1997 Project Abstract
For the Period Ending June 30, 1999.

This project was supported by the Environment and Natural Resources Trust Fund.

TITLE: ELECTRONIC ENVIRONMENTAL EDUCATION RAPTOR NETWORK

Project Manager: Mark Martell
Organization: The Raptor Center at the University of Minnesota
Address: 1920 Fitch Ave. St. Paul, MN 55108
Web Page: http://www.raptor.cvm.umn.edu/raptor/meeen/meeenhp.html
Legal Citation: (ML 97, Ch. 216, Sec. 15, Subd. 13(i)).
Appropriation Amount: $222,000

Statement of Objectives: This project will allow students from all parts of Minnesota to participate as satellite monitored radio-tracking equipment follows Minnesota raptors during their migration. Participation in this research, and the discovery of other natural phenomena will be done using the Internet. This experience will be integrated into a total environmental education program, which includes classroom materials and activities. The project will coordinate its services and information with teachers and other private and public cooperators.

Overall Project Results: A total of 17 Minnesota Ospreys were trapped and fitted with radio tracking devices; 9 in 1997, and 8 in 1998. Ospreys were trapped in Cass, Crow Wing, Hennepin, Ramsey, Washington, and Wright counties. Using non-LCMR funds, an additional 35 Ospreys from outside of Minnesota were also tagged. During the summer of 1997, we tagged and monitored 3 Minnesota Swainson's Hawks from Pipestone and Waseca counties. In the spring and summer of 1998 we placed satellite-tracking units on 3 Bald Eagles that had been injured and admitted to The Raptor Center for medical care. Minnesota Ospreys were found wintering in Mexico, Nicaragua (2), Venezuela (2), Colombia, Cuba, Peru, Bolivia, and Brazil. Two of the Swainson's Hawks wintered in Argentina, while the third did not make it past Bolivia where, we believe, it died.

As an electronic education resource we focused much of our education efforts on the Web. Six areas of our Website were designed to provide educational information. To help teachers use the program education staff conducted workshops. Classroom materials such as map kits, posters, videos, and slide shows supplemented the information found on the Website. On-line educational materials are available at the *Highway to the Tropics* Website: http://www.raptor.cvm.umn, which had over 350,000 hits per month during the spring of 1999.

Project Results Use and Dissemination: The primary method of result dissemination was through our Website, listed above. Presentations at conferences in Minnesota, other parts of the United States and internationally were conducted. Newspaper, magazine and electronic media also covered the project.

Date of Report: July 1, 1999
LCMR Final Work Program Update Report

Project Completion Date: June 30, 1999

LCMR Work Program 1997

I. PROJECT TITLE: ELECTRONIC ENVIRONMENTAL EDUCATION RAPTOR NETWORK

Project Manager:	Mark Martell
Affiliation:	The Raptor Center at the University of Minnesota
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Web Page:	http://www.raptor.cvm.umn.edu/raptor/meeen/meeenhp.html

Total Biennial Project Budget:

$ LCMR:	222,000
-$ LCMR Spent:	222,000
= $LCMR Balance:	0

A. Legal Citation: ML 97, Ch. 216, Sec. 15, Subd. 13(i),

Appropriation Language: This appropriation is from the trust fund to the University of Minnesota raptor center for the second biennium to implement an electronic environmental education network using satellite tracking with birds of prey. The raptor center must seek additional public and private partnerships.

B. Status of Match Requirement: None required. Additional partnerships include: $10,000 from the Meadowood Foundation payable in June 1997, and $10,000 additional payable in June 1998. $20,000 from the Dellwood Foundation payable in June 1997, and an additional $10,000 payable in June 1998. Other fundraising activities and partnerships ongoing.

II. Project Summary and Results: This project will allow students from all parts of Minnesota to participate as satellite monitored radio-tracking equipment follows Minnesota raptors during their migration. Participation in this research, and the discovery of other natural phenomena will be done using the Internet. This experience will be integrated into a total environmental education program which includes classroom materials and activities. The project will coordinate its services and information with teachers and other private and public cooperators.

III. **Progress Summary:**

FINAL

Match – Matching funds were obtained from the following sources:

THE NATURE CONSERVANCY - WINGS	$100,000
MEADOWOOD FOUNDATION	$ 30,000
NATIONWIDE INSURANCE	$ 30,000
MISCELLANEOUS INDIVIDUALS	$ 29,500
BOISE CASCADE	$ 22,500
DELLWOOD FOUNDATION	$ 20,000
INTERNATIONAL FLAVORS AND FRAGRANCES	$ 7,500
MOORE FOUNDATION	$ 7,500
PGE&S CORP.	$ 7,000
DISNEY CONSERVATION FUND	$ 5,000
WETLANDS INSTITUTE	$ 3,500
TOTAL	$262,500

DATA COLLECTION

Ospreys, Bald Eagles, and Swainson's Hawks from Minnesota were tagged and monitored during the study. A total of 17 Minnesota Ospreys were trapped and fitted with radio tracking devices; 9 in 1997, and 8 in 1998 (Table 1). Ospreys were trapped in Cass, Crow Wing, Hennepin, Ramsey, Washington, and Wright counties. Using non-LCMR funds, an additional 35 Ospreys from outside of Minnesota were also tagged (Table 2). During the summer of 1997, we trapped and placed satellite-tracking units on 3 Minnesota Swainson's Hawks from Pipestone and Waseca counties. In the spring and summer of 1998 we placed satellite-tracking units on 3 Bald Eagles. These eagles were injured and had been admitted to The Raptor Center for medical care.

Table 1. Minnesota Ospreys fitted with satellite radio units.

Year	Male	Female	Immature	Total
1998	**2**	**4**	**2**	**8**
1997	**3**	**6**	**0**	**9**
TOTAL	**5**	**10**	**2**	**17**

Table 2. Non-Minnesota Ospreys fitted with satellite radio units.

YEAR	NEW YORK		NEW JERSEY		OREGON		TOTAL
	Male	Female	Male	Female	Male	Female	
1998	2	4	1	2	0	6	15
1997	1	5	1	3	2	8	20
TOTAL	3	9	2	5	2	14	35

Satellite tracked radio-telemetry units, also known as Platform Telemetry Transmitters (PTTs) weighing approximately 30 grams (Microwave Telemetry Inc.) were placed on the back of each bird (Figure 1). To conserve battery power and extend the effective life of the units, each PTT was pre-programmed to turn on for 8 hrs during a varying cycle through the year. Most typical was a cycle that had the PTT turn on for 8 hrs then off for 48 – 72 hrs during the anticipated fall and spring migration and a 8/240 cycle during summer and winter. Bird locations were determined using NOAA satellites and on-board tracking equipment operated by ARGOS Inc. Locations in latitude and longitude degrees, date, time, location error, and other data were received from ARGOS within 24 hours of satellite contact with a bird.

Figure 1. Osprey carrying PTT before release.

Data collection on the Ospreys was severely compromised in 1997 due to widespread failure of the radio units. Six of the 9 units deployed from Minnesota failed before the birds began migration. Fifteen of twenty units deployed in the other states also failed. This failure rate of 72% was due to a faulty chip obtained by the manufacturer. Researchers worldwide were affected by this problem. The manufacturer agreed to replace the faulty units with new ones for deployment in the summer of 1998. Data collection in 1998 was significantly better with six of the eight Minnesota Ospreys, and 13 of the 15 non-Minnesota Ospreys working into the winter.

The Ospreys we tracked from Minnesota wintered across a wide range of Latin America. Minnesota Ospreys were found in Mexico, Nicaragua (2), Venezuela (2), Colombia, Cuba, Peru, Bolivia, and Brazil. The Osprey from other states wintered in Mexico (7), Cuba, Peru, Colombia, El Salvador, Brazil (4), and Venezuela (2).

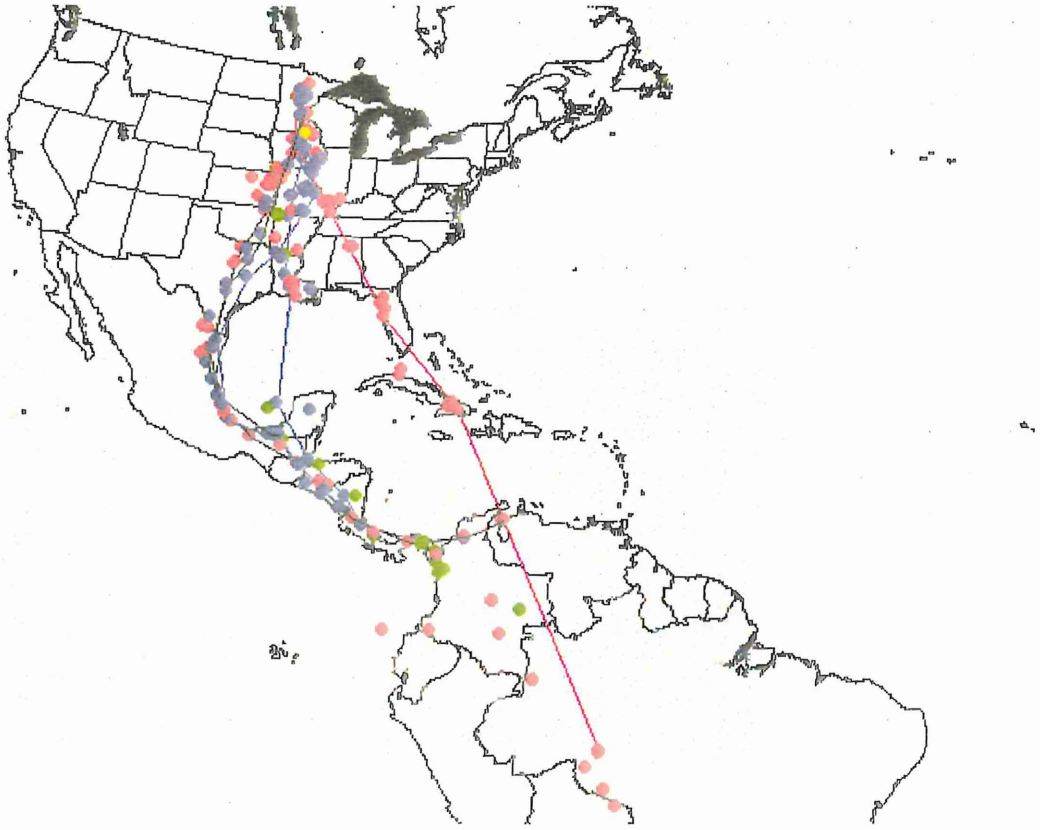

Figure 2. Migration routes of Minnesota Ospreys.

The three Swainson's Hawks migrated south. Two of them wintered in Argentina, while the third did not make it past Bolivia where, we believe, it died. Both of the birds that wintered in Argentina returned to Minnesota in the spring of 1998.

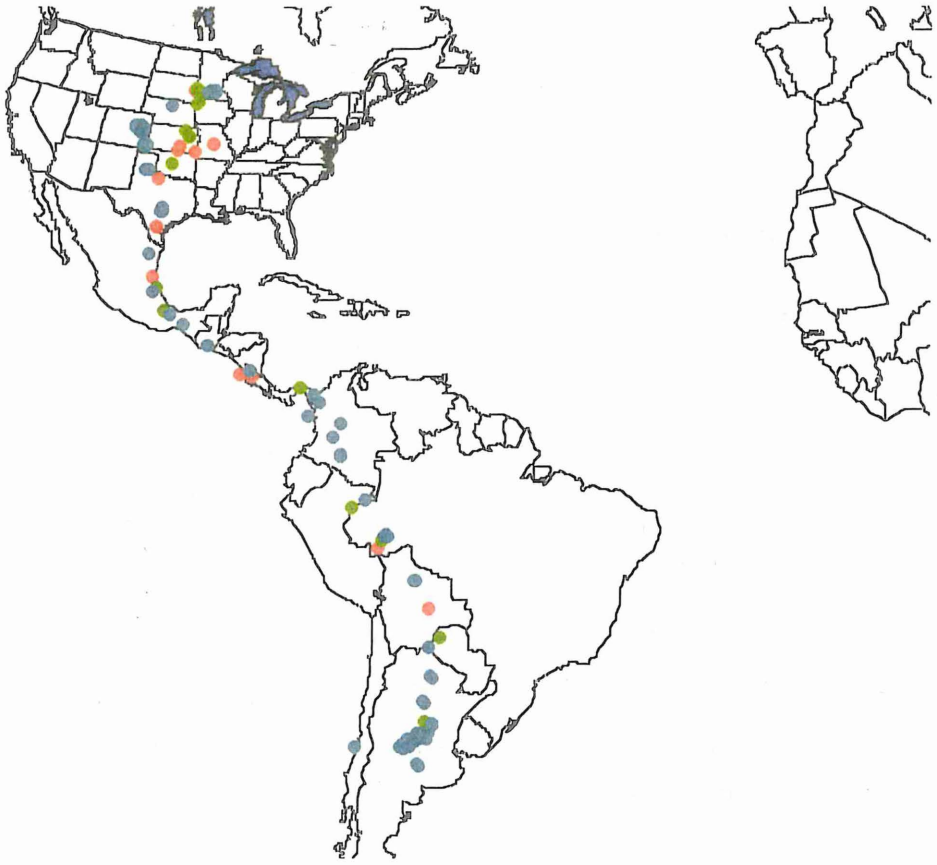

Figure 3. Migration routes of Minnesota Swainson's Hawks.

This part of the project was particularly satisfying. Responding to reports of a massive pesticide caused die-off of Swainson's Hawks on their wintering grounds (over 5,000 dead hawks were found) we worked with researchers from Argentina, Canada, and the United States to determine the migratory paths and wintering areas Swainson's Hawks from across North America. Minnesota is on the eastern edge of the species breeding range and thus a valuable part of the study.

As a result of the information we gathered, combined with field work done in Argentina, the size of the threat was documented and immediate steps were taken to protect these and other birds from this deadly poison.

The two Bald Eagles we tracked remained in the Twin Cities area for a number of weeks after their release. We lost track of one eagle near Cloquet, MN on 7/19/98, while the other eagle apparently spent the summer near Spooner, WI.

EDUCATION

WEB BASED

As an electronic education resource we focused much of our education efforts on the Web. Six areas of the Website were designed to provide educational information, they are:

- Teacher Lesson Plans - The Teacher Lesson Plan category is a compilation of 16 lesson plans for grades 4 - 8. The lesson plans are multi-disciplinary and center on learning about ospreys. The lesson plans may be used in sequential order or individually.

  We hope that the on-line lesson plans will help students understand "the big picture" in regards to the osprey and the world they live. Hopefully, through participation in this project, students will understand the complexities in studying wildlife, especially migratory birds, and the challenges migratory species face in our world community.

" Radical Raptors" - The first lesson; "Radical Raptors," addresses some basic questions such as, "What is a raptor?" and "Why are they different than other birds?"

"It's All Interconnected!" - We look at the relationships between animals and plants on an ecosystem and habitat level.

"Predator/Prey Relationships" - Addresses predator and prey relationships. These lessons will provide students with an understanding of the osprey as a bird of prey and how it fits into ecosystems and habitats in Minnesota and the Southern Hemisphere. This first section also demonstrates the importance of how plants and animals are dependent upon one another to comprise a healthy viable ecosystem.

The second group of lesson plans deals mainly with habitats the osprey uses throughout it's life cycle.

"Lake and Pond Study" - Starting with an examination of breeding habitats in Minnesota, "Pond and Lake Study," lesson #4, will provide students with an in-depth look at characteristics of these two habitats and the plants and animals which live in and around them.

"River Study" - Also provides students with an in-depth look at characteristics of this habitat and the plants and animals which live in and around the river.

"The Rainforest" - Students will look at the osprey's wintering sites in the Southern

Hemisphere, which usually are located in or near rainforests. The rainforest habitat and it's plants and animals will be discussed and examined.

"Wetland Wonders" - Addresses fresh and salt water wetlands, and how the osprey is dependent upon these areas.

" Nest Watch!" - Students will look at ways to construct osprey nesting platforms and monitor artificial and natural nest sites.

After learning about the habitats in a general sense, we explore water quality in the next group of lesson plans.

"Making Your Own Sampling Tools" - Enables students to construct various tools to use on field trips to measure the water quality of lakes, ponds, and rivers in their area which have osprey activity on them. It is hoped that when a class completes these activities they will be shared with others, on Project Pages, in The Raptor Center Web site. This will enable comparisons, conclusions, and further questions about the health of water utilized by ospreys.

" Water Quality Testing for Lakes" - Introduces students to the chemical aspects of water quality in terms of Ph, dissolved oxygen, nitrates, nitrites, salinity, temperature, and other tests.

"Macroinvertebrate Study" - A macro invertebrate study of aquatic habitats where ospreys are found, will be the focus. Macro invertebrate studies will lead students in discussions about the quality of water ospreys utilize, using a biological inventory as an indicator.

"Seining" - Focuses on seining to determine the fish species found in ponds, lakes, and rivers with osprey activity.

"My Favorite Meal" - Students will dissect a perch, a favorite food of ospreys.

"Raptors and Culture" - This will enable students to better understand other cultures around the world and their attitudes towards wildlife, and raptors in particular.

" The Road South" - This migration tracking exercise will enable students to learn about geography, as well as basic mapping terminology.

"The "Write" Stuff" - Focuses on basic computer keyboard techniques, as well as writing skills.

♦ Family Activities – This is a collection of activities for the whole family. These are groups of activities designed for pre k through adults. The activities included are:

- SCRAMBLED OSPREYS
- WORD SEARCH

- OSPREY FUN FACT QUIZ
- AMAZING OSPREY
- CONNECT THE DOTS
- COLOR THE FOOD PYRAMID

- Talk to the Scientist – This area was discontinued in spring of 1999.

- Updates and Resources - This section contains news updates about the project and other resources available to educators. Each new posted news bite contains a date on the first line to assist the user. We encourage schools and other users to post to this section.

- Project Pages – This area was discontinued in spring of 1999.

OFF SITE

To help teachers use the program the education staff conducted workshops. Workshops were done at the following locations.

01/13/98 – Minnesota Science Teacher's Association – Science Museum of Minnesota

01/31/98 – Facilitator's Workshop – Mashomack Preserve, Shelter Island, New York

The two-hour introductory teacher workshops were made available for educators in grades 4 through 12. The goals of the teacher workshops were:

- Learn how to access The Raptor Center Web site on the Internet and find the Highway to the Tropics project area

- Identify ways for students and teachers to assist with scientific studies about birds of prey

- Discover ways for students to communicate with researchers in the Highway to the Tropics project

- Discuss the Internet as a tool for environmental education

CLASSROOM MATERIALS

The vast resources found on the Internet at the Raptor Center's Web site and other locations are supplemented by classroom materials such as:

- *Map migration kits* - To assist teachers in the classroom, map kits were made available from The Raptor Center. These kits allow teachers and students to plot the movements of birds and note the geographic relationships of birds to each other and Minnesota.

- *Posters* – Highway to the Tropics posters, featuring osprey migration on one side, and life histories of birds of prey on the other were distributed. Funded by Target, these full-color posters were distributed nation wide. A new poster called Eagle Track was produced by Boise Cascade, was made available and distributed by the public relations firm of Himle-Hoerner.

- *Videos* – Video footage shot by various news organizations and others were used in presentations.

- *Slide shows* – Put together by staff members for presentations to the general public.

An updated brochure has been produced and is being distributed to potential users of the program.

WEBSITE

On-line educational materials are available at the *Highway to the Tropics* Website: http://www.raptor.cvm.umn.edu/newwebdev/meeen/meeenhp.html

All raptor movement data is posted on the Website on a weekly basis. This information includes a latitude/longitude reading, the date of the reading, and the nearest geographical feature represented by that reading. Other information on that bird is posted as it becomes available.

Between September 1, 1997 and July 31, 1998 we implemented a tool for measuring the use of the educational resources on the Highway to the Tropics Website. A volunteer registration form was added as a gate to pass through enroute to the project area. During that period we registered 706 users in 40 states and 11 countries. Of these, 177 (25%) are from formal education facilities, 140 (20%) are from informal education facilities, and 389 (55%) are from individuals, families, and home school advocates.

By the spring of 1999 the web site was getting over 350,000 hits per month.

PRESENTATIONS AND PUBLICATIONS

In September of 1997, Highway to the Tropics Project Manager, Mark Martell traveled to Israel at the invitation of Tel Aviv University to take part in an international seminar and workshop on avian migration tracking and Internet education. He presented a talk to the group on the LCMR funded *Highway to the Tropics* and co-lead an Internet workshop which included a real-time exploration of the *Highway to the Tropics* Web page. This weeklong seminar was followed up with the publication of "Migrating Birds Know No Boundaries: Scientific and Educational Aspects of Migrating Bird Conservation".

We published a paper in that proceedings entitled;

Highway to the Tropics: Using Satellite Telemetry and the Internet to track Ospreys in the Western Hemisphere, which was co-authored by Mark S. Martell, Michael J. Kennedy, Charles J. Henny, and Peter E. Nye.

Other presentations presented by project staff included:

Mark Martell, Osprey Migration in North America. 1998. Presentation at the Minnesota Ornithologists Hawk Ridge Meeting. Duluth, Minnesota, September 1998.

Michael Kennedy, Highway to the Tropics. Presentation at the Midwest Raptor Management Symposium. St. Paul, MN. March 1998.

Mark Martell, Michael Kennedy, C.J. Henny, and P. Nye. 1998. HIGHWAY TO THE TROPICS: Using Satellite Telemetry and the Internet to track Raptors in the Western Hemisphere. North Dakota and Minnesota Chapters of the Wildlife Society, Joint Winter Conference, Fargo, ND, February 1998

Mark Martell, 1997 Satellite telemetry studies on ospreys and Swainson's hawks. Minnesota Ornithologists' Annual Meeting. December 6, 1997. Minneapolis, Minnesota, December 1997.

Mark Martell, 1997. Highway to the Tropics: Raptor migration from Minnesota to Latin America. Minnesota Wildlife Rehabilitation Conference. Sandstone, Minnesota, November 1997.

COOPERATORS

A wide variety of cooperators and partners were involved in this project. Some played roles in a specific area such as education or research. Others were involved in multiple aspects of the program.

- Anoka County Parks, Wargo Nature Center, Hugo, MN
- Kathleen Clark - New Jersey Endangered and Nongame Species Program
- Deep Portage Conservation Reserve, Hackensack, MN
- Dr. Charles Henny - United States Geological Survey
- Minnesota Office of Environmental Assistance, SEEK (Sharing Environmental Education Knowledge) Program
- Minnesota Department of Natural Resources – Nongame Program
- National Wildlife Federation, Washington, D.C.
- The Nature Conservancy,
  - Mashamack/Shelter Island Chapter, Shelter Island, NY
  - Wings of the Americas
- Mr. Peter Nye – New York Dept. of Environmental Conservation
- Stillwater Area High School, Stillwater, MN
- United States Fish and Wildlife Service, Walnut Creek National Wildlife Refuge, Prairie Center, IA
- Wetlands Institute – Stone Harbor, New Jersey

IV. Outline of Project Results:

Result 1: Place satellite monitored radio-tracking equipment on Minnesota raptors and collect data on their migration and wintering season locations. Ten raptors in the summer of 1997, and ten more in 1998, will be trapped at nest sites in Minnesota. Trappers, who will include the project manager, will be acting under permits issued by the U.S. Fish and Wildlife Service and the Minnesota Department of Natural Resources. A satellite radio-transmitter will be placed on each bird, which will be released immediately after being trapped. Information on each bird will be collected for up to one year, depending on the life of the transmitter battery. This will result in data being collected during all months of the year.

LCMR Budget:	101,357	Balance:	0
Match:	50,000	Match Balance:	0

Completion Date:
August 30, 1997 - 1st year trapping
December 1, 1997 - 1st year fall migration data collection
May 15, 1998 - 1st year spring migration data collection
August 30, 1997 - 2nd year trapping
December 1, 1998 - 2nd year fall migration data collection
May 15, 1998 - 2nd year spring migration data collection

Result 2: On-line materials will be made available via the Internet. Materials which will supplement the teacher lesson plans produced in 1995-1997 will be added. We will produce and distribute classroom materials to compliment on-line lesson plans and research data. Brochures will be developed and distributed to schoolteachers and districts and other interested non-government organizations according to marketing strategies developed at The Raptor Center. Training for educators will be available statewide to ensure the technical skills of teachers is acceptable to retrieve and present the project to students.

LCMR Budget:	83,403	Balance:	47,454
Match:	0	Match Balance:	0

Completion Date:
December 15, 1997 - Planning/development of prototype classroom materials and on-line information. Completion of marketing brochure.
May 30, 1998 - Distribution/testing of prototype classroom materials and on-line information.
September 30, 1998 - Completed revisions of classroom materials. On-line materials available.
May 30, 1999 - Distribution of classroom materials.

Result 3: Place data and information on project Web page. Raptor relocation information will be relayed from the project manager to the Internet manager and placed on the system. Additional information including supplementary data, biological, natural history, and geographic information will be developed by the education specialist and relayed to the Internet manager for placement on the system.

LCMR Budget:	37,240	Balance:	16,328
Match:	0	Match Balance:	0

Completion Date:
December 30, 1997 - 1st year fall migration data and prototype educational materials online.
May 30, 1998 - 1st year spring migration data on-line
September 30, 1997 - Educational materials on-line.
December 30, 1998 - 2nd year fall migration data on-line.
May 30, 1998 - 2nd year spring migration data on-line.

V. Dissemination: In addition to the availability of information on the Internet through the project Web site; data, results, and evaluation of the raptor data, as well as the concept of using the Internet in this fashion will be disseminated through various means. These may include scientific and popular journals, presentations and workshops, and The Raptor Center Newsletter.

VI. Context:

A. Significance: This project will greatly expand the present state of knowledge regarding raptor migration routes and wintering areas. Following up on information gathered in 1995 - 1996, we will be able to confirm and further delineate raptor migration and wintering areas. Determining the wintering area of Minnesota's Swainson's hawks and evaluating the threat that pesticide use poses to the future health and stability of that population will allow specific recommendations to be made regarding that species management. Utilizing satellite and Internet technology will allow students to actively participate in ongoing scientific research. We will be coordinating our activities with appropriate public and private scientific and educational organizations. This will ensure minimal overlap and maximum coordination between projects.

B. Time:

C. Budget Context:

	July 1995 - June 1997	**July 1997 - June 1999**	**July 1999 - June 2001**
	Prior expenditures on this project	**Proposed expenditures on this project**	**Anticipated future expenditures on this project**
1. LCMR	$ 250,000	$ 220,000	$ 195,000
2. Other State	$ 10,000	$	$

3. Non State Cash	$ 38,000	$ 50,000	$ 80,000
Total	$ 298,000	$ 270,000	$ 275,000

1997 LCMR budget breakdown

BUDGET:	
Personnel	$ 159,100
Equipment	$ 27,500
Acquisition	$ 0
Development	$ 0
Other	$
Supplies and Services	$ 17,500
Data Recovery	$ 15,500
Vehicle Rental	$ 2,400
Total	**$ 222,000**

VII. Cooperation: Mr. Andrew Weaver, Stillwater Area High School $5,000 (2.25%)

VIII. Location: Osprey will be taken from various parts of their Minnesota range. Use of the Internet and classroom activities will be available statewide.

XII. Reporting Requirements: Periodic Workprogram progress reports will be submitted not later than January 1, 1997, July 1, 1998, January 1, 1999. A final Workprogram report and associated products will be submitted by June 30, 1999.