflies. "I'm Homeless!" addresses habitat loss and fragmentation. The remaining sub-theme "Does Anyone Care?" is a call to action to preserve the butterfly and its habitat.

TTZ Education staff will work closely with the Zoo's Conservation and Research Department and the Ohio Department of Natural Resources to produce a five minute video about the Mitchell's satyr. The video will focus on the main theme and sub-themes. The content and production will be appropriate for the elementary level. After production, the video will be converted to a DVD format for distribution. Two-hundred fifty DVDs will be copied for distribution to teachers during the teacher workshops.

A curriculum component will be created to complement the DVD video. The curriculum will be divided into three units. Each unit will focus on one of the sub-themes. Two hundred fifty copies of each of the 12 lessons will be produced. Additionally, the curricula will be divided into two modules; one focused on grades 1-3 and the other grades 4-6 (see table 1).

Table I

		Sub-Themes (Units)		
		I'm Starving!	**I'm Homeless!**	**Does Anyone Care?**
Mitchell's Satyr	Grades 1-3 module	2 lessons	2 lessons	2 lessons
	Grades 4-6 module	2 lessons	2 lessons	2 lessons

The curriculum will be developed using the 5-E instructional model, a widely recognized, inquiry-based, constructivist learning model. All lessons will be aligned to the Ohio and Michigan State Proficiency Outcomes for Science.

The final piece for the education component will be a color poster depicting the Mitchell's satyr. Text will be included, addressing each of the aforementioned sub-themes. Seven hundred fifty posters will be produced. When the DVDs, curriculum, and posters are ready for distribution, TTZ Education Department staff will conduct teacher workshops to train elementary teachers to use the materials. Emphasis will be placed on disseminating curriculum to teachers in elementary schools in four communities near existing Mitchell's satyr habitat; Coldwater, Ann Arbor, Jackson, and Centreville, Michigan.

Mitchell Magdich, TTZ Curator of Education, will supervise the education component. Approximately 5% of his time will be allocated for this project. A temporary employee hired

specifically for this project will include Science Education Specialist Karen Mitchell, a retired schoolteacher with extensive experience in elementary science education methodologies. Mitchell will develop the curriculum. Linda Calcamuggio, Education Specialist at TTZ, will coordinate teacher training. Approximately 4% of her time will be allocated to this project. Videography and production will be done by employees of the Ohio Department of Natural Resources (ODNR). The Toledo Zoo Interpretive Services Department will prepare curriculum materials for print production, design the DVD sleeve jacket and design the poster. Vanessa Snyder, Curator of Interpretive Services at TTZ, will supervise design of the curriculum, poster and DVD sleeve jacket. She will spend approximately 5% of her time on the project.

Preparation of the educational materials will begin in the spring of 2006 with teacher workshops beginning in January of 2008. This schedule is appropriate because video production, such as the videography, will operate concurrently with the conservation field season and the flight period for adult Mitchell's satyrs. The products will be completed for meetings, scheduling and planning with school administrators in the fall of 2007 with teacher workshops beginning in the winter and spring of 2008.

2. **WHAT ARE THE ANTICIPATED BENEFITS OF THIS EDUCATIONAL PROJECT?**
Most of the populace is generally unfamiliar with local animal species, particularly those species that are rare or endangered. This is especially true of the smaller, more obscure species that are not generally well known or particularly charismatic (e.g., butterflies). Conversely, the same populace is often much more familiar with exotic animals, including endangered ones, that live in distant regions of the world. Much of this is due to the popular, animal centric media outlets such as Animal Planet. Likewise, most elementary science textbooks and children's story books concentrate on the more prolific, exotic endangered animals. Little if any attention is given to endemic animal species, particularly endangered varieties. Even less consideration is given to the root causes of their demise. This project concentrates on a local endangered butterfly in order to connect teachers and students to a global phenomenon occurring in their communities. In addition, some of the root issues causing endangerment such as habitat loss and habitat fragmentation can be investigated from a more relevant context since teachers and students are able to observe the events first hand. Ultimately, the project outcome is to raise the awareness of teachers and students regarding the Mitchell's satyr butterfly and habitat and the causes of the species decline. This will be accomplished by 1) implementing a well-designed curriculum and 2) by training teachers to use it. Consequently, teachers and students will know about the butterfly's natural history, habitat, the various plants that it requires for survival and the reasons for the species demise. As an informed audience, teachers and students will be more capable of identifying opportunities to protect the butterfly and its habitat and take appropriate action.

3. **HOW DOES THE PROJECT BUDGET SUPPORT THE EDUCATION COMPONENT GOALS AND OBJECTIVES?**
Costs for producing and replicating the DVDs and for printing the curriculum and printing the poster are based on estimates from reliable vendors who have a track record of quality work for TTZ. The labor costs for writing the curriculum are based on a written proposal from Mitchell. The labor costs for a graphic designer for the curriculum, poster and DVD jacket are based on an estimate provided by the Curator of Interpretive Services at TTZ using current rates for the pool of part time graphic support staff currently employed by TTZ. The Zoo's in kind match is based on existing salaries, wages and fringe benefits for Zoo staff in the Education Department and Interpretive Services Department while the Ohio Department of Natural Resources in kind match is based on their experience with current industry standard costs for filming and producing a five minute video program. Mileage costs are based on the federal rate and four projected day trips to the Michigan communities of Ann Arbor, Centreville, Coldwater and Jackson to meet with school district officials and for conducting teacher workshops. We attempted to be as frugal as possible without jeopardizing educational objectives and quality.

4. **WHAT ARE THE QUALIFICATIONS AND RESPONSIBILITIES OF THE PROJECT PERSONNEL?**
Curator of Education, Mitchell L. Magdich, supervises all of the Zoo's educational functions including public programs, interpretive programs, school programs, home school programs, outreach programs, overnight programs, camps, distance learning, the Children's Zoo, the library, the science resource

center, teacher training and docent training. He has over 16 years experience in Zoo education and over 20 years as an informal science educator including employment as a park naturalist. Magdich has a Bachelor of Education degree. Magdich will supervise the education component of the project.

Magdich has been conducting research on Ohio's threatened and endangered butterflies for 18 years. He conceived and developed the Ohio reintroduction of the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis*) to Ohio, a project implemented by the Conservation and Research Department of TTZ. Magdich is also a member of the steering committee and is the chairperson of the education subcommittee for the Butterfly Conservation Initiative (BFCI), a national butterfly recovery program administered through the American Zoo and Aquarium Association (AZA). He has received several awards related to his work with butterflies including the 1998 Conservation Colleague Award from The Nature Conservancy, The United States Fish and Wildlife Service National Endangered Species Program Award in 2000 , the AZA Outstanding Service Award in 2000, and was a key member of the group that obtained the AZA North American Conservation Award for TTZ in 2003. Magdich also produced the educational loan boxes that were cited as a key feature of the lake sturgeon educational effort that resulted in the Mace Award in 1997.

Vanessa Snyder, Curator of Interpretive Services at TTZ, will supervise graphic design of the educational curriculum, design of the DVD sleeve jacket and design of the Mitchell's satyr poster at TTZ. Snyder has several award-winning design efforts to her credit, including the graphic designs for TTZ Aviary, which won the AZA Exhibits Award in 1999 and the Aquarium graphics for lake sturgeon that won the Mace Award in 1997. Artists and designers hired through the Interpretive Services Department at TTZ will do graphic design of the curriculum. Department staff has extensive experience in design and production of posters, brochures, pamphlets, booklets, reports, educational materials, murals, signs and exhibits that are used or displayed throughout TTZ.

Linda Calcamuggio, Education Specialist, has 6 years experience as a Zoo educator. She has direct oversight of the Zoo's distance learning, overnight and teacher training programs. Calcamuggio will conduct and supervise the teacher workshop segment of the education component.

Karen Mitchell is a retired elementary school teacher with over 30 years experience in the classroom. Karen has extensive experience in science education methodologies and has participated and assisted in Zoo education programs for over 12 years. Mitchell will oversee the development of the butterfly curriculum.

The Ohio Department of Natural Resources (ODNR) will provide staff for the filming and production of the video segment. ODNR has extensive experience in videography, having filmed and produced the widely distributed 30-minute wildlife program Wild Ohio! for several years.

Schedule of Completion

	May 06	Jun 06	Jul 06	Aug 06	Sep 06	Oct 06	Nov 06	Dec 06	Jan 07	Feb 07	Mar 07	Apr 07
CONSERVATION COMPONENT												
Collection and planting of Wetland plants	----------	----------										
Oviposition studies		----------	----------	----------								
Larval container experiments		----------	----------	----------	----------	----------						
Larval host plant selection/ fidelity			----------	----------								
Care for larvae in diapause	----------					----------	----------	----------	----------	----------	----------	----------
EDUCATION COMPONENT.												
Filming and production		----------	----------	----------	----------							
DVD replication						----------	----------	----------				
Graphic design- DVD sleeve			----------	----------								
Lesson plan development						----------	----------	----------				

	May 07	Jun 07	Jul 07	Aug 07	Sep 07	Oct 07	Nov 07	Dec 07	Jan 08	Feb 08	Mar 08	Apr 08
CONSERVATION COMPONENT												
Collection and planting of Wetland plants	----------	----------	----------									
Oviposition studies		----------	----------	----------								
Larval container experiments		----------	----------	----------	----------	----------						
Larval host plant selection/ Fidelity			----------	----------								
Care for larvae in diapause	----------					----------	----------	----------	----------	----------	----------	----------
Revision of Wetland Butterfly Manual											----------	----------
EDUCATION COMPONENT												
Lesson plan graphic design	----------	----------										
Printing curriculum, poster	----------	----------										
Assemble teacher packets			----------	----------								
Teacher training					----------	----------	----------	----------	----------	----------	----------	----------

Project Budget Form

SECTION 1: SUMMARY BUDGET, CPS AND EDUCATION COMPONENTS

Name of Applicant Organization **The Toledo Zoo**

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

DIRECT COSTS

	IMLS	Cost Share	Total
SALARIES & WAGES	$38,191	$88,869	$127,060
FRINGE BENEFITS	$17,580	$14,282	$ 31,862
CONSULTANT FEES	$ 0	$ 0	$ 0
TRAVEL	$ 4,136	$ 2,750	$ 9,647
MATERIALS, SUPPLIES & EQUIPMENT	$ 5,642	$ 3,712	$ 9,354
SERVICES	$ 579	$ 2,120	$ 2,699
OTHER	$ 140	$ 0	$ 140
TOTAL DIRECT COSTS	$ 66,268	$ 111,733	$ 180,762
INDIRECT COSTS	$ 9,940	$ 16,759	$ 27,114
		TOTAL PROJECT COSTS	$ 207,876

AMOUNT OF COST SHARE $ 111,733

AMOUNT OF IN-KIND CONTRIBUTIONS $ 16,759

TOTAL AMOUNT OF COST SHARE (CASH & IN-KIND CONTRIBUTIONS) $ 128,492

AMOUNT REQUESTED FROM IMLS, INCLUDING INDIRECT COSTS $ 76,208

PERCENTAGE OF TOTAL PROJECT COSTS REQUESTED FROM IMLS 38 %
(MAY NOT EXCEED 50%)

Have you received or requested funds for any of these project activities from another federal agency?
(Please check one) ☐ Yes ☑ No

If yes, name of agency _____

Request/Award amount _____

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET

Year ☑1 ☐2 ☐3 – Budget Period from 5 /1 /06 **to** 4 /30 /07

Name of Applicant Organization **The Toledo Zoo**

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

SALARIES AND WAGES (PERMANENT STAFF)

NAME/TITLE	NO.	METHOD OF COST COMPUTATION	IMLS	COST SHARE	TOTAL
[redacted]	(1)	1yr@$60,000 x 20% time		$12,000	$12,000
	( )				
	(1)	1yr@$54,620 x 10% time		$ 5,462	$ 5,462
	( )				
		TOTAL SALARIES AND WAGES $		$17,462	$17,462

SALARIES AND WAGES (TEMPORARY STAFF HIRED FOR PROJECT)

NAME/TITLE	NO.	METHOD OF COST COMPUTATION	IMLS	COST SHARE	TOTAL
[redacted]	(1)	1 year @ $28,868	$14,434	$14,434	$28,868
	( )				
	(1)	13 week stipend@ $4,200		$ 4,200	$ 4,200
	(1)	720 hours @ $8.00/ hour		$ 5,760	$ 5,760
		TOTAL SALARIES AND WAGES $	$14,434	$24,394	$38,828

FRINGE BENEFITS

RATE		SALARY BASE	IMLS	COST SHARE	TOTAL
[redacted] 30 %	of $	12,000		$ 3,600	$3,600
[redacted] 30%	of $	5,462		$ 1,639	$1,639
[redacted] 0%	of $	28,868	$8,660		$8,660
		TOTAL FRINGE BENEFITS	$ 8,660	$ 5,239	$13,899

CONSULTANT FEES

NAME/TYPE OF CONSULTANT	RATE OF COMPENSATION (DAILY OR HOURLY)	NO. OF DAYS (OR HOURS) ON PROJECT	IMLS	COST SHARE	TOTAL
	TOTAL CONSULTANT FEES		$		

TRAVEL

FROM/TO	NUMBER OF: PERSONS	DAYS	SUBSISTENCE COSTS	TRANSPORTATION COSTS	IMLS	COST SHARE	TOTAL
Tol/ Lib. Fen	(2)	(3)	$180	$259	$ 439		$ 439
Tol/ LNGA	(2)	(3)	$180	$232	$ 412		$ 412
Tol/ BSGA	(4)	(4)	$560	$815		$1,375	$1,375
			TOTAL TRAVEL COSTS		$ 851	$1,375	$3,548

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET CONTINUED

Year ☑1 ☐2 ☐3

MATERIALS, SUPPLIES AND EQUIPMENT

Item	Method of Cost Computation	IMLS	Cost Share	Total
Butterfly supplies	see attached sheet	$628		$628
Horticult. supplies	see attached sheet	$900		$900
Caging supplies	see attached sheet	$800		$800
TOTAL COST OF MATERIALS, SUPPLIES, & EQUIPMENT		$ 2,238		$2,238

SERVICES

Item	Method of Cost Computation	IMLS	Cost Share	Total
	TOTAL SERVICES COSTS	$		

OTHER

Item	Method of Cost Computation	IMLS	Cost Share	Total
Tub netting, custom made for 1 x 2 m	4 nets @ $35 each	$140		$140
	TOTAL OTHER COSTS	$ 140		$140
	TOTAL DIRECT PROJECT COSTS	$ 26,323	$48,470	$76,115

INDIRECT COSTS

Check either item A or B and complete C. (See section on Indirect Costs, pages 3.6–3.7.)

Applicant organization is using:

☑ A. An indirect cost rate which does not exceed 15 percent of modified total direct costs charged to IMLS.

☐ B. Federally negotiated indirect cost rate (see pages 3.6–3.7).

Name of Federal Agency _____ Expiration Date of Agreement _____

Rate base amount 15 % of $ $76,115 = $ 11,417

	IMLS	Cost Share	Total
C. TOTAL INDIRECT COSTS	$ 3,948	$7,270	$11,417

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET

Year ☐ 1 ☑ 2 ☐ 3 – **Budget Period from** 5 / 1 / 07 **to** 4 / 30 / 08

Name of Applicant Organization **The Toledo Zoo**

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

SALARIES AND WAGES (PERMANENT STAFF)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
[redacted]	(1)	1yr@$61,800 x 20% time		$12,360	$12,360
	( )				
	(1)	1yr@$55,620 x 10% time		$ 5,562	$ 5,562
	( )				
		TOTAL SALARIES AND WAGES $		$17,922	$17,922

SALARIES AND WAGES (TEMPORARY STAFF HIRED FOR PROJECT)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
[redacted]	(1)	1 year @ $29,734	$14,867	$14,867	$29,734
	( )				
	(1)	10 week stipend@ $2,000		$ 2,000	$ 2,000
	(1)	720 hours @ $8.00/ hour	$ 5,760		$ 5,760
		TOTAL SALARIES AND WAGES $	20,627	$16,867	$37,494

FRINGE BENEFITS

Rate		Salary Base	IMLS	Cost Share	Total
[redacted] 30 %	of $	12,360		$ 3,708	$3,708
30%	of $	5,562		$ 1,669	$1,669
30%	of $	29,734	$8,920		$8,660
		TOTAL FRINGE BENEFITS	$ 8,920	$ 5,377	$14,297

CONSULTANT FEES

Name/Type of Consultant	Rate of Compensation (Daily or Hourly)	No. of Days (or hours) on project	IMLS	Cost Share	Total
		TOTAL CONSULTANT FEES	$		

TRAVEL

From/To	Number of: Persons	Days	Subsistence Costs	Transportation Costs	IMLS	Cost Share	Total
Tol/ Lib. Fen	(2)	(3)	$180	$259	$ 439		$ 439
Tol/ LNGA	(2)	(3)	$180	$232	$ 412		$ 412
Tol/ BSGA	(4)	(4)	$560	$815		$1,375	$1,375
			TOTAL TRAVEL COSTS		$ 851	$1,375	$3,665

Project Budget Form

SECTION 2: CONSERVATION DETAILED BUDGET CONTINUED

Year ☐ 1 ☑ 2 ☐ 3

MATERIALS, SUPPLIES AND EQUIPMENT

Item	Method of Cost Computation	IMLS	Cost Share	Total
Butterfly supplies	see attached sheet	$628		$628
Horticult. supplies	see attached sheet	$900		$900
TOTAL COST OF MATERIALS, SUPPLIES, & EQUIPMENT		$ 1,528		$1,528

SERVICES

Item	Method of Cost Computation	IMLS	Cost Share	Total
Color copies	20 pages @ $0.95/ page x 25	$475		$475
1st class postage	25 manuals @ $4.14 each	$104		$104
	TOTAL SERVICES COSTS	$ 579		$579

OTHER

Item	Method of Cost Computation	IMLS	Cost Share	Total
	TOTAL OTHER COSTS	$		
	TOTAL DIRECT PROJECT COSTS	$ 32,505	$41,541	$75,485

INDIRECT COSTS

Check either item A or B and complete C. (See section on Indirect Costs, pages 3.6–3.7.)

Applicant organization is using:

☑ A. An indirect cost rate which does not exceed 15 percent of modified total direct costs charged to IMLS.

☐ B. Federally negotiated indirect cost rate (see pages 3.6–3.7).

Name of Federal Agency _____ Expiration Date of Agreement _____

Rate base amount

15 % of $ $75,485 = $ 11,323

	IMLS	Cost Share	Total
C. TOTAL INDIRECT COSTS	$ 4876	$6,231	11,107

Project Budget Form

SECTION 2: EDUCATION DETAILED BUDGET

Year ☑ 1 ☐ 2 ☐ 3 – Budget Period from 5 / 1 /06 **to** 4 /30 /07

Name of Applicant Organization **The Toledo Zoo**

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

SALARIES AND WAGES (PERMANENT STAFF)

NAME/TITLE	NO.	METHOD OF COST COMPUTATION	IMLS	COST SHARE	TOTAL
[redacted]	(1)	1yr @ $54,620 x 5% time		$2,731	$2,731
	(1)	1yr @ $54,620 x 5% time		$2,731	$2,731
	( )				
	( )				
		TOTAL SALARIES AND WAGES	$	$5,462	$5,462

SALARIES AND WAGES (TEMPORARY STAFF HIRED FOR PROJECT)

NAME/TITLE	NO.	METHOD OF COST COMPUTATION	IMLS	COST SHARE	TOTAL
[redacted]	(1)	$22/ hour x 40 hours	$ 880		$880
	( )				
	(1)	$25/ hour x 45 hours	$1,125		$1,125
	( )				
		TOTAL SALARIES AND WAGES	$ 2,005		$2,005

FRINGE BENEFITS

RATE		SALARY BASE	IMLS	COST SHARE	TOTAL
[redacted]	% of $	$2,731		$ 819	$ 819
	% of $	$2,731		$ 819	$ 819
	% of $				
		TOTAL FRINGE BENEFITS	$	$1,638	$1,638

CONSULTANT FEES

NAME/TYPE OF CONSULTANT	RATE OF COMPENSATION (DAILY OR HOURLY)	NO. OF DAYS (OR HOURS) ON PROJECT	IMLS	COST SHARE	TOTAL
		TOTAL CONSULTANT FEES	$		

TRAVEL

FROM/TO	NUMBER OF: PERSONS	DAYS	SUBSISTENCE COSTS	TRANSPORTATION COSTS	IMLS	COST SHARE	TOTAL
Tol/ Lib. Fen	(2)	(3)	$180	$259	$439		$439
	( )	( )					
	( )	( )					
	( )	( )					
			TOTAL TRAVEL COSTS		$ 439		$439

Project Budget Form

SECTION 2: EDUCATION DETAILED BUDGET CONTINUED

Year ☑1 ☐2 ☐3

MATERIALS, SUPPLIES AND EQUIPMENT

Item	Method of Cost Computation	IMLS	Cost Share	Total
TOTAL COST OF MATERIALS, SUPPLIES, & EQUIPMENT		$		

SERVICES

Item	Method of Cost Computation	IMLS	Cost Share	Total
Filming/ production	$53/ hour x 40 hours		$2,120	$2,120
	TOTAL SERVICES COSTS	$	$2,120	$2,120

OTHER

Item	Method of Cost Computation	IMLS	Cost Share	Total
	TOTAL OTHER COSTS	$		
	TOTAL DIRECT PROJECT COSTS	$ 2,444	$9,220	$11,664

INDIRECT COSTS

Check either item A or B and complete C. (See section on Indirect Costs, pages 3.6–3.7.)

Applicant organization is using:

☑ A. An indirect cost rate which does not exceed 15 percent of modified total direct costs charged to IMLS.

☐ B. Federally negotiated indirect cost rate (see pages 3.6–3.7).

Name of Federal Agency _____ Expiration Date of Agreement _____

Rate base amount 15 % of $ 11,664 = $ 1,750

	IMLS	APPLICANT	TOTAL
C. TOTAL INDIRECT COSTS	$ 367	$1,383	$1,750

Project Budget Form

SECTION 2: EDUCATION DETAILED BUDGET

Year ☐1 ☑2 ☐3 – **Budget Period from** 5 / 1 /07 **to** 4 /30 /08

Name of Applicant Organization **The Toledo Zoo**

IMPORTANT! READ INSTRUCTIONS ON PAGES 3.5–3.7 BEFORE PROCEEDING.

SALARIES AND WAGES (PERMANENT STAFF)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
[redacted]	(1)	1yr @ $54,620 x 5% time		$2,731	$2,731
[redacted]	(1)	1yr @ $54,620 x 5% time		$2,731	$2,731
[redacted]	(1)	1yr @ $32,500 x 4% time		$1,300	$1,300
	( )				
		TOTAL SALARIES AND WAGES	$	$6,762	$6,762

SALARIES AND WAGES (TEMPORARY STAFF HIRED FOR PROJECT)

Name/Title	No.	Method of Cost Computation	IMLS	Cost Share	Total
TZ Support staff	(1)	$25/ hour x 45 hours	$1,125		$1,125
graphics artist	( )				
	( )				
	( )				
		TOTAL SALARIES AND WAGES	$ 1,125		$1,125

FRINGE BENEFITS

Rate	Salary Base	IMLS	Cost Share	Total
[redacted] 30%	of $ $2,731		$ 819	$ 819
[redacted] %	of $ $2,731		$ 819	$ 819
[redacted] %	of $ 1,300		$ 390	$ 390
	TOTAL FRINGE BENEFITS	$	$2,028	$2,028

CONSULTANT FEES

Name/Type of Consultant	Rate of Compensation (Daily or Hourly)	No. of Days (or hours) on project	IMLS	Cost Share	Total
	TOTAL CONSULTANT FEES		$		

TRAVEL

From/To	Number of: Persons	Days	Subsistence Costs	Transportation Costs	IMLS	Cost Share	Total
Tol/ Ann Arbor	(1)	(4)	$172	$225	$ 397		$ 397
Tol/ Jackson	(1)	(4)	$124	$345	$ 469		$ 469
Tol/Coldwater	(1)	(4)	$124	$396	$ 520		$ 520
Tol/ Centreville	(1)	(4)	$124	$485	$ 609		$ 609
			TOTAL TRAVEL COSTS		$ 1,995		$1,995

Project Budget Form

SECTION 2: EDUCATION DETAILED BUDGET CONTINUED

Year ☐1 ☑2 ☐3

MATERIALS, SUPPLIES AND EQUIPMENT

Item	Method of Cost Computation	IMLS	Cost Share	Total
DVD replication	250 copies @ $3.60 each		$ 900	$900
Poster printing	750 copies @ $1.25 each	$938		$938
Curriculum printing	12lessonsx250copiesx1.25	$938	$2,812	$3,750
TOTAL COST OF MATERIALS, SUPPLIES, & EQUIPMENT	$	1,876	$3,712	$5,588

SERVICES

Item	Method of Cost Computation	IMLS	Cost Share	Total
	TOTAL SERVICES COSTS	$		

OTHER

Item	Method of Cost Computation	IMLS	Cost Share	Total
	TOTAL OTHER COSTS $			
	TOTAL DIRECT PROJECT COSTS $	4,996	$12,502	$17,498

INDIRECT COSTS

Check either item A or B and complete C. (See section on Indirect Costs, pages 3.6–3.7.)

Applicant organization is using:

☑ A. An indirect cost rate which does not exceed 15 percent of modified total direct costs charged to IMLS.

☐ B. Federally negotiated indirect cost rate (see pages 3.6–3.7).

Name of Federal Agency _____ Expiration Date of Agreement _____

Rate base amount 15 % of $ 17,498 = $ 2,625

	IMLS	APPLICANT	TOTAL
C. TOTAL INDIRECT COSTS	$ 749	$1,875	$2,625