1998 Research Project Abstract

For the period ending December 31, 1999
This project was supported by the Minnesota Environment and Natural Resources Trust Fund

Title:	**Minnesota's Forest Bird Diversity Initiative Continuation**
Program Manager:	Lee A. Pfannmuller
Organization:	Minnesota Department of Natural Resources
Address:	Box 25, 500 Lafayette Road, St. Paul, Minnesota 55155
Web Site Address:	http://www.nrri.umn.edu/mnbirds/default.htm
Legal Citation:	M.L. 1997, Chpt. 216, Sec. 15, Subd. 14(b)
Approp. Amount:	$350,000

STATEMENT OF OBJECTIVES

Designed as a long-term initiative that began in FY92-93, the project's primary goal is to develop landscape management tools to maintain Minnesota's rich diversity of forest birds. Major objectives in the FY98-99 biennium were to: analyze forest bird population trends; identify factors that affect reproductive success; refine and verify the ability of the LANDIS model to predict forest bird distribution and abundance; and develop educational materials and management prescriptions.

OVERALL PROJECT RESULTS

During the FY98-99 biennium project staff completed the eighth and ninth years of monitoring forest bird populations in the Chippewa National Forest and Superior National Forest, the seventh and eighth years in the St. Croix Valley study region and the fourth and fifth years in southeastern Minnesota. Statistical analysis to detect statistically significant trends in population abundance show that most breeding bird populations in northern and east-central Minnesota have been relatively stable and slightly more species (ten) have shown a decreasing trend compared with those that are increasing (eight species). Results for the southeast region show that three species may be experiencing long-term population declines, while only two species have increased. The majority of species in all regions show considerable year-to-year variation in abundance levels. A study to assess the effect of forest fragmentation on nest predation rates produced equivocal results, but documented a diverse set of nest predators. A review of all major nesting studies recently conducted in Minnesota revealed that the nesting success of forest birds in Minnesota is highly variable, but success is likely not as high as expected in highly forested environments. Significant progress continued on the development of many components of the forest landscape planning tool. Parameterization of the forest simulation model, LANDIS, was completed for our Pine County study area. Future forest conditions were simulated for 300 years and preliminary second-tier bird-habitat models were used to predict future avian community composition. Progress was made on software components of the forest planning tool that are necessary to make this a useful addition to a land manager's planning process.

PROJECT RESULTS USE AND DISSEMINATION

A major expansion of the project's web site (http://www.nrri.umn.edu/mnbirds) now provides public access to the data and information collected as part of the initiative. Project staff disseminated forest management recommendations through the publication of a forest stewardship booklet, "Planning for the Birds: Things to Consider When Managing Your Forest" by Carol Pearson. A total of 15,500 copies were published for distribution throughout the state. A series of six workshops on birds and forests were completed that reached over 400 natural resource professionals between June and October 1997 and project staff helped deliver five workshops on the state's new forest management guidelines given by the Minnesota Logger Education Program. A total of 12 presentations on forest bird management and conservation, highlighting the results of this project, have been delivered to local, regional and national audiences this biennium. Eight papers have been published, four in peer-reviewed publications. One new masters of science graduate project was completed this biennium and two are nearing completion

August 30, 2000
LCMR Final Work Program Update Report

Project Completion Date: December 31, 1999
LCMR Work Program 1997

I. PROJECT TITLE: MINNESOTA'S FOREST BIRD DIVERSITY INITIATIVE: CONTINUATION

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Total Biennial Project Budget:

LCMR:	$350,000
-LCMR Amount Spent:	$350,000
=LCMR Balance:	$ 0

A. Legal Citation: ML 1997, Chap. 216, Sec. 15, Subd. 14(b).

MINNESOTA'S FOREST BIRD DIVERSITY INITIATIVE: CONTINUATION $350,000.

Appropriation Language: This appropriation is from the trust fund to the commissioner of natural resources for the fourth biennium of a six biennium project for a comprehensive monitoring and research program that develops management tools to maintain forest bird diversity. This appropriation is available until June 30, 2000, at which time the project must be completed and final products delivered, unless an earlier date is specified in the work program.

B. Status of Match Requirement: Not Applicable

II. PROJECT SUMMARY AND RESULTS

The goal of Minnesota's Forest Bird Diversity Initiative is to develop landscape management tools to maintain Minnesota's rich diversity of forest birds. The first six years of funding (1991-1996) have allowed us to: 1) establish a powerful monitoring system to begin detecting changes in forest bird populations and to assess the potential causes for the changes observed; 2) develop more detailed methods including a

combination of field sites, field experiments, and technology (e.g., geographic information systems (GIS), remote sensing, and models) to better predict how forest bird populations may respond to changes in forest vegetation; and 3) transfer the information gathered to natural resource managers throughout the state through special publications, technical reports, peer-reviewed publications, workshops, meetings and special events. Monitoring and information transfer are continuing activities of this initiative and the mechanisms for accomplishing them are now well-developed.

The synthesis of field experiments and insuring that information is ground truthed, spatially-referenced through GIS, and appropriately linked to models, is a challenging and complicated process. Using the data gathered as part of this and other projects in Minnesota, as well as information gathered from across the northern regions of the country, the future of this initiative is to identify species that are most at risk and what factors are most likely responsible. We will work with resource managers to maintain populations of these species through coordinated and prudent changes in forest practices that insure their perpetuation while maintaining a healthy and sustainable forest industry.

Specific project results for the FY98-99 biennium that are designed to support these efforts and long-term goals are as follows:

Result #1: Analysis of forest bird population trends.

Result #2: Identification of factors that affect reproductive success.

Result #3: Refine and verify the ability of the LANDIS model to predict bird distribution and abundance in relation to the patterns and composition of forest vegetation.

Result #4: Develop educational materials and management prescriptions.

III. PROGRESS SUMMARY: August 30, 2000

Note: A comprehensive report of the initiative's outcomes for the FY98-99 biennium has been compiled into a reported titled, **Minnesota's Forest Bird Diversity Initiative, LCMR Final Report, August 2000**. The unabridged version of the report includes appendices with copies of final and draft manuscripts of publications resulting from the work; the abridged version lacks the appendices. The following account provides a brief overview of the objective/result and a short summary of our primary accomplishments.

Result #1: Analysis of forest bird population trends

Established in the heavily forested counties of northern and east-central Minnesota in FY92-93 and in the southeastern forest region in FY96, the forest bird monitoring program is designed to assess long-term population trends for Minnesota's forest bird species and relate those trends to the forest landscape. Because many factors can affect population levels in a given year (e.g., food availability, weather) data for a minimum of ten to 15 years are essential to accurately assess long-term trends.

Our primary objectives for the bird monitoring program in the FY98-99 biennium were two fold: 1) to continue collecting data on breeding birds from the habitat-specific sampling points established in the Chippewa NF, the Superior NF, the St. Croix River Valley and southeastern Minnesota; 2) to analyze these data collected since 1991 to identify species with statistically significant trends in population abundance.

Our most significant accomplishments and findings this biennium were:

- Breeding bird data continued to be collected from 1,263 sampling points already established in northern, east-central and southeastern Minnesota. Data have now been collected from the national forests for nine years, from the St. Croix River Valley for eight years and from southeastern Minnesota for five years.
- We developed a new statistical approach to test for significant population trends. The method we used is similar to non-parametric route regression that is used by the Breeding Bird Survey (BBS) program.
- We were able to test abundance trends for 74 species between 1991 and 1999. Forty-eight species were tested in the Superior NF, 53 species in the Chippewa NF, 33 species in the St. Croix region, and 35 species in the southeast.
- Overall, we have found an approximately equal number of species that show increasing trends and decreasing trends. One (2%) of the species tested in the Chippewa NF had increased significantly and seven (13%) decreased. Six (13%) of the species tested in the Superior NF also had significant decreasing trends, and five (10%) had increasing trends. Along with the Superior NF, the St. Croix and southeast study areas had fairly even proportions of increasing and decreasing species. In the St. Croix, two (6%) of the species tested increased significantly, and two (6%) decreased. In the southeast, two (6%) species increased significantly and three (9%) decreased.
- The combined regional analyses of the northern forests and the Wisconsin study area indicated that four species increased, the Blue Jay, Black-capped Chickadee, White-breasted Nuthatch and Northern Waterthrush. The first three of these species are permanent residents that commonly visit feeders.
- The regional analyses showed that seven species declined significantly including the Eastern Wood-Pewee, Connecticut Warbler, Mourning Warbler, White-throated Sparrow, Veery, Ovenbird and Canada Warbler. These are all migrant species and all but the Eastern Wood-Pewee nests on or near the ground.

Additional details are available in the abridged and unabridged versions of the final report.

Result #2: Identification of factors that affect reproductive success

Monitoring changes in forest bird populations provides valuable information on their distribution and relative abundance. The best measure of a healthy forest bird community, however, is whether populations are maintained by successful reproduction. Field studies conducted in previous bienniums indicate that some common nesting species, such as the red-eyed vireo, have had extremely poor reproductive success due to high levels of predation.

However, field studies we conducted on the Least Flycatcher (a species for which nests are relatively easy to find) emphasized how variable nest success can be from year to year. In 1996 Least Flycatcher nest success nearly tripled in north central Minnesota from 24% in 1994 to 67% in 1996. Moreover, nest success in other parts of Minnesota exceeded 75%. This does not mean that nest productivity is not an issue in Minnesota for forest birds, but it emphasizes how variable and difficult it is to study in forested regions.

We initially intended to focus our efforts in FY98-99 on investigating factors responsible for these variable findings, specifically how statewide patterns of predator distribution (both birds and mammals) correspond to the relative abundance and distribution of habitat types and then relate that to our knowledge of forest bird reproductive success. However, the scope of this analysis became too large and expensive to initiate and compromised our ability to focus more intensively on the model development. Staff felt that additional "focused" experiments to address questions regarding reproductive success and predation in a local setting, would be more useful, especially in light of the cost to conduct experiments over broad statewide scales. As a result, during the FY98-99 biennium, our efforts were restricted to completing two field studies that were initiated in southeastern Minnesota during the FY96-97 biennium and initiating one new study in northern Minnesota. Preliminary results of the nest productivity studies conducted in southeastern Minnesota were reported on in the FY96-97 report and have not changed following more detailed analysis.

Our most significant accomplishments this biennium were:

- A review of all major nesting studies recently conducted in Minnesota, including those conducted by this initiative, reveals that the nesting success of forest birds in Minnesota is highly variable, but success is likely not as high as expected in highly forested environments.
- A study to examine whether nest predation on artificial nests were higher in deciduous or coniferous forests or in contiguous or fragmented forest produced equivocal results.

Additional details are available in the abridged and unabridged versions of the final report.

Result #3: Refine and verify the ability of the LANDIS model to predict bird distribution and abundance in relation to the patterns and composition of forest vegetation.

The overall goal of this component of the initiative is to describe and analyze the forest landscape so that we can develop a predictive model to describe how bird populations respond, over time, to changes in forest cover types and landscape level vegetation patterns as a consequence of logging, land use change, and natural disturbances to the forest environment. The model will enable project staff to identify areas of high priority and concern for forest birds and areas where forest management efforts should be considered.

During the previous three bienniums considerable resources have been directed at a variety of work activities leading up to the development of this predictive model. Briefly these activities have included:

- Establishment of the bird monitoring program to provide data that relates bird distribution and abundance to forest cover types and stand age.
- Examination of the ability of coarse resolution land cover data (USGS LUDA) to accurately discriminate ecoregions and landscape-scale features important to forest bird diversity (Mladenoff et al. 1997).
- Development of a land cover and forest type classification for all the northern study areas by digital image analysis of fine resolution land cover data from Landsat satellite thematic mapper images.
- Establishment of nine one-square mile study plots where more intensive field studies were conducted to spatially relate bird distribution, abundance and nest success to landscape patterns at a local scale. On each of these areas forest types were mapped from standard aerial photos and ground-truthed, and bird sampling transects were established at 200 meter intervals and spatially located using a satellite based geographic positioning system. The spatially located bird data allowed us to begin to analyze forest landscape characteristics with bird species presence and abundance.
- Significant progress was made developing the first tier of the bird habitat model, relating bird distribution and abundance to forest stand cover type and age.
- Efforts to develop the second tier of the bird habitat model, relating bird distribution and abundance to forest vegetation patterns at the landscape level were initiated.
- Work on several important components of the forest landscape model, LANDIS, was completed.

During the FY98-99 biennium project staff had two primary goals: 1) to continue development of the bird habitat response module relating bird distribution and abundance to forest cover types and landscape level vegetation patterns; and 2) to verify and further refine the LANDIS model by testing its applicability at different habitat and landscape scales.

Our most significant accomplishments and findings this biennium were:

- Significant progress was made developing the second tier of the bird habitat models, relating bird distribution and abundance not only to forest stand cover type and age but also landscape patterns, including:
  - Evaluation of scale-dependency in the second-tier habitat models.
  - Evaluation of alternative statistical modeling techniques that will allow us to have a unified modeling approach across all bird species.
- Work on several important components to link the bird habitat models to the output from the forest landscape model, LANDIS, has been completed, including:
  - Development of a preliminary program that applies bird habitat models to LANDIS output.
  - Refinement of an algorithm to convert forest type maps to bird habitat class maps.

Additional details are available in the abridged and unabridged versions of the final report.

Result #4: Develop educational materials and management prescriptions.

To further integrate forest bird management concerns into traditional forest management practices, project results need to be properly disseminated by developing educational materials and management prescriptions and then disseminating these products through established delivery mechanisms. During the previous

bienniums, work has focused on using the study findings to develop numerous presentations on forest birds that have been delivered to over 100 audiences including forest land managers, loggers and forest planners. The 182 page book, "Birds and Forests: a Management and Conservation Guide," a compilation of our current knowledge about Minnesota birds, was produced and widely distributed throughout the state and Great Lakes region. In addition, numerous peer-reviewed publications and technical reports were prepared and distributed and six master's theses were completed.

Our most significant accomplishments this biennium were:

- A major expansion of the project's web site that provides public access to the data and information collected as part of the initiative.
- Publication of a forest stewardship booklet, "Planning for the Birds: Things to Consider when Managing your Forest" by Carol Pearson. A total of 15,500 copies were published for distribution throughout the state.
- Completion of a series of six workshops on birds and forests that reached over 400 natural resource professionals between June and October 1997.

Additional details are available in the abridged and unabridged versions of the final report.

IV. OUTLINE OF PROJECT RESULTS

This is a continuation of a long-term project begun in FY92-93. The results listed below represent a continuation of the fundamental components of the initiative (monitoring, development of a predictive model and education) as well as a focus into critical forest management issues revealed by project findings.

Result #1: Analysis of forest bird population trends.

Background: Data on forest birds have been collected annually by a habitat-specific monitoring program that was established in the heavily forested counties of northern and east-central Minnesota in FY92-93 and in the southeastern forest region, fragmented by agriculture and expanding urbanization, in FY96. The monitoring network now includes nearly 1200 sampling points that will continue to be sampled in the 1998 and 1999 breeding seasons. Results to date show that most northern forest birds are maintaining relatively stable populations. Yet, because many factors can affect population levels in a given year (e.g. weather, food availability, and habitat) data for a minimum of 10 years are essential to accurately assess long-term trends and the relationship of birds to forest landscapes.

Product: An up-to-date statistical analysis of population trends using project data collected since FY92 will be conducted at the end of the biennium and compared to broad statewide trends as depicted by the federal Breeding Bird Survey. Detailed methods for data collection and analysis are presented in the attached research addendum. When appropriate, forest management practices will be recommended for species demonstrating long-term population declines.

Budget: $81,000 Balance: $0

Completion Date: December 31, 1999

Result #2: Identification of factors that affect reproductive success.

Background: Monitoring changes in forest bird populations provides valuable information on their distribution and relative abundance. The best measure of a healthy forest bird community, however, is whether populations are maintained by successful reproduction. Field studies conducted in previous bienniums indicate that some common nesting species, such as the red-eyed vireo, have had extremely poor reproductive success due to high levels of predation.

However, based on the results of data gathered in the summer of 1996, we found relatively high nest success for the Least Flycatcher, a species for which nests are relatively easy to find. Using this species as a model in 1996, we duplicated our previous nest searching efforts in north central Minnesota, but expanded the study to include eastern and northeastern forested areas of Minnesota. In 1996, nest success nearly tripled for the species in north central Minnesota from 24% in 1994 to 67% in 1996. Moreover, nest success in other parts of Minnesota exceeded 75%. This does not mean that nest productivity is not an issue in Minnesota for forest birds, but it emphasizes how variable and difficult this will be to study in forested regions. Because of these results, we feel it is prudent to place more effort into the modeling portion of the study at this time and continue selected, but less expensive, field studies during the next biennium.

Product: Factors responsible for these variable findings will be investigated, including how spatial habitat patterns affect predator distribution and abundance. Additional discussion and details for achieving this result are presented in the attached research addendum. Stand and landscape level management recommendations to improve nesting success will be developed.

Budget: $47,486 Balance: $ 0

Completion Date: December 31, 1999

Result #3: Refine and verify the ability of the LANDIS model to predict bird distribution and abundance in relation to the patterns and composition of forest vegetation.

Background: During previous bienniums considerable resources have been directed at employing GIS techniques to develop a computer simulation model (LANDIS) that allows interactive assessment and prediction of bird species distribution and abundance across forest landscapes in relation to forest age and composition. Most of the primary development work has been completed. The standard forest succession component of the LANDIS model has been customized to Minnesota conditions and a forest harvest module has been developed. The first level of the bird response module that relates bird distribution and abundance to habitat cover types, stand age and minimum patch size has also been developed. With a reduction in efforts directed toward studies of reproductive success, we will increase the activities directed toward refinement and verification of the LANDIS model.

Products: Efforts this biennium will focus on two major elements: 1) developing the second level of the bird response module that relates bird distribution and abundance to *patterns* of vegetation including composition at the landscape scale, patch size and edges; and 2) verifying and further refining the model by testing its applicability at different habitat and landscape scales. Project staff will work to integrate the

model into forest planning efforts that are underway at a variety of scales, including assessing the consequences of forest stand management decisions and regional forest planning efforts. Detailed methods are presented in the attached research addendum.

Budget: $181,514 Balance: $0

Completion Date: December 31, 1999

Result #4: Develop educational materials and management prescriptions.

Background: To further integrate forest bird management concerns into traditional forest management practices, project results need to be properly disseminated by developing educational materials and management prescriptions and then disseminating these products through established delivery mechanisms. To date project staff have used the current study findings to develop numerous presentations on forest birds that have been delivered to over 100 audiences. Current recommendations about various aspects of forest bird management also have been presented to audiences of forest land managers, loggers and forest planners. The 182 page book, Birds and Forests: A Management and Conservation Guide, a compilation of our current knowledge about Minnesota birds, was produced and has been widely distributed throughout Minnesota (over 1,700 copies). In addition, 15 peer-reviewed publications are now complete or in preparation, 13 other technical reports and publications have been prepared and distributed, and six Master Theses have been completed.

Products: Presentations, educational materials and management prescriptions for forest birds that incorporate project results will continue to be developed for established delivery systems (e.g. Forest Stewardship Program, Logger Education Program, Forest Resource Council's Regional Landscape Planning Teams). Several projects are underway that will span the FY96-97 and FY98-99 bienniums, including the development of 2-4 management pamphlets that will be incorporated into the forest stewardship manual and the development of 3-5 forest stewardship workshops specifically targeted to forest bird management. During this biennium an emphasis will also be placed on the development of management guidelines for species that are most at risk. Further information is provided in the attached research addendum.

Budget: $40,000 Balance: $0

Completion Date: December 31, 1999

V. DISSEMINATION: Dissemination of project data and findings can be categorized as follows:

- Availability of Primary Data. Data sharing is being coordinated with LMIC and the U.S. Forest Service; the U.S. Forest Service national GIS data standards are being followed for quality control. Spatial data will be shared in compatible format with LMIC, DNR, the National Forests and other cooperators to allow for use in management and planning. On an operational basis, a GIS data coverage catalog has been created to index the many large data layers and provide for user access. Data are backed up and archived across the system on a weekly basis.

- World Wide Web. Information about the project is also accessible on the world wide web through the Natural Resources Research Institute. The NRRI home page contains broad information about the research activities of the Institute and a variety of options can be reviewed for more information about specific projects, including the Minnesota Forest Bird Diversity Initiative. Included is a broad overview of the major objectives of the project and a summary of some of the results to date.

- Professional Meetings and Technical Publications. Project results will be presented to peers in the field at national, regional and state scientific meetings, as well as to resource managers and planners who will be users of the information and results. Following presentation of results at such meetings, they will be published in the peer-reviewed literature in the major national journals in the field. As mentioned above, 15 peer-reviewed publications are now complete or in preparation and 13 other technical reports and publications have been prepared and distributed. A complete list is provided in Attachment B to the Research Addendum.

- Application of Project Findings to Forest Management. In addition to continuing the efforts of the initiative that are briefly described under Result #4 (Develop educational materials and management prescriptions), several other mechanisms will be used for disseminating the management recommendations and policies developed by this project. One of the project's investigators, JoAnn Hanowski, NRRI, serves on the Wildlife Workgroup of the Forest Resources Councils' Management Guidelines Team. The workgroup is charged with developing new site level forest management guidelines that address forest wildlife needs. Ms. Hanowski has been closely involved with the project since its inception and will be able to apply all our recent findings to this significant effort. Once complete, the guidelines will serve as the model for application on all forest ownerships. As mentioned above, at the state level project staff will also be collaborating closely with the State Forest Stewardship Program.

  At the federal level project staff will work closely with the forest biologists on both the Superior and Chippewa National Forests to revise their current forest practices. The supervisors on both forests are very supportive of this initiative. At the regional level project staff will work with state representatives on the Upper Great Lakes Biodiversity Committee and other regional forums to disseminate the work throughout the Great Lakes States.

- Application to Statewide Conservation Efforts. Project staff will also be using the information from this initiative to assist with the development of a statewide landbird conservation plan. The plan is part of a larger, international avian conservation program known as Partners In Flight. A steering committee of diverse stakeholders throughout the state will be established in the fall of 1996 and work on the plan should begin in early 1997. Data gathered by the Forest Bird Diversity Initiative will provide the cornerstone of the plan's focus in Minnesota's forested region.

VI. CONTEXT

A.Significance: Minnesota lies in a narrow forest belt that supports the highest diversity of songbirds in North America. Although this diversity is an excellent indicator of forest ecosystem health, birds have received little management attention. Furthermore, the recent GEIS on Expanded Timber Harvesting (Jaakko Poyry Inc. 1994) predicts that some forest bird populations may decline. Accurate resource information is needed to properly direct management activities to prevent such declines while still accommodating sustained timber utilization.

Prior to the initiation of this study in FY92, efforts to assess the effects of forest management on songbird populations in Minnesota had focused only on limited questions at the local scale (e.g., Niemi and Pfannmuller 1979, Niemi and Hanowski 1984 and Engstrom 1990). The influence of the surrounding landscape on the bird community composition had only been considered in a few selected studies elsewhere in the eastern United States (e.g., Askins et al. 1987, Blake and Karr 1987, Hejl 1992, Opdam et al. 1985, Robbins 1979). These latter studies began to suggest that a conservation model for forest birds requires a broad, landscape-level approach integrated with a more innovative approach that addresses a wider range of management options at the stand level.

Practical applications to demonstrate a conservation effort at this scale were lacking. This initiative fills that void and has been widely recognized as a national forest bird conservation model. It is the first comprehensive program to relate forest vegetation and landscape patterns to regional bird diversity with a long-term monitoring program. The large-scale, habitat-specific monitoring program is intended to complement the National Biological Service's Breeding Bird Survey (BBS), established in 1966, by gathering more detailed information on trends and habitat use by Minnesota's forest birds, especially those not efficiently sampled by the BBS. Gathering this data for a minimum of 10 years is essential for understanding natural population variations.

This monitoring effort is complemented by extensive research to identify factors responsible for observed population trends and modeling to analyze relationships between habitat at the stand level, vegetation patterns at the landscape level and bird populations. For example, one research objective of the initiative is to link studies of reproductive success with bird relative abundance, habitat use and landscape context. Together, the results of these efforts are leading to the development of management prescriptions that ensure the maintenance of Minnesota's rich diversity of forest birds.

The information gathered will be essential to the efforts for landscape-level planning of the Minnesota Forest Resources Council and the Minnesota Forest Resource Partnership as directed by the 1995 Sustainable Forestry Act. Project staff also are working closely with forest bird researchers throughout the Great Lakes states, through a project funded by the Great Lakes Protection Fund, to apply our statewide information to questions regarding forest bird management throughout the region.

B.Time: The monitoring and research program established by this project will be operable for two additional bienniums beyond FY98-99, for a total of six bienniums. We anticipate that approximately the same level of funding will be requested from LCMR and from our other cooperators (see below).

C.Budget Context: Information to describe the project context and budget history is presented as follows: 1) Funding History which summarizes expenditures for the previous three bienniums; 2) Proposed and Anticipated Expenditures for the FY98-99 and FY00-01 bienniums; 3) Relationship to Other Projects which provides a summary of the primary projects that the Forest Bird Diversity Initiative has collaborated with since its inception in 1991; and a 4) Detailed Budget for FY98-99.

1. Funding History

	July 91-June 93 Prior Expenditure	July 93-June 95 Prior Expenditures	July 95-June 97 Prior Expenditures
LCMR	$300,000	$500,000	$400,000
Other State		$ 50,000	$ 60,030
Non State Match	$200,000	$ 66,000	$188,900
In-Kind		$ 81,600	$ 81,600
Total	$500,000	$697,600	$730,530

2. Proposed and Anticipated Expenditures

	July 97-June 99 Project Period	July 99-June 01 Future Expenditures
LCMR	$ 350,000	$ 380,000
Other State	$ 57,010	-
Non State Match	$ 108,260	$ 70,000
In-Kind	$ 82,000	$ 82,000
Total	$ 597,270	$ 532,000

3. Relationship to Other Specific Projects that Contribute Matching Dollars

- USDA Forest Service Monitoring Efforts (1991-1996; $154,500)

  This is a cooperative project with the North Central Forest Experiment Station and the Chippewa and Superior National Forests. We have established a habitat-specific monitoring program on over 900 point samples that were proportionally, randomly selected based on available habitat. All points are censused annually. The results are used to assess habitat use and population trends for more than 50 forest bird species, serving as an early-warning system for potential population declines. The effort is complementary to the Forest Bird Diversity Initiative monitoring efforts in the St. Croix Valley and southeastern Minnesota, forming a statewide monitoring network in the primary forested zones of Minnesota. Funding support for FY98-99 still needs to be negotiated.

- St. Louis County Monitoring Efforts (1994-1996; $21,000)

  St. Louis County is one of the largest forested counties in the U.S. and is much larger than many U.S. states. Because of the vast publicly-owned forests in St. Louis county we have established a cooperative program with land managers for the county. The goal is to inventory and monitor birds using St. Louis County administered forestlands. The data gathered are the same as those used in the statewide bird monitoring effort and, hence, complementary with those data. Information gathered for these sites is used in the Initiative's analysis of habitat use by birds and is used to aid management of St. Louis County lands for the benefit of both sustained forest use and wildlife.

- Minnesota Power - Boulder Lake Management Area (1994-1998; $37,000)

  The Boulder Lake Management Area, owned by Minnesota Power, is a cooperative effort of the University of Minnesota, St. Louis County and the Minnesota DNR to do research and provide "hands-on" environmental education on sound forest and water quality management to local schools and adults. At this site we have established a large research study plot (one mile square) and have initiated a number of studies on bird habitat relationships and nest productivity in addition to studies on small mammals, reptiles and amphibians. The bird studies are complementary to the Initiative and the data gathered will be used in the development of bird, habitat and landscape models.

- Forest Bird Biodiversity: Indicators of Environmental Condition and Change in the Great Lakes Watershed - Great Lakes Protection Fund (1996-1998; $382,000 of which $80,000 is directly relevant to Minnesota)

  This is a large, multi-investigator project that is developing a standard protocol for monitoring birds and developing spatially-referenced data bases that will be used to develop conservation priorities for forest birds across the Great Lakes region. The project will combine a series of GIS data layers to identify areas of high conservation concern in the forests of the Great Lakes watershed. Since portions of Minnesota are within this watershed, some of the efforts for this project will be highly beneficial to the Forest Bird Diversity Initiative in terms of identifying areas of high conservation value within Minnesota's forests.

- The Contribution of Forested Wetland Communities to Maintaining Minnesota's Rich Diversity of Forest Birds - Environmental Protection Agency (1992 -1994; $30,000)

  The funds provided by this grant contributed to the required $200,000 match during the FY92-93 biennium. The project focused on documenting the contribution of forested wetlands (Types 7 and 8) to the regional diversity of forest birds. Funds were used to sample approximately 120 points in our larger monitoring program that were located in forested lowland cover types.

- Forest Bird Inventory and Monitoring: A tool to evaluate the relative importance of forested wetlands and to assist with watershed protection efforts in southeastern Minnesota - Environmental Protection Agency (1995-1997; $20,000)

  Up until 1995 the initiative's monitoring efforts were focused entirely in northern and east-central Minnesota. Using LCMR funds a pilot (75 monitoring points) was established in three southeastern counties (Rice, Wabasha and Goodhue) during the 1995 field season. This pilot effort pointed out several new challenges that raised the costs of the monitoring program. For example, the more fragmented nature of the landscape in southeastern Minnesota results in census points being more widely dispersed and fewer points being censused each morning. EPA funds granted through the above contract agreement have enabled us to expand the monitoring program in the southeast by an additional 125 sampling points for the 1996 and 1997 field seasons.

- Nesting success of forest birds in the Upper Mississippi River, Minnesota - National Biological Service (1996-1997; $54,560)

  This project is part of the National Biological Service's State Partnership Program. Because one of the primary concerns for forest birds in Minnesota is to identify stand and landscape characteristics associated with successful nesting, we requested funds from NBS to work on a joint project in southeastern Minnesota to begin an assessment of nest productivity for selected species in this region. The effort is highly complementary with the Forest Bird Diversity Initiative because it greatly augments the funding of our research activity on nesting success. Thus far, the Initiative has primarily focused its efforts on nest success in the larger forested areas of northern and central Minnesota.

- Minnesota Forest Resources Council Research Committee - Riparian Birds (1996-1998; $100,000)

  The effects of logging in riparian forest areas on wildlife are not well-documented and have been identified as an area of concern by the Forest Bird Diversity Initiative; monies however, have been inadequate to directly address this question through fieldwork and selected field experiments. This study will gather baseline "before" data on birds using riparian forests throughout the state and will

initiate a series of experiments on the effects of selected removal of trees from these areas on birds. The results of the study will be extremely important in improving our understanding of riparian areas and will be incorporated into the Initiative's modeling efforts.

- Forest Stewardship Program (1996-1997; $17,040)

The Forest Stewardship Program is considered a primary mechanism for delivering information on forest bird management. In 1996 project staff were awarded two small grants to work more closely with the stewardship program. The first grant ($7,940) was awarded to provide support for developing and presenting 3-5 workshops specifically on forest bird management to stewardship plan writers. Tentative dates are in late June and early July, 1997. The second grant ($9,100) was awarded to develop and publish several eight page pamphlets on improving forest habitat for nongame birds.

4. Detailed Budget for FY98-99:

Proposed Expenditures for the 1997-1999 LCMR Funding Period:

Personnel			$ 314,336
	Percent effort	Cost	
Landscape Ecologist (contract with Dr. David Mladenoff)	-	$ 20,000	
Post-Doctoral Associate	90%	$ 58,968	
Natural Resource Specialist (Pearson)	60%	$ 40,000	
Research Fellow (Hanowski)	25%	$ 27,644	
Research Fellow (Peter Wolter)	60%	$ 53,382	
Assistant GIS Scientist (Sales)	60%	$ 40,498	
Statistician (Lima)	20%	$ 17,134	
Programmer (Heim)	15%	$ 10,903	
Field Ornithologists/Biologist	15-30%	$ 26,828	
Graduate Students	50%	$ 15,795	
Undergraduate Assistants	10%	$ 3,184	
Other			
Travel			$ 13,364
GIS Fees			$ 10,000
Field and Office Supplies			$ 2,000
Telephone			$ 800
Mailing			$ 400
Printing			$ 600
Publication(s)			$ 5,500
Equipment (Computer)			$ 3,000
Total			$ 350,000

VII. COOPERATION: Minnesota's Forest Bird Diversity Initiative is overseen by a project steering committee that meets approximately 3-4 times per year to review the status of the project and discuss its future goals, objectives and products. Primary members of that team include: Lee Pfannmuller (Department of Natural Resources, Project Manager); Dr. Gerri Niemi (NRRI, Principal Investigator); JoAnn Hanowski (NRRI, Lead Field Investigator); Jan Green (Minnesota Ornithologists Union); Doug Anderson (Division of Forestry, Department of Natural Resources); and Tim O'Hara (Minnesota Forest Industry).

Additional cooperators include: 1) Dr. Richard Buech, USFS, North Central Experiment Station; 2) Superior and Chippewa National Forests; 3) the Minnesota Ornithologists Union (MOU); 4) Potlatch, Boise-Cascade and Blandin paper companies; 5) Wolf Ridge Environmental Learning Center; 6) Minnesota Power; 7) Dr. Melinda Knutson, National Biological Service - LaCrosse; 8) the Minnesota Forest Resource Council Research Committee; 9) the Great Lakes Protection Fund; and 10) the Forest Stewardship Program. Together, it is anticipated that these cooperators will contribute approximately $165,270 in cash contributions to the project in FY98-99 and $67,800 toward the $82,000 in in-kind contributions.

Finally, of the total $350,000 of LCMR funds granted to this initiative, $310,000 will be subcontracted to the Natural Resources Research Institute, University of Minnesota-Duluth. The principal cooperators at NRRI include the following:

Dr. Gerri Niemi (15% of his time will be devoted to the initiative)
Professor and Director, Center for Water and the Environment
Natural Resources Research Institute
University of Minnesota - Duluth

JoAnn Hanowski (25% of her time will be devoted to the initiative)
Research Fellow, Center for Water and the Environment
Natural Resources Research Institute
University of Minnesota - Duluth

Peter Wolter (60% of his time will be directed to the initiative)
Research Fellow, Center for Water and the Environment
Natural Resources Research Institute
University of Minnesota - Duluth

Resumes of these individuals are included in the Research Addendum, Attachment A.

VIII. LOCATION: A map of the state is attached showing the counties where the Initiative is working. (Work Program Attachment A)

IX. REPORTING REQUIREMENTS: Periodic Work program progress reports will be submitted not later than December 31, 1997, September 15, 1998 and March 15, 1999. A final Work program report and associated products will be submitted by December 31, 1999.

X. RESEARCH PROJECTS: Refer to Research Addendum

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