1995 Project Abstract
For the Period Ending June 30, 1997
This project was supported by the MN Future Resources Fund: ML95, Chp. 220,Sec. 19, Subd. 6(g).

TITLE: ELECTRONIC ENVIRONMENTAL EDUCATION NETWORK M3-3
PROJECT MANAGER: Mark Martell
ORGANIZATION: The Raptor Center at the University of Minnesota
ADDRESS: 1920 Fitch Avenue, St. Paul, MN 55108
WEB STIE ADDRESS: http://www.raptor.cvm.umn.edu
LEGAL CITATION: ML95, Chp. 220,Sec. 19, Subd. 6(g),
APPROPRIATION AMOUNT: $250,000

Statement of Objectives
A. Data gathering - Place satellite monitored radio-tracking equipment on Minnesota Ospreys and Swainson's Hawks and collect data on their migration and wintering season movements.

B. Materials and workshop development - Produce and distribute brochures, workbooks, and other classroom material. Train teachers to access information on INTERNET.

C. Put data on INTERNET - Ospreys and Swainson's Hawks migration data, as well as other information gathered by project staff, Minnesota naturalists and students will be placed on the INTERNET. A model for Environmental Learning Center participation will be developed.

Overall Project Results Satellite telemetry was used to determine the migratory routes, stopover sites, and wintering areas of 12 Minnesota nesting Ospreys, and 2 Swainson's Hawks between 1995 and 1996. Nine Osprey and three Swainson's Hawks were fitted with radios in the summer of 1997. Our data show that Minnesota Ospreys take 2 distinct migratory routes south, identify 6 countries where wintering areas occurr, and determine that females differed from males in their timing and final winter destination. Minnesota Swainson's Hawks migrated south along the same route, and wintered in the same areas, as other North American Swainson's Hawks. This exposes them to pesticide problems that, in the past, resulted in the deaths of over 5,000 hawks.

A Website connects schoolchildren and the general public to the project, allowing them to participate in research as it happens. The data, migration locations, natural history information, and 16 teacher lesson plans were placed on the Web. Use of this Website increased 700% in 1996 and is being used by over 50 schools. Classroom materials consisting of posters, maps, and printed materials have been distributed to schools around Minnesota and the United States.

Partnerships with Environmental Learning Centers around the state which included Deep Portage Conservation Center, Wargo Nature Center, and Hennepin Parks resulted in a variety of programming and materials production. National partnerships included the USGW-National Biological Service, the NY Dept. of Environmental Conservation, and The Nature Conservancy, resulting in a broader learning experience for schoolchildren statewide.

Project Results Use and Dissemination Project data is available to schools and the general public on the Internet at the Highway to the Tropics Website; *http//www.raptor.cvm.umn.edu.* Twelve teacher workshops and over 20 classroom and public presentations were given during the course of the project. These presentations increased the awareness and skills of teachers and others using these materials. Two editions of the "Satellite Tracker" newsletter was written, published, and distributed. They were sent to cooperators, teachers, and other supporters of EEEN and updated readers on the latest research and educational developments of the project. Six presentations were given to professional organizations by project staff.

The project will continue as a result of monies approved by the Minnesota State Legislature on the recommendation of LCMR. Additional private monies have been and will continue to be raised to support and expand the project nationally and possibly internationally.

Date of Report: July 1, 1997

1995 LCMR Final Work Program Report

I. **Project Title and Project Number:** ELECTRONIC ENVIRONMENTAL EDUCATION NETWORK M3-3

Program Manager: Mark Martell
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A. **Legal Citation:** ML95, Chp. 220,Sec. 19, Subd. 6(g),
Total biennial LCMR appropriation: $250,000
Balance:

Appropriation Language: This appropriation is from the future resources fund to the office of environmental assistance for an agreement with the University of Minnesota Raptor Center to develop a program for student participation in satellite-tracking research, data collection and dissemination using INTERNET, workshops, material development, and off-site classroom experience. This appropriation must be matched by at least $38,000 of non-state money.

B. **Status of Match Requirement:**
Match Required: $38,000
Amount Committed to Date: $ 38,000
Match Spent to Date: $ 38,000

II. **Project Summary:** The Electronic Environmental Education Network (EEEN) will allow students from all parts of Minnesota to participate as satellite monitored radio-tracking equipment follows Minnesota ospreys and Swainson's hawks migrating to and from Central America. 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 workbooks, maps and other classroom materials and activities. A model site will be developed to allow local environmental education centers to use the INTERNET to communicate knowledge and information between schools and centers. EEEN will coordinate its services and information with the Minnesota Environmental Education Advisory Board's LCMR funded SEEK project.

III. Work Program Update Summary: Final Status

Satellite telemetry was used to determine the migratory routes, stopover sites, and wintering areas of Minnesota nesting Ospreys, and Swainson's Hawks. Two Osprey were trapped in 1995, 10 Osprey and 2 Swainson's Hawks were trapped in 1997, and plans were set to trap nine Osprey and three Swainson's Hawks in 1997. This data is available to schools and the general public on the Internet at the Highway to the Tropics Website; *http//www.raptor.cvm.umn.edu.* An additional 6 Ospreys trapped in New York and Oregon with non-LCMR funds were tracked and monitored on the Web page.

Our data show that Minnesota Ospreys take 2 distinct routes south: one going from Minnesota through the central U.S., Mexico, Central America, and into South America. The second route leads through the Southeastern U.S., down the Florida peninsula through Cuba, Haiti, and across the Caribbean to South America. Minnesota Ospreys have been found wintering in Cuba, Bolivia, Peru, Brazil, Colombia, and Nicaragua. Females differed from males in their timing and final winter destination. Of the 12 birds tagged in 1995 and 1996, nine returned from their wintering areas (75%).

A Web site, titled Highway to the Tropics, connects schoolchildren and the general public to the project, allowing them to participate in research as it happens. The data, migration locations, natural history information, and 16 teacher lesson plans, were placed on the Web and are being accessed statewide. Use of this Web site increased 700% in 1996 and is being used by over 50 schools.

Different page layouts for the EEEN homepage were developed and implemented. Changes were made in response to comments and feedback sent by teachers, students, and others. The homepage is now organized around themes allowing the user quick and easy access to information. The Web site is broken down into six areas: Teacher Lesson Plans, Family Activities, Talk to the Scientist, Updates and Resources, Project Pages, and Migration Data.

Classroom materials consisting of posters, maps, and printed materials have been distributed to schools around Minnesota and the United States. Twelve teacher workshops and over 20 classroom and public presentations were given. These presentations increased the awareness and skills of teachers and others using these materials. Two editions of the "Satellite Tracker" newsletter were written, published, and distributed. They were sent to cooperators, teachers, and other supporters of EEEN and updated readers on the latest research and educational developments of the project. This has increased communication between EEEN staff and our partners, private funders, and teachers.

Partnerships with Environmental Learning Centers around the state which included Deep Portage Conservation Center, Wargo Nature Center, and Hennepin Parks resulted in a variety of programming and materials production. Due to the differences in access to technology a single Environmental Learning Center model was not developed. National partnerships resulted in a broader experience for schools while opening doors to private funders (see Appendix I).

Transition to 1997 - Birds still transmitting signals from 1996 along with birds trapped in the summer of 1997 will be monitored. Additional birds will be brought on line in future years. Data will be analyzed each year, as well as for the project as a whole. The inclusion of new species, which may include Peregrine Falcons, Bald Eagles, and Golden Eagles, is being explored for 1997 and beyond. All three of these species would be tracked from Minnesota, as well as nationwide, in cooperation with our partners.

Production of an updated marketing brochure is being planned. Additional marketing opportunities using the Internet, mass media, and school mailings are being evaluated. New classroom materials such as; a raptor slide show featuring identification and natural history of Minnesota raptors is being planned along with production of a new video. Activities and materials that would be appropriate for use in conjunction with tracking new species are being planned.

A new Web page design is being implemented. This will present a cleaner and easier to use format. It will also allow for the inclusion of other species that we plan to track.

Stronger ties with our partners, particularly The Nature Conservancy's WINGS program should result in an increasing number of ELCs being involved in EEEN. As Web technology becomes more common and accepted at schools and nature centers we expect increased participation by these partners in development and use of EEEN's educational products.

IV. Statement of Objectives:

A. Data gathering - Place satellite monitored radio-tracking equipment on Minnesota Ospreys and Swainson's Hawks and collect data on their migration and wintering season movements.

B. Materials and workshop development - Produce and distribute brochures, workbooks, and other classroom material. Train teachers to access information on INTERNET.

C. Put data on INTERNET - Ospreys and Swainson's Hawks migration data, as well as other information gathered by project staff, Minnesota naturalists and students will be placed on the INTERNET. A model for Environmental Learning Center participation will be developed.

Timeline for Completion of Objectives:

	7/95	10/96	1/96	6/96	10/97	1/97	6/97
A. Data Gathering	XXXXXXXXXXXXXX			XXXXXXXXXXXXXXX			
B. Material Dev.		XXXXXXXXXXXXX			XXXXXXXXXXX		
C. Data on INTERNET			XXXXXXXXXXXXX			XXXXXXXXXXX	

V. Objective/Outcome:

A. Title of Objective/Outcome: Data Gathering

A.1 Activity: Place satellite monitored radio-transmitters on Ospreys and Swainson's Hawks.

A.1.a. Context within the project: Radio-transmitters will relay the location of each Osprey back to the project manager and, via INTERNET, to students.

A.1.b. Methods: Six adult Ospreys in the summer of 1995, twelve more in 1996, and four Swainson's Hawks in 1996, 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. The number and origin of the birds will constitute a significant sample size and allow extrapolation of this data to the entire Minnesota Osprey population. The number of Swainson's Hawks included in the study was determined after consultation with biologists working on similar projects in Idaho and Canada. This sample size is reasonable number given the limitations of our knowledge of available nest sites in Minnesota and will provide us with sufficient data to determine the potential threat to the total Minnesota population.

A.1.c. Equipment:

$43,200 - Twenty-six satellite radio-transmitters at a cost of $2,700 each. This equipment will be placed on the birds and is non-recoverable. The equipment purchased with this appropriation will continue to be used for the same program through it's useful life and if use changes the University of Minnesota will pay back the appropriate fund an amount equal to either the cash sale price the University receives from the sale at that time or a residual value to be negotiated with the Director if the University chooses not to sell it.

$ 3,000 - Vehicle rental for 6 months at $500/month.

$ 750 - Nets, traps and miscellaneous equipment for trapping birds and attaching transmitters.

A.1.d. Budget
Total Biennial LCMR Budget: $96,692.75
LCMR Balance:
MATCH
MATCH BALANCE:

A.1.e. Timeline:

	7/95	9/95	1/96	6/96	9/96	1/97	6/97
Product 1 (Placement of Transmitters Yr.1)	XXXXXXX						
Product 2 (Placement of transmitters Yr.2)					XXXXXXXXX		

A.1.f. Workprogram Update: Final Status

A total of 12 Ospreys and 2 Swainson's Hawks were trapped and fitted with satellite monitored radio units (PTTs) in Minnesota during 1995 - 96. And an additional 12 units were purchased for placement on birds in 1997. Two Ospreys in August of 1995, and ten Ospreys and 2 Swainson's Hawks in the summer of 1996 were trapped in Minnesota and fitted with PTTs. The Ospreys were trapped in Carver, Wright, Cass, and Crow Wing Counties. There were 4 nest sites where both the male and female were caught (accounting for 8 of the 10 Ospreys). We re-trapped a male in Carver County in 1996, which was also trapped and monitored in 1995. A new PTT was placed on this bird and a second season of monitoring commenced in August 1996. Both Swainson's Hawks were females trapped near their nest, one near Pipestone, and the other near Woodstock. Fitted with PTTs, monitoring of these birds commenced in August 1996.

An additional 3 Ospreys from the Columbia River in Oregon, and 3 from Long Island, New York were trapped and fitted in summer 1996, using funds obtained from private sources.

Ospreys trapped in 1995 - 96

	MALE	FEMALE	PAIRS	RETRAP
Minnesota	6	6	4	1
Oregon	2	1	1	-
New York	1	2	0	-
Totals	9	9	5	1

A total of six transmitters were ordered from the manufacturer in the summer of 1995, however due to a delay in delivery we did not receive them until late August which did not allow sufficient time to trap the six Ospreys we had hoped for, before migration. Four transmitters were purchased for use on Swainson's Hawks in 1996. The money for these additional transmitters came from a reduction in the cost of transmitters from $3,000 to $2,700 apiece, and from savings realized in objectives B2 and C1. New transmitters, nets, and equipment were purchased in the summer of 1996.

The justification for adding Swainson's Hawks to the original objective was information received in February 1996 that 4,100 Swainson's Hawks were found dead in Argentina, apparently as the result of pesticide poisoning. Swainson's Hawks which had been fitted with satellite telemetry in California, Idaho, and Alberta, Canada were among the dead birds. The potential for this high level of mortality to seriously impact the North American breeding population is very great. In Minnesota, there is a breeding population of Swainson's Hawks of unknown size, but probably relatively small. If Minnesota breeding birds were being impacted by this mortality it would have a very serious impact on the future of this species in the state. By radio tracking a sample of birds, and working with researchers from other parts of North America, we might be able to determine if Minnesota Swainson's Hawks are endangered by this pesticide threat on their wintering grounds.

Swainson's Hawk research is being conducted in cooperation with the Minnesota Department of Natural Resources Nongame Program, the Minnesota Ornithologists Union, Boise State University, and the Raptor Information Center of the National Biological Survey.

Meetings were held with Dr. Cesar Marquez to plan additional research on Osprey migration in Colombia, using non-LCMR funds. A meeting was also held with Mr. Felix Wilson to arrange research contacts in Cuba.

Transition to 1997 Project - The inclusion of new species, which may include Peregrine Falcons, Bald Eagles, and Golden Eagles, is being explored for 1997 and beyond. All three of these species would be tracked from Minnesota, as well as nationwide, in cooperation with our partners.

In preparation for the 1997 field season, three summer field employees were hired to assist in trapping and monitoring of Ospreys and Swainson's Hawks. Transmitters and trapping equipment were ordered for 10 Ospreys and 4 Swainson's Hawks in Minnesota. Ten additional Ospreys in New York and 10 in Oregon will also be trapped, using funds from private sources.

A.2 Activity: Monitoring/Data collection

A.2.a. Context within the project: This step involves receiving information from the radio-transmitters placed on the birds and determining the location of each individual bird.

A.2.b. Methods: The radio signal from each transmitter is received by an earth-orbiting satellite, which transmits the information to an earth receiving station operated by ARGOS. The information will be relayed to a personal computer maintained by the project manager. The information is then analyzed and plotted and the migration routes and wintering sites are determined.

A.2.c. Equipment:

$2,000 - Personal Computer with modem for receiving and analyzing data. This equipment will be used to continue the network after the end of the grant period. The equipment purchased with this appropriation will continue to be used for the same program through it's useful life and if use changes the University of Minnesota will pay back the appropriate fund an amount equal to either the cash sale price the University receives from the sale at that time or a residual value to be negotiated with the Director if the University chooses not to sell it.

A.2.d. Budget
Total Biennial LCMR Budget: $20,046.28
LCMR Balance:
MATCH
MATCH BALANCE:

A.2.e. Timeline:

	7/95	10/95	3/96	6/96	9/96	3/96	6/97
Product 1							
Monitor 1995 Osprey	XXXX	XXXXXX	XXXXX	XXXX	XXXXX	XXXXX	
Product 2							
Monitor 1996 Osprey				XXXXXX	XXXXX	XXXXXX	

A.2.f. Workprogram Update - Final Status

Of the 12 Minnesota Ospreys tagged in 1995-96, we were able to collect fall, winter, and spring movement data on 5, fall and winter data on another 5, and just fall movement data on 2. Minnesota Osprey took 2 distinct routes south: 1) through the central U.S., then along the east coast of Mexico through Central America and into South America, or, 2) through the Southeastern U.S., down the Florida peninsula then over Cuba, Haiti, and across the Caribbean to South America. This differed from both the East and West Coast birds we monitored. The West coast birds flew south through California to Mexico, while the East coast birds took one route south to Florida, through Cuba, and across the Caribbean to South America.

Nesting pairs of Ospreys did not migrate or winter together and in some cases, took separate routes south. Females always left the breeding area before the males. In general females started migration in mid to late August, and arrived on their wintering areas before the males, which began migration around mid-September. Females also tended to winter further south and spend more time in transit than males. Maps detailing the routes and wintering areas are presented in Appendix II.

Osprey wintering sites occurred across a broad area of the New World tropics. Minnesota Ospreys were located in Cuba, Bolivia (2), Peru (2), Brazil, Colombia, and Nicaragua. One bird tracked for 2 consecutive years used the same wintering area in both years, although it apparently took a different route each year. Osprey spring migration began in late February. Individual birds took the same routes back in spring as they used in fall. Nine of the 12 birds returned to Minnesota in spring and we were able to confirm nesting by 6 of them.

In fall of 1996, a part time data analyst was hired to assist in organizing and analyzing the data. An Undergraduate Research Opportunity Grant (UROP) was secured by a Univ. of Minnesota student, Charles Mote-Brown, which allowed him to do special data analysis on the migration data.

Two Swainson's Hawks were tracked south in cooperation with researchers in the United States, Canada, and Argentina. One Minnesota bird's signals stopped in Bolivia and we had no further contact with that individual. The other Minnesota bird was tracked to Argentina, where it wintered along with other North American Swainson's Hawks. This bird was tracked back to her Pipestone County nesting area, where she nested in 1997.

Transition to 1997 Project - Birds still transmitting from 1996 along with birds trapped in the summer of 1997 will be monitored. Data will be analyzed by year as well as for the project as a whole.

B. Title of Objective/Outcome: Materials and workshop development

B.1 Activity: Marketing of Program, communications and brochure development and distribution.

B.1.a. Context within the project: Marketing strategies, including brochures intended to inform teachers and school districts about the program, explaining its features, and how to access it will be developed and appropriate information will be distributed.

B.1.b. Methods: Marketing strategies will be developed and implemented. Brochures will be designed, produced and printed for distribution to educators and school districts.

B.1.c. Equipment:

B.1.d. Budget
Total Biennial LCMR Budget: $19,851.20
LCMR Balance:
MATCH
MATCH BALANCE:

B.1.e. Timeline:

	7/95	10/95	1/96	6/96	10/96	1/97	6/97
Product 1 Marketing Strategy Development	XXXXXXXXX						
Product 2 1995 Brochure Production			XXX				
Product 3 Distribute 1995 brochure				XXXXXXXXXXX			
Product 4 Re-evaluation of Marketing Strategy				XXXXXXX			
Product 4 1996 Brochure Production					XXXXXXXX		
Product 5 Distribute 1996 brochure						XXXXXXXXXXXXX	

B.1.f. Workprogram Update: Final Status

Our marketing strategy was developed primarily to reach teachers and school districts. As we realized the extent of public interest in the project our marketing expanded to target a wider audience. An advisory board consisting of teachers, environmental education specialists, and naturalists was formed to evaluate the strategy.

A high priority was placed on the development of partnerships with SEEK, Hennepin Parks, Wargo Nature Center, Wetlands Institute of New Jersey, and the WINGS program of The Nature Conservancy.

A brochure was produced and distributed to school districts statewide.

We developed and constructed a portable, tabletop display to market EEEN at workshops, conventions and other large scale gatherings. A second tabletop exhibit was created for use in PETsMART stores in the Twin Cities.

An article was written for MN Extension Service newsletter, which allowed marketing to be extended through Extension Service.

A newsletter, *"The Satellite Tracker"* was developed, written, printed and distributed in fall 1996, and spring 1997. This publication was sent to cooperators, teachers, and other supporters of EEEN. It updated its readers on the latest research and educational developments of the project, and encouraged further use of EEEN.

Surveys were sent out to teachers who have attended workshops requesting feedback on the use of EEEN in the classroom.

The project, particularly workshops, was marketed at schools statewide and through meetings with:

- Univ. of MN - Duluth Continuing Ed. Department,
- Red Wing school district,
- Cannon Falls Rotary Club,
- Duluth Audubon Society,
- Midwest Raptor Symposium,
- Lake Superior Center,
- Hennepin Parks,
- State Board of Soils and Water at Wargo Nature Center,
- National Computer Education Conference in Minneapolis, and
- The North American College Teachers Association.

Presentations promoting MEEEN were given to:

- U of MN Extension educators - Winter 1995 - 96
- Raptor Center Day Camp - July 16, 1996
- Edina Rotary Club - August 8, 1996
- River Bend Nature Center - August 9, 1996
- Midwest Environmental Education Conference, Cedar Falls, IA - August 1996
- Nicolet Island Community Association - September 10, 1996
- Hyland Park Reserve (Bloomington) - September 21, 1996
- Minn. Board of Environmental Education - September 26, 1996
- Lake Elmo School Geography Night - November 21, 1996
- Roseville Nature Center - December 7, 1996
- Roseville Nature Center - April 1997
- OEA conference in Duluth - May 17-18, 1997

Transition to 1997 Project - Production of an updated brochure is being planned. Additional marketing opportunities using the Internet, mass media, and school mailings are being evaluated.

B.2 Activity: Classroom Activities Development.

B.2.a. Context within the project: Printed material, including workbooks and maps will be made available to classrooms for use with information on the INTERNET

B.2.b. Methods: Design, develop, and implement materials for classroom use to compliment the on-line lesson plans and research data. Map kits, lesson plans, Questions and Answers with the Scientists will be developed. Materials will be reviewed, and additional suggestions developed by an Educational Advisory Committee.

B.2.c. Equipment:

B.2.d. Budget
Total Biennial LCMR Budget: $1,934.42
LCMR Balance:
MATCH
MATCH BALANCE:

B.2.e. Timeline:

	7/95	10/95	1/96	6/96	10/96	1/97	6/97
Product 1 Map Kits		XXXXXXXXX					
Product 2 Advisory Board		XXXXXXXXXX					
Product 3 Classroom Activities Development			XXXXXXXX				
Product 4 Classroom Activities Production				XXXXXX		XXXXXXX	
Product 5 Classroom Activities Distribution				XXXX		XXXXXXXXXX	
Product 6 Classroom Activities Evaluation			XXXXXXXX			XXXXXXXXXX	

B.2.f. Workprogram Update: Final Status

Classroom activities including map kits, lesson plans and videos were developed by the project's education specialist, and the education advisory board with advice and assistance from teachers and other environmental educators. A teacher evaluation form, allowing educators to give feedback on our products resulted in changes and improvements.

A reduction in the budget from the original estimate of $23,000 to $19,200 was made to partially cover the cost of purchasing additional transmitters (see A.1). This reduction is the result of savings in this activity and will not reduce the objectives or products. The savings are a result of not paying a former cooperator, CGEE at Hamline University (see January 1996 work program update) for staff time.

The following materials were produced for use in the classroom to go along with on-line data and materials:

- A map kit was designed, developed and sold to schools.
- Videos of summer fieldwork were produced and made available.
- Development and production of a classroom outreach kit was done in cooperation with Wargo Nature Center.
- A poster featuring Highway to the Tropics on one side, and Minnesota raptors was produced and donated by Target Corp. These posters are being distributed nationwide.

On-line materials included sixteen Teacher Lesson Plans that were created and made available on our Web page. They were designed 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.

1. *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?"

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

3. *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 its life cycle.

4. *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.

5. *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.

6. *The Rainforest* - Students 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.

7. *Wetland Wonders* - Addresses fresh and salt water wetlands, and how the Osprey is dependent upon these areas.

8. *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, water quality is explored in the next group of lesson plans. Water is very important to Ospreys. Without clean water to provide a healthy fish stock for food, Ospreys would not be able to successfully breed.

9. *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. 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.

10. *Lesson #10* - Introduces students to the chemical aspects of water quality such as: pH, dissolved oxygen, nitrates, nitrites, salinity, temperature, and other tests.

11. *Macroinvertebrate Study* - Macro invertebrate studies will lead students in discussions about the quality of water Ospreys utilize, using a biological inventory as an indicator.

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

13. *My Favorite Meal* - Students will dissect a perch, a favorite food of Ospreys.

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

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

16. *Osprey Key Pals* - Focuses on basic computer keyboard techniques, as well as writing skills.

The on-line lesson plans will help students understand "the big picture" in regards to the Osprey and the world they live. 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.

In addition to the teacher lesson plans, family activities have been developed for use by parents and children at home, and include:

- SCRAMBLED OSPREYS
- WORD SEARCH
- OSPREY FUN FACT QUIZ
- AMAZING OSPREY
- CONNECT THE DOTS
- COLOR THE FOOD PYRAMID

The following presentations in and outside of the classroom were used to bring MEEEN directly to schoolchildren and facilitate the use of the on-line materials.

- Jan 21 & 25, 1997 - Wargo Nature center.
- Feb 10, 1997 - Harriet Alexander Nature center.
- March 1, 1997 - University presentation at UW-Stevens Point.
- March 26, 1997 - Farmington Middle School
- April 19, 1997 - Harriet Alexander Nature Center.
- May 7, 1997 - Warner Nature Center.
- May 14, 1997 - Biotechnology for accelerated students U of MN.
- June 4, 1997 - Coon Rapids Middle School
- June 14, 1997 - St. Francis Pioneer days,
- June 23 - 25, 1997 - Day camp for grade schoolers.
- June 28, 1997 - Minnetonka Power squadron - Osprey nest construction.

Transition to 1997 Project - A raptor slide show, featuring identification and natural history of Minnesota raptors is being planned along with production of a new video. Activities and materials that would be appropriate for use in conjunction with tracking new species are being planned.

B.3 Activity: Teacher training

B.3.a. Context within the project: Training will be provided for teachers from across Minnesota to provide them with the technical knowledge they need to access our information on the INTERNET, as well as the background to interpret and present it to their students.

B.3.b. Methods: A series of training workshops will be held around the state. The number and location will be coordinated with the state's environmental education office. Telephone support will be available to provide information and answer questions that teachers may have regarding accessing INTERNET.

B.3.c. Equipment:

B.3.d. Budget
Total Biennial LCMR Budget: $24,471.64
LCMR Balance:
MATCH $5,000
Match funds will be divided between the two products listed below as follows:
Product 1 - $2,500 (50%)
Product 3 - $2,500 (50%)

MATCH BALANCE: $0

B.3.e. Timeline:

	7/95	10/95	1/96	6/96	10/96	1/97	6/97
Product 1 1995 Workshops		XXXXXXXXXXXXX					
Product 2 Telephone Assistance Available		XXXXXX	XXXXXXXXXX		XXXXXXXX	XXXXXXXXX	
Product 3 1996 Workshops					XXXXXXXXX		

B.3.f. Workprogram Update: Final Status

Telephone assistance for teachers and other users of the project has been available since August 1995.

A $10,000 grant from the Minnesota Extension Service was secured and used for the development and implementation of teacher workshops statewide. Volunteers were trained to conduct EEEN workshops on August 13, 1996.

Teacher workshops were given in:

- Gonvick, Clearwater Co. - January, 1996
- Fairmont, Martin Co. - March, 1996
- Faribault, Rice Co. - April, 1996
- Rochester, Olmstead Co. - April, 1996
- St. Louis Park, Hennepin Co - May, 1996
- Fairmont, Martin Co. - June, 1996
- Hamline University - July 19, 1996
- Science Museum of Minnesota - July 31, 1996
- Mankato - September 14, 1996
- Otter Lake Elementary School - December 17, 1996
- Science Museum of Minnesota - Jan 11, 1997
- Arden Hills - April 21, 1997
- Roseville - April 29, 1997

Workshops that were scheduled but canceled due to weather:

Crookston, Polk Co. - March, 1996
Coon Rapids, Anoka Co. - March, 1996

Transition to 1997 Project - Additional workshops around the state are being planned. The use of facilitators to conduct teacher workshops is being planned. The first of these facilitator workshops is being arranged in cooperation with Hennepin Parks.

C. Title of Objective/Outcome: Put data on INTERNET

C.1 Activity: Put Osprey data on INTERNET

C.1.a. Context within the project: Providing students the opportunity to engage in real-time data analysis makes the availability of Osprey and Swainson's Hawk location information the heart of the project. Providing this data, along with associated information to give it context, will allow students to participate in the field research.

C.1.b. Methods: Osprey and Swainson's Hawk 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.

C.1.c. Equipment:

$3,500 - Computer, software, associated hardware to access INTERNET. This equipment will be used to continue the network after the end of the grant period. The equipment purchased with this appropriation will continue to be used for the same program through it's useful life and if use changes the University of Minnesota will pay back the appropriate fund an amount equal to either the cash sale price the University receives from the sale at that time or a residual value to be negotiated with the director if the University chooses not to sell it.

C.1.d. Budget
Total Biennial LCMR Budget: $45,207.73
LCMR Balance:
MATCH: $8,000
Match funds will be divided between the two products listed below as follows:
Product 1 - $4,000 (50%)
Product 2 - $4,000 (50%)

MATCH BALANCE:

C.1.e. Timeline:

	7/95	10/95	1/96	6/96	10/96	1/97	6/97
Product 1 Put 1995 data on the INTERNET			XXXXXX	XXXXXXX			
Product 2 Put 1996 data on the INTERNET					XXXXXX	XXXXXX	

C.1.f. Workprogram Update: Final Status

A private donation of $2,000 was received in fall of 1995 and applied against the matching funds for purchase of a computer. The budget for activity C1 was reduced by $4,000 in the first year to help pay for the cost of additional transmitters. The reduction comes from savings realized in charges for obtaining relocation data from ARGOS, and the 1-800 teacher information phone line. There was no reduction in the objectives or products for this activity.

Osprey and Swainsnon's Hawk data was collected and put on the INTERNET at the Raptor Center's Web site:
(http://www.raptor.cvm.umn.edu)
beginning in August, 1995. Updates of the migratory data have occurred at least weekly. Beginning in November, 1995, lesson plans were placed on the Web site along with background information relating to Ospreys, satellites, and avian migration

In the fall of 1996, a temporary employee was hired to fill in while the Internet manager was on maternity leave. Also during fall 1996, a student at the University of Minnesota was recruited to develop electronic educational materials on the INTERNET. This section became the final WEB page layout of *Swainson's Hawks: Prairie Partners* and was completed in November 1996. In the spring of 1997, a new page layout for the EEEN homepage was developed and implemented. This was done in response to comments and feedback received from users. The new homepage is better organized around our themes and allows the user quicker and easier accesses to information. The Web site area is broken down into six categories: Teacher Lesson Plans, Family Activities, Talk to the Scientist, Updates and Resources, Project Pages, and Migration Data.

Use of the EEEN Web site has increased by almost 700% in 1996. Over 50 educational institutions are utilizing these materials. We have received feedback from a large number of parents and students who are making use of Highway to the Tropics from home.

Transition to 1997 Project - A new Web page design is being implemented. This will give a cleaner, easier to use format and allow for planned future inclusion of other species to be tracked.

C.2 Activity: Put Environmental Education Center online

C.2.a. Context within the project: A model will be developed to allow local environmental learning centers to use INTERNET to communicate knowledge and information between schools and centers.

C.2.b. Methods: An environmental learning center (ELC) specialist located at Deep Portage Environmental Center, will collect data on local Osprey and other Minnesota natural history phenomena. This data will be put on the INTERNET. Interactive activities will be developed to link the INTERNET with on-site use of environmental learning centers. Activities will be specifically designed to serve as models for other environmental learning sites. A plan will be written which will be made available to other ELCs outlining this model and its implementation.

C.2.c. Equipment:

$2,000 - Computer, modem and software for use at Deep Portage Environmental Center. This equipment will be used to continue the network after the end of the grant period. The equipment purchased with this appropriation will continue to be used for the same program through it's useful life and if use changes the University of Minnesota will pay back the appropriate fund an amount equal to either the cash sale price the University receives from the sale at that time or a residual value to be negotiated with the Director if the University chooses not to sell it.

C.2.d. Budget
Total Biennial LCMR Budget: $41,795.98
LCMR Balance: $ 20,813.50
MATCH: $25,000

Match funds will be divided between the three products listed below as follows:

Product 1 - 10,000 (40%)
Product 2 - 10,000 (40%)
Product 3 - 5,000 (20%)

MATCH BALANCE:

C.2.e. Timeline:

	7/95	10/95	1/96	6/96	10/96	1/97	6/97
Product 1 Local Data Collection	XXXXXXX			XXXX	XXXXX		XXX
Product 2 ELC On-line		XXXXX	XXXXXXXXX		XXXXXX	XXXXXXX	
Product 3 Written Report						XXXX	

C.2.f. Workprogram Update: Final Status

Deep Portage Conservation Reserve and The Raptor Center devised student data collection procedures and protocols. Preliminary models were tested with students in Spring 1996 when the project was introduced to schools in northcentral Minnesota. During the 1996-97 school year students collected data at Deep Portage during regularly scheduled school visits.

Teacher workshops were held at Deep Portage on October 25 - 27 and December 4 - 6, 1996.

As ideas and procedures were developed at Deep Portage they were tried at other Environmental Learning Centers including Wargo in Hugo, and Hennepin Parks. It quickly became clear that one model was not sufficient to account for the differences in technology available at individual ELCs and schools. Thus, the integration of EEEN occurred at different speeds and in different areas. This resulted an increase in the number of cooperating ELCs, without relying on one model.

Transition to 1997 - An increasing number of ELCs will be involved in EEEN. As Web technology becomes more common and accepted at schools and nature centers we expect increased participation A. by these partners in development and use of EEEN's educational products.

VI. Evaluation: Objective will be evaluated on the scientific results of the research. The value of these results will be judged through peer review of publications and presentations. Objectives B. and C. will be evaluated on the basis of the number of students accessing the information on the INTERNET and using the materials.

VII. Context within field: Objective A. will greatly expand the present state of knowledge regarding Osprey migration routes and wintering areas. It will also allow us to determine the wintering area of Minnesota's Swainson's hawks and evaluate the threat that pesticide use poses to the future health and stability of that population. Objectives B. and C. by utilizing new technology will allow students to actively participate in ongoing scientific research. We will be coordinating our activities with Pam Landers and Denise Stromme from the Environmental Education Office. This will insure minimal overlap and maximum coordination between projects.

VIII. Budget Context: The Raptor Center has spent between $10,00 - $15,00 per year since 1990 releasing Osprey into the Twin Cities area. In January the project manager will begin work on Osprey in Costa Rica at a cost of $2,500 to TRC.

IX. Dissemination: In addition to the availability of information on the INTERNET; data, results, and evaluation of the Osprey 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.

X. Time: Use of the INTERNET as a means of involving students in research and environmental education has almost unlimited possibilities. We expect to be able to find additional funding to continue this effort after June 1997.

XI. Cooperation:

Deep Portage Conservation Reserve. Mike Naylon, Director. The site for the Environmental Learning Center model.

XII. Reporting Requirements: Semiannual six-month workprogram update reports will be submitted not later than January 1, 1996, July 1, 1996, January 1, 1997, and a final six-month workprogram update and final report by June 30, 1997.

XIII. REQUIRED ATTACHMENT:

1. Qualifications: See May 12, 1995 workprogram.

2. Project Staffing Summary: See May 12, 1995 workprogram.

APPENDIX I.

PROJECT PARTNERS

Dr. Charles Henny - USGS, Biological Services Division
Peter Nye - New York Department of Environmental Protection
Shelter Island and Long Island Chapters, The Nature Conservancy
SEEK Pilot Partner
Bruce Munson, University of Minnesota-Duluth
Wargo Nature Center, Hugo, Minnesota
Minnesota Department of Natural Resources Nongame Program
WSPA-Raptor Center, Bogota, Colombia
Wetlands Institute of New Jersey
Hennepin Parks

PRIVATE FUNDERS

Doug and Shirley Dayton
Wallace Dayton
Dellwood Foundation
Larsen Foundation
Special Projects Foundation of the Big Game Club
University of Minnesota Extension Service
Jim Bracke
Hon. Elmer Anderson
Pepper and Andrew Fuller
Norm and Linda Harris
Paul Helvig
John Kavanewsky
Mr. and Mrs. Robert Siversten
Joanne and Phillip VonBlon

Appendix II.

Fall migration routes and wintering areas of Minnesota Osprey.

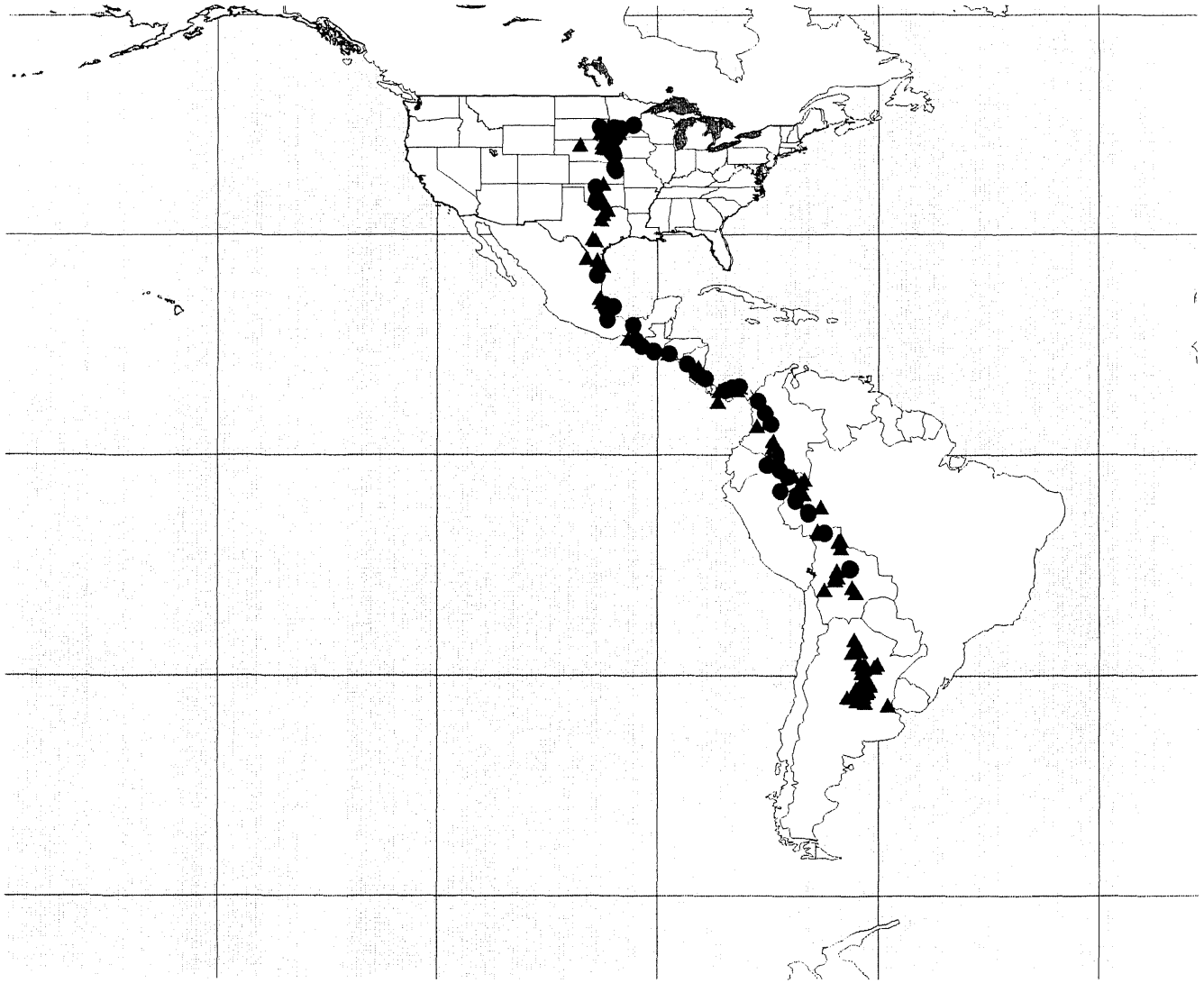
BIRD	NEST LOCATION	DEPARTURE DATE	ROUTE	CURRENT LOCATION
X0(f)	Crow Wing Co., MN (Whitehawk)	8/24 - 9/4	Georgia- Fla.- Cuba-Colombia-Brazil-Bolivia	Bolivia
AA(f)	Cass Co., MN	8/12 - 8/20	Wis.-Alabama-Fla.-Cuba	Cuba
AB(m)	Cass Co., MN	9/21 - 9/22	IA-MO-MIS-TX-Mex.-Nicaragua-Costa Rica-Panama-Colombia	Peru
YO(f)	Crow Wing, MN	8/22 - 9/2	KS-TX-Cen.Am.-Colombia	Peru
Y9(m)	Crow Wing, MN	9/15 - 10/5	MO-Mexico	Panama
39(f)	Lake Maria, MN	8/2 - 9/23	unk.	Brazil
02(m)	Lake Maria, MN	9/29 - 10/9	Alabama, Cuba, Colombia	Brazil
P4(f)	Steiger Lake, MN	8/27 - 9/6	IA-MO-TX-Mex.	Panama
P3(m)	Steiger Lake, MN	9/5 - 9/15	IL-TN- Nicaragua	Colombia
AK(m)	Cass Co., MN	9/2 -10/3	unk	Nicaragua

Overleaf 1. Map of Osprey migration

Overleaf 2. Map of Swainson's hawk migration.

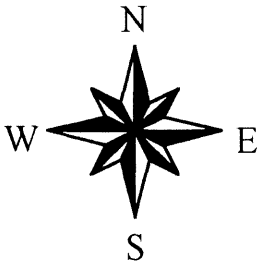
Figure 1. Fall osprey migration routes 1995 - 96

Figure 2. 1996 Migration of Minnesota Swainson's Hawks



▲ Swainson's Hawk 229

● Swainson's Hawk 228



APPENDIX III.

Professional presentations given.

Mark Martell - *Satellite Telemetry Studies on Minnesota Raptors* - Presentation for the Minnesota Ornithologists Union, Annual Meeting, Minneapolis, MN, December 1995.

Mark Martell and Bill Lane - *The Movements of Two Osprey Nesting in Minnesota (USA), as Determined by Satellite Telemetry*. The Raptor Research Foundation 2nd International Meeting. Urbino, Italy

Michael Kennedy and Mark Martell - *Highway to the Tropics* - National Association of Interpretation, Annual National Workshop, Billings, Montana, October 1996

Michael Kennedy - *Round-table discussion on electronic environmental education*, National Association of Interpretation, Annual National Workshop, Billings, Montana, October 1996

Mark Martell - *Satellite Telemetry Studies on Minnesota Raptors* - Minnesota Ornithologists Union, Annual Meeting, Minneapolis, MN, December 1996

Mark Martell - *Migration of Minnesota Osprey and Swainson's Hawks* - Midwest Raptors Conference, Milwaukee, WI, March 1997.