



910118

LEGISLATIVE COMMISSION ON MINNESOTA RESOURCES (LCMR) BIENNIAL REPORT

Pursuant to:

M.S. 116P.09 Subd. 7

January 1991

Commission Members

**Senators: Greg Dahl, Bob Lessard, William Luther,
Gene Merriam, Roger Moe, Earl Renneke**

**Representatives: Virgil Johnson, Phyllis Kahn, Chair,
Henry Kalis, Willard Munger, Tom Osthoff, John Sarna**

Citizen Advisory Committee Members

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The following information is also requested in: 116P.09 Subd. 7

**Sec. 4: Recommendation to implement successful projects
and programs into a state agency's standard operations:.....No recommendations**

**Sec. 8: Any findings or recommendations that are
deemed proper to assist the legislature in formulating
legislation:.....No recommendations**

**Sec. 9: A list of all gifts and donations with a value
over \$1,000:.....None**

**Sec. 11: A copy of the most recent certified financial
and compliance audit.....Not available
(the first expenditures from the Trust Fund will begin July 1, 1991)**

Legislative Commission on Minnesota Resources

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JOHN R. VELIN
Director



Legislative Commission on Minnesota Resources Fact Sheet

The Legislative Commission on Minnesota Resources, commonly known as the LCMR, is a group of 16 senior legislators who are appointed by their peers. The function of the LCMR is to recommend projects to the legislature for special natural resource projects. These projects help maintain and enhance Minnesota's natural resources. Today's LCMR developed from a program initiated in 1963. Since that time, over \$235 million has been spent for projects to protect and enhance Minnesota's resources.

Projects are funded from three sources: (1) the Minnesota Future Resources Fund, which receives money from tax on cigarettes, about \$17 million per biennium; (2) federal oil overcharge funds which is about \$1 to \$2 million per biennium, and (3) the new Minnesota Environment and Natural Resources Trust Fund (Trust Fund).

The Trust Fund was established by constitutional amendment in 1988. The corpus of the trust will receive 40% of the net state lottery receipts. The income from the trust fund will provide a perpetual source of funding for projects according to the strategic plan. A strategic plan for the Trust Fund was developed from a grass roots approach by conducting a series of regional forums and a statewide natural resources congress in which all citizens were encouraged to attend and provide comments. An 11 member statewide citizens' advisory committee refined the strategic plan for consideration by the LCMR and referral to the legislature.

The Trust Fund is designed to provide a long-term permanent and stable source of funding for our natural resources. Money will be spent to pay for projects such as conservation easements on erodible land and wetlands, to provide research for protection and/or management of natural resources, enhance public education about natural resources and the environment and preserve and enhance fish, wildlife, land, water and other natural resources.

Biennially, proposed projects are submitted to the LCMR for their review, approval and ultimately, inclusion in the state's budget plan. The LCMR decides which of the three funding sources to use for each project in their recommendations. Research proposals are also referred to an expert peer review panel. Approved projects must be conducted and completed according to an approved work plan. After a project is completed, the results and final report are presented to and reviewed by the commission.

Any individual, organization (profit or non-profit), community or state agency can submit a proposal for consideration. The next round of Request for Proposals will be announced late fall, 1991.

ALLOCATION RECOMMENDATION PROCESS

by Representative Phyllis Kahn, Chair LCMR

As Chair of the Legislative Commission on Minnesota Resources (LCMR), I am pleased and proud to announce the final project recommendations that will be presented to the Legislature for approval and funding during the next session. Ninety-seven projects from eleven issue areas will be funded for about \$32 million dollars. With the emergence of the state's Environment and Natural Resources Trust Fund (funded by the new state lottery,) we have been able to provide significantly more support for projects to enhance Minnesota's environment and natural resources.

The process of choosing these projects was both complex and time consuming. Commission members and Citizen Advisory Committee members spent the summer of '89 visiting cities and towns throughout Minnesota looking at natural resource projects. Seven regional forums were held giving over 1,000 citizens the opportunity to advise Commission members of their concerns regarding natural resources in their area. In September, the Commission sponsored a state-wide Natural Resource Congress which was held in St. Paul. Experts were brought in from all over the United States to address concerns in eleven different issue areas. About 250 people attended the Congress. The data was gathered, organized and evaluated.

In December we issued a Request for Proposals resulting in over 700 proposals. The proposals came from academic institutions, state agencies, cities and counties and private businesses, both profit and non-profit. From the February 16 RFP deadline, through July, hundreds of dedicated people have had input into the selection of the recommended projects.

The first group to review the projects were coordinating committee members - experts in each issue area who spent dozens of hours carefully analyzing the diverse projects. After their consideration, the Citizen Advisory Committee (CAC), comprised of 14 individuals appointed by the Governor, the Speaker of the House and the Majority Leader, carefully reviewed each project that might be funded by the Environment and Natural Resource Trust Fund. The CAC formulated the Trust Fund's Strategic Plan and the projects were considered according to the guidelines set forth in the Trust Fund Strategic Plan.

With these recommendations in place, the Commission began their work. The projects were winnowed down to 200 which best matched the criteria set forth in the RFP. Hearings (very similar to legislative budget hearings) were then set and each proposed project manager had the opportunity to state their case before the Commission members. The hearings occurred over 8 separate days and then the allocation process took an additional 3 days.

I really want to thank the many people who were part of this pro-

cess. They helped the Commission choose an extraordinary group of projects and we couldn't have done the job without their input and insight.

As Commission Chair, I am confident the projects that were selected best fit the needs of the state, represent fine scientific advances, excellent environment and natural resource planning as well as offering tremendous social and recreational opportunities. The proposed projects will directly benefit and enhance the lives of Minnesota citizens from all areas of the state, including rural, urban and suburban. In addition, some may result in successful commercial advances for economic development at some future date. Most importantly, our precious natural resources are offered protection, preservation and enhancement through the many varied creative and innovative activities of the Legislative Commission on Minnesota Resources.

A handwritten signature in cursive script, appearing to read "Douglas Kahn".

CHAPTER 116P
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

- 116P.01 Findings.
- 116P.02 Definitions.
- 116P.03 Trust fund not to supplant existing funding.
- 116P.04 Trust fund account.
- 116P.05 Legislative commission Minnesota resources.
- 116P.06 Advisory committee.
- 116P.07 Resources congress.
- 116P.08 Trust fund expenditures; exceptions; plans.
- 116P.09 Administration.
- 116P.10 Royalties, copyrights, patents.
- 116P.11 Availability of funds for disbursement.
- 116P.12 Water system improvement loan program.
- 116P.13 Minnesota future resources fund.

116P.01 FINDINGS.

The legislature finds that all Minnesotans share the responsibility to ensure wise stewardship of the state's environment and natural resources for the benefit of current citizens and future generations. Proper management of the state's environment and natural resources includes and requires foresight, planning, and long-term activities that allow the state to preserve its high quality environment and provides for wise use of its natural resources. The legislature also finds that to undertake such activities properly, a long-term, consistent, and stable source of funding must be provided.

HIST: 1988 c 690 art 1 s 5

116P.02 DEFINITIONS.

Subdivision 1. **Applicability.** The definitions in this section apply to sections 116P.01 to 116P.13.

Subd. 2. **Advisory committee.** "Advisory committee" means the advisory committee created in section 116P.06.

Subd. 3. **Board.** "Board" means the state board of investment.

Subd. 4. **Commission.** "Commission" means the legislative commission on Minnesota resources.

Subd. 5. **Natural resources.** "Natural resources" includes the outdoor recreation system under section 86A.04 and regional recreation open space systems as defined under section 473.351, subdivision 1.

Subd. 6. **Trust fund.** "Trust fund" means the Minnesota environment and natural resources trust fund established under Minnesota Constitution, article XI, section 14.

HIST: 1988 c 690 art 1 s 6; 1989 c 335 art 1 s 269

116P.03 TRUST FUND NOT TO SUPPLANT EXISTING FUNDING.

(a) The trust fund may not be used as a substitute for traditional sources of funding environmental and natural resources activities, but the trust fund shall supplement the traditional sources, including those sources used to support the criteria in section 116P.08, subdivision 1. The trust fund must be used primarily to support activities whose benefits become available only over an extended period of time.

(b) The commission must determine the amount of the state budget spent from traditional sources to fund environmental and natural resources activities before and after the trust fund is established and include a comparison of the amount in the report under section 116P.09, subdivision 7.

HIST: 1988 c 690 art 1 s 7

116P.04 TRUST FUND ACCOUNT.

Subdivision 1. Establishment of account and investment.

A Minnesota environment and natural resources trust fund, under article XI, section 14, of the Minnesota Constitution, is established as an account in the state treasury. The commissioner of finance shall credit to the trust fund the amounts authorized under this section and section 116P.10. The state board of investment shall ensure that trust fund money is invested under section 11A.24. All money earned by the trust fund must be credited to the trust fund. The principal of the trust fund and any unexpended earnings must be invested and reinvested by the state board of investment.

Subd. 2. Repealed, 1990 c 610 art 1 s 59

Subd. 3. Revenue. Nothing in sections 116P.01 to 116P.12 limits the source of contributions to the trust fund.

Subd. 4. Gifts and donations. Gifts and donations, including land or interests in land, may be made to the trust fund. Noncash gifts and donations must be disposed of for cash as soon as the board prudently can maximize the value of the gift or donation. Gifts and donations of marketable securities may be held or be disposed of for cash at the option of the board. The cash receipts of gifts and donations of cash or capital assets and marketable securities disposed of for cash must be credited immediately to the principal of the trust fund. The value of marketable securities at the time the gift or donation is made must be credited to the principal of the trust fund and any earnings from the marketable securities are earnings of the trust fund.

Subd. 5. Audits required. (a) The commission shall select a certified public accountant annually to audit the trust fund. The audit must be given to the governor and the legislature and be available to the public.

(b) The legislative auditor shall audit trust fund expenditures to ensure that the money is spent for the purposes provided in the commission's budget plan.

HIST: 1988 c 690 art 1 s 8; 1990 c 610 art 1 s 44

116P.05 LEGISLATIVE COMMISSION MINNESOTA RESOURCES.

(a) A legislative commission on Minnesota resources of 16 members is created, consisting of the chairs of the house and senate committees on environment and natural resources or designees appointed for the terms of the chairs, the chairs of the house appropriations and senate finance committees or designees appointed for the terms of the chairs, six members of the senate appointed by the subcommittee on committees of the committee on rules and administration, and six members of the house appointed by the speaker. The commission shall develop a budget plan for expenditures from the trust fund and shall adopt a strategic plan as provided in section 116P.08.

(b) The commission shall recommend expenditures to the legislature from the Minnesota future resources account under section 116P.13. At least two members from the senate and two members from the house must be from the minority caucus. Members are entitled to reimbursement for per diem expenses plus travel expenses incurred in the services of the commission.

(c) Members shall appoint a chair who shall preside and convene meetings as often as necessary to conduct duties prescribed by this chapter.

(d) Members shall serve on the commission until their successors are appointed.

(e) Vacancies occurring on the commission shall not affect the authority of the remaining members of the commission to carry out their duties, and vacancies shall be filled in the same manner under paragraph (a).

(f) The commission may adopt bylaws and operating procedures to fulfill their duties under sections 116P.01 to 116P.13.

HIST: 1988 c 690 art 1 s 9; 1989 c 335 art 1 s 269; 1990 c 594 art 1 s 56

116P.06 ADVISORY COMMITTEE.

(a) An advisory committee of 11 citizen members shall be appointed by the governor to advise the legislative commission on Minnesota resources on project proposals to receive funding from the trust fund and the development of budget and strategic plans. The governor shall appoint at least one member from each congressional district. The governor shall appoint the chair.

(b) The governor's appointees must be confirmed with the advice and consent of the senate. The membership terms, compensation, removal, and filling of vacancies for citizen members of the advisory committee are governed by section 15.0575.

HIST: 1988 c 690 art 1 s 10; 1989 c 335 art 1 s 269

116P.07 RESOURCES CONGRESS.

The commission must convene a resources congress at least once every biennium. The congress must be open to all interested individuals. The purpose of the congress is to collect public input necessary to allow the commission, with the advice of the advisory committee, to develop a strategic plan to guide expenditures from the trust fund. The congress also may be convened to receive and review reports on trust fund projects.

HIST: 1988 c 690 art 1 s 11

116P.08 TRUST FUND EXPENDITURES; EXCEPTIONS; PLANS.

Subdivision 1. **Expenditures.** Money in the trust fund may be spent only for:

- (1) the reinvest in Minnesota program as provided in section 84.95, subdivision 2;
- (2) research that contributes to increasing the effectiveness of protecting or managing the state's environment or natural resources;
- (3) collection and analysis of information that assists in developing the state's environmental and natural resources policies;
- (4) enhancement of public education, awareness, and understanding necessary for the protection, conservation, restoration, and enhancement of air, land, water, forests, fish, wildlife, and other natural resources;
- (5) capital projects for the preservation and protection of unique natural resources;
- (6) activities that preserve or enhance fish, wildlife, land, air, water, and other natural resources that otherwise may be substantially impaired or destroyed in any area of the state;
- (7) administrative and investment expenses incurred by the state board of investment in investing deposits to the trust fund; and
- (8) administrative expenses subject to the limits in section 116P.09.

Subd. 2. **Exceptions.** Money from the trust fund may not be spent for:

- (1) purposes of environmental compensation and liability under chapter 115B and response actions under chapter 115C;
- (2) purposes of municipal water pollution control under the authority of chapters 115 and 116, including combined sewer overflow under section 116.162;
- (3) costs associated with the decommissioning of nuclear power plants;
- (4) hazardous waste disposal facilities;
- (5) solid waste disposal facilities; or
- (6) projects or purposes inconsistent with the strategic plan.

Subd. 3. **Strategic plan required.** (a) The commission shall adopt a strategic plan for making expenditures from the

trust fund, including identifying the priority areas for funding for the next six years. The reinvest in Minnesota program must be reviewed by the advisory committee, resources congress, and commission during the development of the strategic plan. The strategic plan must be updated every two years. The plan is advisory only. The commission shall submit the plan, as a recommendation, to the house of representatives appropriations and senate finance committees by January 1 of each odd-numbered year.

(b) The advisory committee shall work with the resources congress to develop a draft strategic plan to be submitted to the commission for approval. The commission shall develop the procedures for the resources congress.

(c) The commission may accept or modify the draft of the strategic plan submitted to it by the advisory committee before voting on the plan's adoption.

Subd. 4. **Budget plan.** (a) Funding may be provided only for those projects that meet the categories established in subdivision 1.

(b) Projects submitted to the commission for funding may be referred to the advisory committee for recommendation, except that research proposals first must be reviewed by the peer review panel. The advisory committee may review all project proposals for funding and may make recommendations to the commission on whether:

(1) the projects meet the standards and funding categories set forth in sections 116P.01 to 116P.12;

(2) the projects duplicate existing federal, state, or local projects being conducted within the state; and

(3) the projects are consistent with the most recent strategic plan adopted by the commission.

(c) The commission must adopt a budget plan to make expenditures from the trust fund for the purposes provided in subdivision 1. The budget plan must be submitted to the governor for inclusion in the biennial budget and supplemental budget submitted to the legislature.

(d) Money in the trust fund may not be spent except under an appropriation by law.

Subd. 5. **Public meetings.** All advisory committee and commission meetings must be open to the public. The commission shall attempt to meet at least once in each of the state's congressional districts during each biennium.

Subd. 6. **Peer review.** (a) Research proposals must include a stated purpose, timeline, potential outcomes, and an explanation of the need for the research. All research proposals must be reviewed by a peer review panel before receiving an appropriation from the trust fund.

(b) In conducting research proposal reviews, the peer review panel shall:

(1) comment on the methodology proposed and whether it can

be expected to yield appropriate and useful information and data;

(2) comment on the need for the research and about similar existing information available, if any;

(3) comment on whether the research proposed meets the categories of subdivision 1; and

(4) report to the commission and advisory committee on clauses (1) to (3).

(c) The peer review panel also must review completed research proposals that have received an appropriation from the trust fund and comment and report upon whether the project reached the intended goals.

Subd. 7. **Peer review panel membership.** (a) The peer review panel must consist of at least five but not more than 11 members who are knowledgeable in general research methods, including but not limited to the areas of air quality research, water research, forest research, fish and wildlife management research, environmental health research, and soil conservation research. Not more than two members of the panel may be employees of state agencies.

(b) Members of the peer review panel shall be selected by the commission and serve four-year staggered terms according to section 15.059. The commission may select additional temporary members for any research proposal deemed to be too technical for adequate peer review by the panel in paragraph (a). Members of the peer review panel shall elect a chair every two years who shall be responsible for convening meetings of the panel as often as is necessary to fulfill its duties as prescribed in this section. Compensation of panel members is governed by section 15.059, subdivision 3.

HIST: 1988 c 690 art 1 s 12; 1989 c 335 art 1 s 178

116P.09 ADMINISTRATION.

Subdivision 1. **Administrative authority.** The commission may appoint legal and other personnel and consultants necessary to carry out functions and duties of the commission. Permanent employees shall be in the unclassified service. In addition, the commission may request staff assistance and data from any other agency of state government as needed for the execution of the responsibilities of the commission and advisory committee and an agency must promptly furnish it.

Subd. 2. **Liaison officers.** The commission shall request each department or agency head of all state agencies with a direct interest and responsibility in any phase of environment and natural resources to appoint, and the latter shall appoint for the agency, a liaison officer who shall work closely with the commission and its staff. The designated liaison officer shall attend all meetings of the advisory committee to provide assistance and information to committee members when necessary.

Subd. 3. **Appraisal and evaluation.** The commission shall obtain and appraise information available through private organizations and groups, utilizing to the fullest extent possible studies, data, and reports previously prepared or currently in progress by public agencies, private organizations, groups, and others, concerning future trends in the protection, conservation, preservation, and enhancement of the state's air, water, land, forests, fish, wildlife, native vegetation, and other natural resources. Any data compiled by the commission shall be made available to any standing or interim committee of the legislature upon the request of the chair of the respective committee.

Subd. 4. **Personnel.** Persons who are employed by a state agency to work on a project and are paid by an appropriation from the trust fund or Minnesota future resources account are in the unclassified civil service, and their continued employment is contingent upon the availability of money from the appropriation. When the appropriation has been spent, their positions must be canceled and the approved complement of the agency reduced accordingly. Part-time employment of persons for a project is authorized.

Subd. 5. **Administrative expense.** (a) The administrative expenses of the commission and advisory committee shall be paid from the Minnesota future resources account until June 30, 1995.

(b) After June 30, 1995, the expenses of the commission and advisory committee combined may not exceed an amount equal to two percent of the total earnings of the trust fund in the preceding fiscal year.

(c) The commission and the advisory committee must include a reasonable amount for their administrative expense in the budget plan for the trust fund.

Subd. 6. **Conflict of interest.** A commission member, advisory committee member, peer review panelist, or an employee of the commission may not participate in or vote on a decision of the commission, advisory committee, or peer review panel relating to an organization in which the member, panelist, or employee has either a direct or indirect personal financial interest. While serving on the legislative commission, advisory committee, or peer review panel, or being an employee of the commission, a person shall avoid any potential conflict of interest.

Subd. 7. **Report required.** The commission shall, by July 1 of each even-numbered year, submit a report to the governor, the chairs of the house appropriations and senate finance committees, and the chairs of the house and senate committees on environment and natural resources. Copies of the report must be available to the public. The report must include:

- (1) a copy of the current strategic plan;
- (2) a description of each project receiving money from the

trust fund and Minnesota future resources account during the preceding two years;

(3) a summary of any research project completed in the preceding two years;

(4) recommendations to implement successful projects and programs into a state agency's standard operations;

(5) to the extent known by the commission, descriptions of the projects anticipated to be supported by the trust fund and Minnesota future resources account during the next two years;

(6) the source and amount of all revenues collected and distributed by the commission, including all administrative and other expenses;

(7) a description of the trust fund's assets and liabilities;

(8) any findings or recommendations that are deemed proper to assist the legislature in formulating legislation;

(9) a list of all gifts and donations with a value over \$1,000;

(10) a comparison of the amounts spent by the state for environment and natural resources activities through the most recent fiscal year; and

(11) a copy of the most recent certified financial and compliance audit.

HIST: 1988 c 690 art 1 s 13

116P.10 ROYALTIES, COPYRIGHTS, PATENTS.

The trust fund owns and shall take title to the percentage of a royalty, copyright, or patent resulting from a project supported by the trust fund equal to the percentage of the project's total funding provided by the trust fund. Cash receipts resulting from a royalty, copyright, or patent, or the sale of the trust fund's rights to a royalty, copyright, or patent, must be credited immediately to the principal of the trust fund. Before a project is included in the budget plan, the commission may vote to relinquish the ownership or rights to a royalty, copyright, or patent resulting from a project supported by the trust fund to the project's proposer when the amount of the original grant or loan, plus interest, has been repaid to the trust fund.

HIST: 1988 c 690 art 1 s 14

116P.11 AVAILABILITY OF FUNDS FOR DISBURSEMENT.

(a) The amount biennially available from the trust fund for the budget plan developed by the commission consists of the interest earnings generated from the trust fund.

(b) For funding projects through fiscal year 1997, the following additional amounts are available from the trust fund for the budget plans developed by the commission:

(1) for the 1991-1993 biennium, up to 25 percent of the revenue deposited in the trust fund in fiscal years 1990 and

1991;

(2) for the 1993-1995 biennium, up to 20 percent of the revenue deposited in the trust fund in fiscal year 1992 and up to 15 percent of the revenue deposited in the fund in fiscal year 1993; and

(3) for the 1995-1997 biennium, up to ten percent of the revenue deposited in the fund in fiscal year 1994 and up to five percent of the revenue deposited in the fund in fiscal year 1995.

(c) Any appropriated funds not encumbered in the biennium in which they are appropriated cancel and must be credited to the principal of the trust fund.

HIST: 1988 c 690 art 1 s 15; 1990 c 594 art 1 s 57; 1990 c 612 s 14

116P.12 WATER SYSTEM IMPROVEMENT LOAN PROGRAM.

Subdivision 1. Loans authorized. (a) If the principal of the trust fund equals or exceeds \$200,000,000, the commission may vote to set aside up to five percent of the principal of the trust fund for water system improvement loans. The purpose of water system improvement loans is to offer below market rate interest loans to local units of government for the purposes of water system improvements.

(b) The interest on a loan shall be calculated on the declining balance at a rate four percentage points below the secondary market yield of one-year United States treasury bills calculated according to section 549.09, subdivision 1, paragraph (c).

(c) An eligible project must prove that existing federal or state loans or grants have not been adequate.

(d) Payments on the principal and interest of loans under this section must be credited to the trust fund.

(e) Repayment of loans made under this section must be completed within 20 years.

(f) The Minnesota public facilities authority must report to the commission each year on the loan program under this section.

Subd. 2. Application and administration. (a) The commission must adopt a procedure for the issuance of the water system improvement loans by the public facilities authority.

(b) The commission also must ensure that the loans are administered according to its fiduciary standards and requirements.

HIST: 1988 c 690 art 1 s 16

116P.13 MINNESOTA FUTURE RESOURCES FUND.

Subdivision 1. Revenue sources. The money in the Minnesota future resources fund consists of revenue credited under section 297.13, subdivision 1, clause (1).

Subd. 2. Interest. The interest attributable to the investment of the Minnesota future resources fund must be

credited to the fund.

Subd. 3. **Revenue purposes.** Revenue in the Minnesota future resources fund may be spent for purposes of natural resources acceleration and outdoor recreation, including but not limited to the development, maintenance, and operation of the state outdoor recreation system under chapter 86A and regional recreation open space systems as defined under section 473.351, subdivision 1.

HIST: 1988 c 690 art 1 s 17; 1989 c 335 art 1 s 179

STATE OF MINNESOTA
MINNESOTA RESOURCES FUND
SCHEDULE OF REVENUES, EXPENDITURES
AND CHANGES IN FUND BALANCE - BUDGET AND ACTUAL
BUDGETARY BASIS
YEAR ENDED JUNE 30, 1990
(IN THOUSANDS)

Minnesota Comparison of Budget and
Actual Revenues, Expenditures and
Changes in Fund Balances
Legal Level of Budgetary Control
All Budgeted Funds
Year Ended June 30, 1990

Legal Citation Yr Chap	Budget	Authorized Budgetary Adjustments	Adjusted Budget	Actual	Variance: Favorable (Unfavorable)
Net Revenues and Transfers-In:					
Net Revenues:					
Tobacco Taxes	\$ 7,733	\$ 0	\$ 7,733	\$ 7,942	\$ 209
Investment Income	0	0	0	587	587
Other Revenues	103	0	103	99	(4)
Net Revenue	\$ 7,836	\$ 0	\$ 7,836	\$ 8,628	\$ 792
Transfers from Federal Fund					
Total Net Revenues and Transfers-In	\$ 7,872	\$ 0	\$ 7,872	\$ 8,664	\$ 792
Expenditures:					
Department of Agriculture:					
89 335 Biological Control of Pests	\$ 250	\$ 0	\$ 250	\$ 248	\$ 2
89 335 Pesticide Use Survey	45	20	65	32	33
Total Department of Agriculture	\$ 295	\$ 20	\$ 315	\$ 280	\$ 35
Department of Health:					
89 335 Pesticide Breakdown Products Survey	\$ 165	\$ 43	\$ 208	\$ 200	\$ 8
89 335 Abandoned Well Technologies	100	(50)	50	2	48
89 335 Indoor Air Quality	54	2	56	10	46
89 335 Community Lead Abatement Project	50	30	80	80	0
Total Department of Health	\$ 369	\$ 25	\$ 394	\$ 292	\$ 102
Minnesota Historical Society:					
89 335 State History Center Exhibit	\$ 100	\$ 0	\$ 100	\$ 2	\$ 98
89 335 Historical Data Base	50	0	50	50	0
89 335 Heritage Trails	50	0	50	30	20
89 335 County and Local Historical Outreach	40	0	40	29	11
89 335 Heirloom Seeds	20	0	20	13	7
89 335 Preservation of Historic Shipwrecks	37	0	37	12	25
89 335 Implement Plan for Archaeological Resources	50	0	50	46	4
Total Minnesota Historical Society	\$ 347	\$ 0	\$ 347	\$ 182	\$ 165
Legislative Commission on Minnesota Resources:					
MS 86.72 Natural Resources Federal Reimbursement Account	\$ 0	\$ 36	\$ 36	\$ 0	\$ 36
89 335 Legislative Commission on Minnesota Resources	340	0	340	340	0
Total Legislative Cmen. on Minn. Resources	\$ 340	\$ 36	\$ 376	\$ 340	\$ 36
Department of Natural Resources:					
89 225 Minnesota River Basin Water Quality Monitoring	\$ 0	\$ 20	\$ 20	\$ 4	\$ 16
89 335 Brighton Beach Breakwater	0	265	265	17	248
89 335 Swan Lake Wildlife Project	0	1,055	1,055	581	474
89 335 Acquisition of Private Exploration Data	75	40	115	42	73
89 335 St Louis County Tract Index	40	0	40	40	0
89 335 Groundwater Sensitivity	362	0	362	354	8
89 335 River Bank and Meander Management	100	0	100	91	9
89 335 Development of Forest Soil Interpretations	25	0	25	25	0
89 335 Urban Forestry	50	0	50	21	29
89 335 Impacts of Forest Road Systems	85	0	85	64	21
89 335 Statewide Public Recreation Map	285	0	285	201	84
89 335 Camper Survey	15	0	15	15	0
89 335 American Youth Hostel Pilot Program	130	0	130	60	70
89 335 Trails Planning and Management	64	10	74	38	36
89 335 Ridgeline Hiking Trail	78	6	84	79	5
89 335 North Shore Harbors Study	100	0	100	100	0
89 335 Mississippi River Interpretive Center Planning	30	30	60	60	0
89 335 Urban Fishing Program	175	0	175	121	54
89 335 North American Waterfowl Plan Coordination	100	0	100	100	0
89 335 Purple Loosetrife Research	100	30	130	130	0
89 335 Polk County Local Volunteer Coordination	25	25	50	50	0

STATE OF MINNESOTA
MINNESOTA RESOURCES FUND
SCHEDULE OF REVENUES, EXPENDITURES
AND CHANGES IN FUND BALANCE - BUDGET AND ACTUAL
BUDGETARY BASIS
YEAR ENDED JUNE 30, 1990
(IN THOUSANDS)

Legal Citation Yr Chap		Budget	Authorized Budgetary Adjustments	Adjusted Budget	Actual	Variance: Favorable (Unfavorable)
	Department of Natural Resources (continued):					
89 335	Accelerated Land Exchange	100	0	100	98	2
89 335	Alternative Dispute Resolution	60	0	60	33	27
89 335	Trail Right-of-Way Protection	75	0	75	0	75
89 335	County Biological Survey	75	0	75	44	31
89 335	LAWCON Administration	40	0	40	40	0
	Total Department of Natural Resources	\$ 2,189	\$ 1,481	\$ 3,670	\$ 2,408	\$ 1,262
	Pollution Control Agency:					
89 335	Ambient Groundwater Monitoring Program	\$ 97	\$ 0	\$ 97	\$ 44	\$ 53
89 335	Minnesota River Basin Water Quality Monitoring	478	0	478	333	145
89 335	PCB's and Mercury in Public Waters	250	0	250	245	5
89 335	Biological Manipulation of Wastewater Treatment Ponds	73	0	73	65	8
89 335	Municipal Solid Waste Materials Recovery	200	0	200	48	154
89 335	Medical Waste Incinerator Evaluation	125	0	125	35	90
89 335	Dioxin from Incinerator Emissions	148	0	148	146	2
89 335	Household Batteries Recycling and Disposal	45	0	45	35	10
89 335	Ash as Soil Amendment	50	0	50	45	5
89 335	Health Risk Assessment Modeling for Composting	40	0	40	40	0
89 335	Contaminants in Minnesota Wildlife	87	0	87	69	18
89 335	Groundwater Sensitivity	0	83	83	27	56
89 335	Aquatic - Science Museum	0	45	45	23	22
	Total Pollution Control Agency	\$ 1,593	\$ 128	\$ 1,721	\$ 1,153	\$ 568
	Science Museum of Minnesota:					
89 335	Water Education for Minnesota	\$ 150	\$ 0	\$ 150	\$ 150	\$ 0
89 335	North Central Minnesota Water Quality Education	75	10	85	85	0
89 335	Aquatic Invertebrate Data Base Development	30	8	38	38	0
	Total Science Museum of Minnesota	\$ 255	\$ 18	\$ 273	\$ 273	\$ 0
	State Planning Agency:					
89 335	Statewide Land Use Update	\$ 225	\$ 0	\$ 225	\$ 225	\$ 0
89 335	Hydrologic Model Applications	55	2	57	57	0
	Total State Planning Agency	\$ 280	\$ 2	\$ 282	\$ 282	\$ 0
	State University System:					
89 335	Departmental Appropriation	\$ 170	\$ 0	\$ 170	\$ 164	\$ 6
89 335	Groundwater Quality Assessment	50	(3)	47	47	0
	Total State University System	\$ 220	\$ (3)	\$ 217	\$ 211	\$ 6
89 335	Department of Trade & Economic Development:	\$ 1,250	\$ 0	\$ 1,250	\$ 1,250	\$ 0
	University of Minnesota:					
89 335	Aeromagnetic Mapping	\$ 315	\$ 0	\$ 315	\$ 315	\$ 0
89 335	Biogeochemical Prospecting	75	0	75	75	0
89 335	Research in Taconite Refinement	100	0	100	100	0
89 335	Groundwater Research	10	0	10	10	0
89 335	Lake Superior Studies	25	0	25	25	0
89 335	Land Use Impacts on Lake Superior	120	0	120	120	0
89 335	County-Level Groundwater Data Management	43	0	43	43	0
89 335	Chemical Transport in Groundwater	150	0	150	150	0
89 335	Lake Aeration Techniques/Hydrologic Forecasting	414	0	414	414	0
89 335	Wetland Plant Communities	45	0	45	45	0
89 335	Water Filter for Iron Removal	14	0	14	14	0
89 335	Simulation of Future Forestry Economy	50	0	50	50	0
89 335	Oak Wilt Research	44	0	44	44	0
89 335	Lignin-Based Engineering Plastics	54	0	54	54	0
89 335	High Flotation Tire Research	20	0	20	20	0
89 335	Aquaculture Development and Education	100	0	100	100	0
89 335	Sonar Measurement of Fish Population	30	0	30	30	0
89 335	Accelerated Soil Survey	600	0	600	600	0

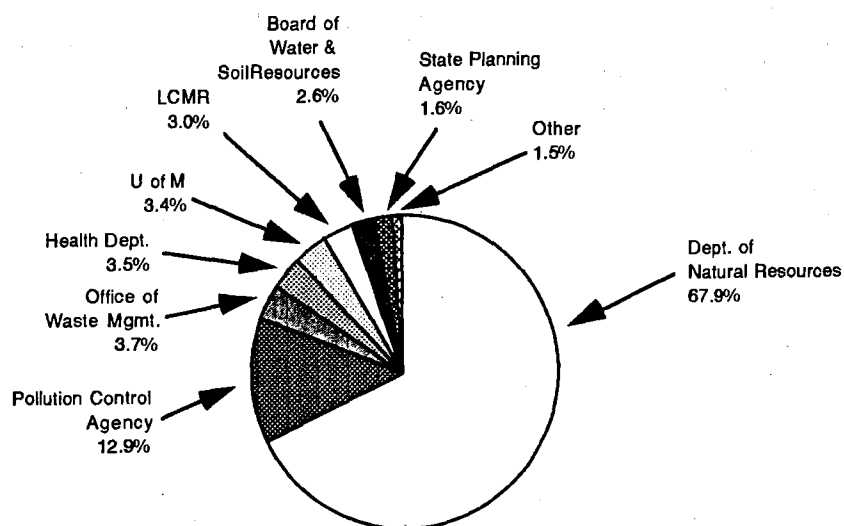
STATE OF MINNESOTA
MINNESOTA RESOURCES FUND
SCHEDULE OF REVENUES, EXPENDITURES
AND CHANGES IN FUND BALANCE - BUDGET AND ACTUAL
BUDGETARY BASIS
YEAR ENDED JUNE 30, 1990
(IN THOUSANDS)

Legal Citation Yr Chap	Budget	Authorized Budgetary Adjustments	Adjusted Budget	Actual	Variance: Favorable (Unfavorable)
University of Minnesota (continued):					
89 335 Densified Refuse Derived Fuel Emissions Testing	75	0	75	75	0
89 335 Peat for Containment of Municipal Incinerator Ash	75	0	75	0	75
89 335 Peat in Poultry Waste Treatment	65	0	65	65	0
89 335 Urban Gardening Program	45	0	45	45	0
Total University of Minnesota	<u>\$ 2,469</u>	<u>\$ 0</u>	<u>\$ 2,469</u>	<u>\$ 2,394</u>	<u>\$ 75</u>
Total Expenditures	<u>\$ 9,807</u>	<u>\$ 1,707</u>	<u>\$ 11,314</u>	<u>\$ 9,065</u>	<u>\$ 2,249</u>
Excess of Revenues and Transfers-In Over (Under)					
Expenditures			\$ (3,442)	\$ (401)	\$ 3,041
Budgetary Fund Balance, July 1, 1989			5,805	5,805	0
Prior Year Adjustments			0	28	28
Undesignated Fund Balance, June 30, 1990			<u>\$ 2,163</u>	<u>\$ 5,232</u>	<u>\$ 3,069</u>

Minnesota Environment and Natural Resource Trust Fund
Minnesota Constitution: Article XI, Sec. 14 and M.S. 116P.04

Revenues \$3,624,078
Expenditures -0-

STATE ENVIRONMENT AND NATURAL RESOURCES EXPENDITURES FOR FY 1990



Department of Natural Resources.....	\$166,378,000
Pollution Control Agency.....	31,594,000
Office of Waste Management.....	9,144,000
Health Department	8,494,000
University of Minnesota	
Natural Resources Research Institute.....	4,190,000
College of Natural Resources.....	1,743,000
Minnesota Geological Survey.....	1,693,000
Mineral Resources Research Center.....	792,000
Legislative Commission on Minnesota Resources	7,233,000
Board of Water and Soil Resources	6,275,000
State Planning Agency - Environmental Programs	3,888,000
Others	1,785,000
Department of Agriculture - Environmental Programs	1,517,000
DTED - Park Grants Administration.....	307,000
MN / Wisconsin Boundary Area Commission	<u>110,000</u>

TOTAL..... \$245,143,000 *

* Does not include state bonding or federal funds.

ESTIMATE OF REVENUES AVAILABLE TO THE LCMR FOR FUNDING RECOMMENDATIONS

<u>Appropriation Year</u>	<u>Environment and Natural Resources Trust Fund</u>	<u>Future Resources Fund</u>	<u>Oil Overcharge</u>	<u>TOTAL</u>
1993	24,000,000	15,000,000	1,000,000	40,000,000
1995	26,000,000	14,500,000	1,000,000	41,500,000
1997	30,000,000	14,000,000	1,000,000	45,000,000
1999	36,000,000	13,000,000	1,000,000	50,000,000

Assumptions: for ENRTF: 338,000,000 gross revenue
40% of net to ENRTF
interest @ 8%

for MFRF: 2% annual decrease in cigarette tax receipts

1991 LCMR FUNDING STRATEGIES

Strategies guiding the project recommendations are listed below, by issue area.

RECREATION AND FISHERIES

- * Develop significant recreational opportunities through increased access and acquisition for trails, lakes, rivers and streams.
- * Preserve and manage river, lake and stream resources.
- * Enhance recreational resource uses in urban areas.
- * Provide natural and historic resource preservation and interpretation.
- * Improve sportfishing and hunting opportunities.

WATER

- * Broaden the base of water monitoring activities through citizen and local government partners.
- * Accelerate land and water restoration activities by pursuing new research techniques.

NATURAL RESOURCE AND ENVIRONMENTAL EDUCATION

- * Coordinate lifelong learning opportunities through a variety of deliverers of environmental education.
- * Address future needs through planning efforts.
- * Increase learning opportunities for persons with disabilities and minority and urban populations.
- * Target inservice training and continuing education opportunities for natural resource and education professionals.

AGRICULTURE, WILDLIFE, AND FORESTRY

- * Improve land and resource management practices.
- * Increase the potential of biological, nonchemical controls of pests and exotic species.
- * Broaden and increase the understanding of managing the forest ecosystem for the impacts on forest resources and wildlife.
- * Provide for wetland restoration, information, education and easement acquisition to enhance wildlife habitat, control erosion and improve water quality.
- * Maintain the diversity of the ecosystem through research, acquisition, monitoring and data collection.

LAND, MINERALS, WASTE AND ENERGY

- * Support all natural resource management by providing basic data collection and mapping.
- * Determine new mineral resource and technology potential.
- * Research and develop alternative uses for problem wastes and production by-products.
- * Increase energy efficiency and conservation to reduce energy generation and consumption and the resulting pollution.

LEGISLATIVE COMMISSION ON MINNESOTA RESOURCES (LCMR) 1991 FINAL RECOMMENDATIONS

These LCMR recommendations are supported by funding from the following sources:

Minnesota Future Resources Fund	17,399,000
Environment and Natural Resources Trust Fund (noted as TF)	13,960,000
Oil Overcharge (Subd. 14)	1,050,000
TOTAL	32,409,000

Projects consistent with the RIM Statutes are noted (R)
There are 26 such projects which total \$10,556,000.

Subd. 2 LCMR Administration 850,000

Subd. 3 RECREATION 4,364,000

	(a) Off-Highway Vehicle Recreation Area	75,000
	(b) Superior Hiking Trail	400,000
	(c) Rails-to-Trails Acquisition and Development	1,000,000
	(d) Local Rivers Planning	400,000
R	(e) Access to Lakes and Rivers	1,000,000
TF	(f) Land/Water Resource Management Lower St. Croix Riverway	360,000
TF	(g) Mississippi River Valley Blufflands Initiative	150,000
	(h) Reclamation of Recreation Systems & Environmental Resources	200,000
	(i) Preservation of Historic Shipwrecks Lake Superior	100,000
	(j) Pokegama Lake Outlet Channel	15,000
	(k) Land & Water Conservation Fund Administration	84,000
	(l) Historic Records Database-Final Phase	180,000
	(m) Fur Trade Research and Planning	250,000
	(n) Mystery Cave State Park Resource Evaluation	150,000

Subd. 4 WATER 4,769,000

TF	(a) Stream and Watershed Information System	200,000
TF	(b) S Cen Minnesota Surface Water Resource Atlases/Data Base	300,000
TF	(c) Minnesota River Basin Water Quality Monitoring	700,000
	(d) Waterwatch-Citizen Monitoring and Protection Program	272,000
	(e) Bioremedial Technology for Groundwater	96,000
TF	(f) County Geologic Atlas and Groundwater Sensitivity Mapping	1,400,000
	(g) Aquifer Analyses in Southeast Minnesota	73,000
TF R	(h) Clean Water Partnership/Grants to Local Units of Government	700,000
TF R	(i) Cannon River Watershed Grants	60,000
TF	(j) Mitigating Mercury in Northeast Minnesota Lakes	300,000
	(k) Development and Application of Aeration Technologies	148,000
	(l) Lake Superior Initiative/Institute for Research	400,000
	(m) Lake Mille Lacs Public Land Use Plan	20,000
TF R	(n) Ecological Evaluation of Year-Round Aeration	100,000

Subd. 5. EDUCATION 2,885,000

TF	(a) Environmental Education Program	790,000
	(b) Teacher Training for Environmental Education	5,000
TF	(c) Video Education Research and Demonstration Project	100,000
TF	(d) Integrated Resource Mgmt Education and Training Program	300,000
	(e) Continuing Ed in Outdoor Rec For Natural Resource Mgrs	125,000
TF R	(f) Environmental Exhibits Collaborative	400,000
	(g) Upper Mississippi River Environmental Education Center	600,000
	(h) Urban Rangers Program	100,000
	(i) Crosby Farm Park Nature Program	85,000
	(j) Youth in Natural Resources	250,000
	(k) Environmental Education for Handicapped	130,000

Subd. 6 AGRICULTURE		2,490,000
TF	(a) Biological Control of Pests	650,000
	(b) Review Levels of Pesticides at Spill Sites	300,000
	(c) Effective Nitrogen/Water Mgt for Sensitive Areas	300,000
TF R	(d) Conservation Reserve Easements	1,000,000
	(e) Native Grass and Wildflower Seed	130,000
	(f) Community Gardening Program	110,000
Subd. 7 FORESTRY		1,550,000
R	(a) Minnesota's Old-Growth Forests: Character and Identification	150,000
	(b) Nutrient Cycling and Tree Species Suitability	220,000
R	(c) State Forest Land Acquisition	500,000
	(d) Means for Producing Lignin-Based Plastics	100,000
	(e) Regeneration and Management of Minnesota's Oak Forests	225,000
R	(f) Private Forest Management for Oak Regeneration	200,000
	(g) Aspen Hybrids and New Tissue Culture Techniques	70,000
	(h) Aspen Decay Models for Mature Aspen Stands	85,000
Subd. 8 FISHERIES		2,020,000
R	(a) Pilot Fish Pond Complex-Fisheries Development and Education	250,000
	(b) Aquaculture Facility Purchase and Dev and Genetic Gamefish	1,200,000
R	(c) Cooperative Urban Aquatic Research Education Program	340,000
R	(d) Catch and Release Program	35,000
	(e) Metropolitan Lakes Fishing Opportunities	75,000
R	(f) Lake Minnetonka Bass Tracking	85,000
	(g) Stocking Survey	35,000
Subd. 9 WILDLIFE		5,500,000
TF R	(a) Insecticide Impact on Wetland and Upland Wildlife	650,000
TF	(b) Biological Control Eurasian Water Milfoil	100,000
	(c) Microbial and Genetic Strategies For Mosquito Control	150,000
TF R	(d) Minnesota County Biological Survey	1,000,000
TF R	(e) Data Base for Plants of Minnesota	130,000
TF	(f) Aquatic Invertebrate Assessment Archive	130,000
TF R	(g) Wetlands Forum	40,000
TF R	(h) Easement Acquisition on Restored Wetlands	400,000
R	(i) Swan and Heron Lake Area Projects	1,000,000
	(j) Wildlife Oriented Rec Fac/Sandstone Unit Nat Wildlife Refuge	9,000
TF R	(k) Reinvest in Minnesota Critical Habitat Match	1,000,000
R	(l) Acquisition and Development of Scientific and Natural Areas	300,000
R	(m) Black Bear Research in East Central Minnesota	100,000
R	(n) Partnership for Accelerated Wild Turkey Management	50,000
TF	(o) Restore Thomas Sadler Roberts Bird Sanctuary	50,000
TF R	(p) Changes in Ecosystem on Biodiversity of Forest Birds	300,000
	(q) Establish Northern Raptors Rehabilitation and Ed Facility	75,000
R	(r) Effect of Avian Flu Virus in Wild Waterfowl	16,000
Subd. 10 LAND		4,826,000
TF	(a) Base Maps for 1990's	1,900,000
	(b) Accelerated Soil Survey	1,270,000
TF R	(c) Statewide Natl Wetlands Inv/PWI/Watershed Map Digitization	750,000
	(d) Statewide Land Use Update	338,000
	(e) Local Geographic Information System Program	143,000
	(f) Geographic Information System Control Point Inventory	175,000
	(g) Land Use and Design Strategies to Enhance Env Quality	100,000
	(h) Model Residential Land Use Guidelines	150,000

Subd. 11 MINERALS	620,000
(a) Subsurface Greenstone Belts in Southwestern Minnesota	120,000
(b) Direct Smelting	500,000
Subd. 12 WASTE	385,000
(a) Remediation of Soils by Co-Composting with Leaves	135,000
(b) Land Spreading of Yard Wastes	100,000
(c) Cellulose Rayons for Biodegradable Packaging	150,000
Subd. 13 ENERGY	
(a) Tree and Shrub Planting for Energy in Minnesota Communities	300,000
Subd. 14 OIL OVERCHARGE	1,050,000
(a) Traffic Signal Timing and Optimization Program	500,000
(b) Waste Crumb Rubber in Roadways	100,000
(c) Biodegradable Plastics-Microbial and Crop Plant Systems	150,000
(d) Agricultural Energy Savings Information	150,000
(e) Residential Urban Environmental Resource Audit	150,000
Subd. 15 Contingent Account	800,000

1 Sec. ... MINNESOTA RESOURCES

2 Subdivision 1. Total

3 Appropriation 32,409,000

4 Summary by fund

5 Minnesota Future Resources Fund

6 \$17,399,000

7 Minnesota Environment and Natural

8 Resources Trust Fund

9 \$13,960,000

10 Oil Overcharge Money in the Special

11 Revenue Fund

12 \$ 1,050,000

13 The appropriations in this section are

14 from the Minnesota future resources

15 fund, unless another fund is named.

16 The appropriations in this section are

17 available until June 30, 1993.

18 Subd. 2. Legislative Commission on

19 Minnesota Resources 850,000

20 For the biennium ending June 30, 1993,

21 the commission shall monitor the

22 programs in this section; assess the

23 status of the state's natural

24 resources; convene a state resource

25 congress; establish priorities for,

26 request, review, and recommend programs

27 for the 1993-95 biennium from the

28 Minnesota future resources fund,

29 Minnesota environment and natural

30 resources trust fund, and oil

31 overcharge money, and for support of

32 the Citizen Advisory Committee

33 activities.

34 Subd. 3. Recreation

35 (a) Off-highway Vehicle Recreation Area 75,000

1 This appropriation is to the
2 commissioner of natural resources to
3 conduct a study in cooperation with the
4 Minnesota 4-WD Association on the
5 feasibility of an off-highway vehicle
6 recreation area.

7 (b) Superior Hiking Trail 400,000

8 This appropriation is to the
9 commissioner of natural resources for
10 planning and administrative assistance
11 and a grant to the Superior Hiking
12 Trail Association for planning,
13 development, and limited use of
14 easement acquisition. The use of
15 conservation corps resources is
16 strongly encouraged. Up to \$80,000 is
17 available to the commissioner for
18 planning and administrative
19 assistance. Available federal and
20 private money is appropriated.

21 (c) Rails-to-Trails Acquisition and

22 Development 1,000,000

23 This appropriation is to the
24 commissioner of natural resources for
25 acquisition and development of trails
26 in accordance with established
27 priorities.

28 (d) Local Rivers Planning 400,000

29 This appropriation is to the
30 commissioner of natural resources for
31 grants of up to two-thirds of the cost
32 to counties, or groups of counties
33 acting pursuant to joint powers
34 agreement, to develop comprehensive
35 plans for the management and protection
36 of up to eight rivers in northern and
37 central Minnesota. The commissioner of
38 natural resources shall include in the
39 work plan for review and approval by
40 the legislative commission on Minnesota
41 resources a proposed list of rivers and
42 a planning process developed by
43 consensus of the affected counties.
44 All plans must meet or exceed the
45 requirements of state shoreland and
46 floodplain laws.

1 (e) Access to Lakes and Rivers 1,000,000

2 This appropriation is to the
3 commissioner of natural resources to
4 provide boat access to major recreation
5 lakes and construct fishing piers in
6 accordance with established priorities,
7 inventory, map, and construct shore
8 access sites in the metropolitan area.

9 (f) Land and Water Resource Management,

10 Lower St. Croix Riverway 360,000

11 This appropriation is from the
12 Minnesota environment and natural
13 resources trust fund to the
14 commissioner of natural resources for a
15 grant to the Minnesota-Wisconsin
16 Boundary Area Commission to develop a
17 management strategy, improved technical
18 capability, and sustained local
19 government and landowner stewardship on
20 the jointly managed lower St. Croix.

21 (g) Mississippi River Valley Blufflands

22 Initiative 150,000

23 This appropriation is from the
24 Minnesota environment and natural
25 resources trust fund to the
26 commissioner of natural resources to
27 assist local units of government to
28 develop the tools necessary to protect
29 the outstanding scenic and biological
30 resources of the blufflands of the
31 Mississippi Valley in Goodhue, Wabasha,
32 Winona, and Houston counties.

33 (h) Reclamation of Recreation Systems and

34 Environmental Resources 200,000

35 This appropriation is to the University
36 of Minnesota, College of Architecture
37 and Landscape Architecture, to
38 investigate urban design strategies for
39 enhancing recreational amenities in
40 suburban areas. The investigation
41 shall be done in cooperation with the
42 metropolitan council.

43 (i) Preservation of Historic Shipwrecks,

01/15/91

[COUNSEL] PSW

SC9400-1

1	Lake Superior	100,000
2	\$80,000 is to the Minnesota historical	
3	society to investigate the historic	
4	significance of shipwrecks on the North	
5	Shore of Lake Superior in accordance	
6	with priorities for placement on the	
7	National Register of Historic Places;	
8	to develop preservation plans to	
9	implement the federal Abandoned	
10	Shipwrecks Act; and to conduct a survey	
11	of the underwater resources in the	
12	vicinity of Split Rock Lighthouse.	
13	\$20,000 is to the commissioner of	
14	natural resources to develop facilities	
15	at Split Rock Lighthouse State Park for	
16	diver access.	
17	(j) Pokegama Lake Outlet Channel	15,000
18	This appropriation is to the	
19	commissioner of natural resources to	
20	work with the Pokegama Lake Association	
21	to develop an environmentally sensitive	
22	design for and to install a permanent	
23	outlet channel for Pokegama Lake. This	
24	appropriation must be matched by	
25	\$15,000 of local money, which must be	
26	spent before the grant is made.	
27	(k) Land and Water Conservation Fund	
28	Administration	84,000
29	This appropriation is to the	
30	commissioner of natural resources for	
31	administration of the federal land and	
32	water conservation program.	
33	(l) Historic Records Database -	
34	Final Phase	180,000
35	This appropriation is to the Minnesota	
36	historical society to automate and make	
37	widely accessible the society's	
38	collections.	
39	(m) Fur Trade Research and Planning	250,000
40	This appropriation is to the Minnesota	
41	historical society to plan and design	
42	the visitor center at the Northwest	

1 Company Fur Post Historic Site, and for
2 site improvements at that site. No
3 more than \$100,000 may be spent for
4 site improvements.

5 (n) Mystery Cave State Park Resource

6 Evaluation 150,000

7 This appropriation is to the
8 commissioner of natural resources to
9 perform a resource inventory and study
10 of Mystery Cave State Park to include
11 groundwater, cave meteorology, geology,
12 and biology as part of the park plan.

13 Subd. 4. Water

14 (a) Stream and Watershed Information

15 System 200,000

16 This appropriation is from the
17 Minnesota environment and natural
18 resources trust fund to the
19 commissioner of state planning to
20 develop an integrated system of
21 information relating to streams,
22 watersheds, and retrieval and analysis
23 tools.

24 (b) South Central Minnesota Surface Water

25 Resource Atlases and Data Base 300,000

26 This appropriation is from the
27 Minnesota environment and natural
28 resources trust fund to the
29 commissioner of natural resources for a
30 grant to Mankato State University for
31 development of surface hydrology
32 atlases and data base in both hard and
33 electronic format for the 13 counties
34 of south central Minnesota.

35 (c) Minnesota River Basin Water Quality

36 Monitoring 700,000

37 This appropriation is from the
38 Minnesota environment and natural
39 resources trust fund to the
40 commissioner of the pollution control
41 agency. This is the final two years of

1 a multiagency four-year effort to
2 identify the sources of nonpoint
3 pollution threatening the water quality
4 and uses of the Minnesota River. The
5 results will be used to direct state
6 and local implementation programs.
7 Federal matching money is appropriated.

8 (d) Waterwatch - Citizen Monitoring
9 and Protection Program 272,000

10 This appropriation is to the
11 commissioner of the pollution control
12 agency to encourage and coordinate
13 citizen and student volunteer
14 monitoring of water quality and
15 biological indicators for Minnesota's
16 lakes and streams.

17 (e) Bioremedial Technology for
18 Groundwater 96,000

19 This appropriation is to the University
20 of Minnesota, Department of Civil and
21 Mineral Engineering, for a pilot
22 demonstration of technology for in situ
23 biodegradation of organic pollutants in
24 groundwater.

25 (f) County Geologic Atlas and
26 Groundwater Sensitivity Mapping 1,400,000

27 \$800,000 is from the Minnesota
28 environment and natural resources trust
29 fund to the University of Minnesota,
30 Minnesota Geologic Survey, to expand
31 production of county geologic atlases
32 and create a new atlas services office.

33 \$600,000 is from the Minnesota
34 environment and natural resources trust
35 fund to the commissioner of natural
36 resources for groundwater sensitivity
37 mapping.

38 (g) Aquifer Analyses in southeast
39 Minnesota 73,000

40 This appropriation is to the
41 commissioner of natural resources for a

1 grant to Winona State University to
2 perform aquifer tests in southeast
3 Minnesota in order to determine aquifer
4 characteristics, surface-subsurface
5 groundwater interaction, and aquifer
6 interaction.

7 (h) Clean Water Partnership Grants
8 to Local Units of Government 700,000

9 This appropriation is from the
10 Minnesota environment and natural
11 resources trust fund to the
12 commissioner of the pollution control
13 agency for Clean Water Partnership
14 grants under Minnesota Statutes,
15 section 115.096. In addition to the
16 required work program, grants may not
17 be approved until grant proposals have
18 been submitted to the legislative
19 commission on Minnesota resources and
20 the commission has either made a
21 recommendation or allowed 30 days to
22 pass without making a recommendation.

23 (i) Cannon River Watershed Grants 60,000

24 This appropriation is from the
25 Minnesota environment and natural
26 resources trust fund to the board of
27 water and soil resources to provide
28 research and demonstration grants to
29 counties consistent with the
30 comprehensive local water management
31 program under Minnesota Statutes,
32 chapter 110B, as part of the Cannon
33 River watershed protection program.

34 (j) Mitigating Mercury in Northeast
35 Minnesota Lakes 300,000

36 This appropriation is from the
37 Minnesota environment and natural
38 resources trust fund to the
39 commissioner of the pollution control
40 agency to investigate how to mitigate
41 the damage caused by the presence of
42 mercury in northeast Minnesota lakes.

43 (k) Development and Application of
44 Aeration Technologies 148,000

1 This appropriation is to the University
2 of Minnesota, St. Anthony Falls
3 Hydraulic Laboratory, to study how to
4 optimize membrane aeration and the
5 hydraulic design of bypass type aerator
6 systems.

7 (1) Lake Superior Initiative - Institute

8 for Research 400,000

9 This appropriation is to the University
10 of Minnesota, Graduate School, to
11 establish an institute for Lake
12 Superior Research that would develop a
13 strong multifaceted research effort.

14 (m) Lake Mille Lacs Public Land Use Plan 20,000

15 This appropriation is to the
16 commissioner of natural resources to
17 plan for shoreline management of
18 publicly-owned lands around Lake Mille
19 Lacs.

20 (n) Ecological Evaluation of Year-Round

21 Aeration 100,000

22 This appropriation is from the
23 Minnesota environment and natural
24 resources trust fund to the
25 commissioner of natural resources to
26 collect baseline data on aerated and
27 nonaerated lakes and determine
28 ecological impacts of aeration.

29 Subd. 5. Education

30 (a) Environmental Education Program 790,000

31 \$400,000 is from the Minnesota
32 environment and natural resources trust
33 fund to the commissioner of education
34 to develop and implement model K-12
35 environmental education curriculum
36 integration. This program will
37 incorporate ongoing models of other
38 deliverers of environmental education.

39 \$30,000 is from the Minnesota
40 environment and natural resources trust
41 fund to the commissioner of education
42 for a grant to the Minnesota Community

1 Education Association to incorporate
2 environmental education into the
3 community education system.

4 \$60,000 is from the Minnesota
5 environment and natural resources trust
6 fund to the commissioner of natural
7 resources to complete a long-term plan
8 for the development and coordination of
9 environmental learning centers.

10 \$85,000 is from the Minnesota
11 environment and natural resources trust
12 fund to the commissioner of state
13 planning for a grant to the Audubon
14 Center of the Northwoods for an
15 assessment of environmental learning
16 center programs and services.

17 \$215,000 is from the Minnesota
18 environment and natural resources trust
19 fund to the commissioner of state
20 planning to develop a statewide
21 environmental education plan. The
22 statewide plan will integrate the
23 plans, strategies, and policies of the
24 department of education, post-secondary
25 institutions, the department of natural
26 resources, and other deliverers of
27 environmental education.

28 (b) Teacher Training for Environmental
29 Education

30 This appropriation is to the
31 commissioner of education for a grant
32 to the St. Paul Chapter of the National
33 Audubon Society for scholarships for
34 the training of teachers in
35 environmental education integration.

36 (c) Video Education Research and
37 Demonstration Project

38 This appropriation is from the
39 Minnesota environment and natural
40 resources trust fund to the
41 commissioner of education for a grant
42 to Twin Cities Public Television to
43 develop a video education demonstration
44 project and a model for a statewide
45 video environmental education

5,000

100,000

- 1 communication network.
- 2 (d) Integrated Resource Management
- 3 Education and Training Program 300,000
- 4 This appropriation is from the
5 Minnesota environment and natural
6 resources trust fund to the
7 commissioner of natural resources to
8 provide training and internship
9 programs in natural resource management.
- 10 (e) Continuing Education in Outdoor
- 11 Recreation for Natural Resource Managers 125,000
- 12 This appropriation is to the University
13 of Minnesota, Department of Forest
14 Resources, to develop and implement an
15 outdoor recreation short course for
16 natural resource planners and managers
17 with outdoor recreation
18 responsibilities.
- 19 (f) Environmental Exhibits Collaborative 400,000
- 20 This appropriation is from the
21 Minnesota environment and natural
22 resources trust fund to the Science
23 Museum of Minnesota to establish a
24 statewide collaborative to share and
25 create traveling water-related exhibits
26 and programs for schools and family
27 groups at different sites.
- 28 (g) Upper Mississippi River Environmental
- 29 Education Center 600,000
- 30 This appropriation is to the
31 commissioner of natural resources for a
32 grant to the city of Winona to develop
33 detailed architectural designs
34 necessary to obtain federal
35 construction funding for an Upper
36 Mississippi River Environmental
37 Education Center. This appropriation
38 is contingent upon federal commitment
39 of at least \$6,000,000 for construction
40 and for future operation and
41 maintenance.
- 42 (h) Urban Rangers Program 100,000

1 This appropriation is to the
2 commissioner of education for a grant
3 to the Minneapolis Park and Recreation
4 Board to develop an urban environmental
5 curriculum for elementary students and
6 families conducted at 44 city
7 recreation centers.

8 (i) Crosby Farm Park Nature Program 85,000

9 This appropriation is to the
10 commissioner of education for a grant
11 to the city of St. Paul to institute a
12 nature study program at Crosby Farm
13 Park to introduce inner city residents
14 and minorities to learning
15 opportunities concerning natural
16 resources and how to conserve and
17 protect those resources.

18 (j) Youth in Natural Resources 250,000

19 This appropriation is to the
20 commissioner of natural resources to
21 develop a career exploration program
22 for minority youths and to test their
23 vocational interests, skills, and
24 aptitudes.

25 (k) Environmental Education for

26 Handicapped 130,000

27 This appropriation is to the
28 commissioner of education for a grant
29 to Vinland National Center to develop a
30 program model in environmental
31 education, including education of
32 persons with disabilities, and to teach
33 the model to educators,
34 environmentalists, and the disability
35 community.

36 Subd. 6. Agriculture

37 (a) Biological Control of Pests 650,000

38 This appropriation is from the
39 Minnesota environment and natural
40 resources trust fund to the
41 commissioner of agriculture to collect
42 and identify potential biological
43 control agents, and to develop and test
44 biological control agents for a variety

1 of pests. A grant request to
2 supplement this appropriation must be
3 submitted to the U.S. Department of
4 Agriculture and the results reported to
5 the legislative commission on Minnesota
6 resources.

7 (b) Review Levels of Pesticides at

8 Spill Sites 300,000

9 This appropriation is to the
10 commissioner of agriculture for a
11 literature search and publication of
12 remediation technologies for pesticide
13 spills, laboratory research on the fate
14 of elevated levels of pesticides in
15 soil, and evaluation of bioremediation
16 techniques.

17 (c) Effective Nitrogen and Water

18 Management for Sensitive Areas 300,000

19 This appropriation is to the
20 commissioner of agriculture to provide
21 an integrated research information base
22 on risks of groundwater pollution
23 involved in nitrogen and water
24 management for crop production.

25 (d) Conservation Reserve Easements 1,000,000

26 This appropriation is from the
27 Minnesota environment and natural
28 resources trust fund to the board of
29 water and soil resources to acquire
30 perpetual easements under Minnesota
31 Statutes, section 40.43, subdivision 3,
32 with priority for wetland areas, to
33 enhance wildlife habitat, control
34 erosion, and improve water quality.

35 (e) Native Grass and Wildflower Seed 130,000

36 This appropriation is to the
37 commissioner of agriculture in
38 cooperation with the commissioner of
39 natural resources to develop the
40 varietal, cultural, and market
41 information necessary to encourage
42 expanded commercial production of
43 Minnesota origin native wildflower and
44 grass seed.

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1 (f) Community Gardening Program 110,000

2 This appropriation is to the University
3 of Minnesota, Minnesota Extension
4 Service, in cooperation with the
5 Minnesota State Horticultural Society
6 and the Self Reliance Center to provide
7 gardening information and technical
8 assistance in metropolitan and
9 nonmetropolitan areas.

10 Subd. 7. Forestry

11 (a) Minnesota Old-Growth Forests -

12 Character and Identification 150,000

13 This appropriation is to the
14 commissioner of natural resources to
15 develop quantitative, structural
16 definitions of Minnesota old-growth
17 forest types, examine the importance of
18 old growth as sensitive habitat, and
19 evaluate old-growth forest stands that
20 are identified as the department of
21 natural resources old-growth guidelines
22 are implemented.

23 (b) Nutrient Cycling and Tree Species

24 Suitability 220,000

25 This appropriation is to the University
26 of Minnesota, Department of Forest
27 Resources, to assess the role of
28 nutrient cycling and associated
29 management practices for sustainability
30 of Minnesota's forest resources under
31 scenarios of increased harvesting and
32 atmospheric change.

33 (c) State Forest Land Acquisition 500,000

34 This appropriation is to the
35 commissioner of natural resources to
36 acquire lands in the highest priority
37 purchase compartments in the R. J.
38 Dorer Memorial Hardwood State Forest.

39 (d) Means for Producing Lignin-Based

40 Plastics 100,000

41 This appropriation is to the University

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[COUNSEL] PSW

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1 of Minnesota, Department of Forest
2 Products, to develop means for
3 fabricating engineering plastics based
4 upon industrial by-product lignins and
5 corresponding raw materials from wheat
6 straw.

7 (e) Regeneration and Management of

8 Minnesota's Oak Forests 225,000

9 This appropriation is to the University
10 of Minnesota, Minnesota Extension
11 Service, for research and education in
12 oak regeneration and management.

13 (f) Private Forest Management for Oak

14 Regeneration 200,000

15 This appropriation is to the
16 commissioner of natural resources to
17 increase technical assistance to
18 private forest landowners in southern
19 Minnesota for oak regeneration.

20 (g) Aspen Hybrids and New Tissue

21 Culture Techniques 70,000

22 This appropriation is to the University
23 of Minnesota, Department of Forest
24 Resources, to research tissue cultured
25 aspen and hybrid aspen clones.

26 (h) Aspen Decay Models for Mature

27 Aspen Stands 85,000

28 This appropriation is to the
29 commissioner of natural resources to
30 contract with Koochiching county and
31 the University of Minnesota, College of
32 Natural Resources, to develop models
33 for aspen decay in mature aspen stands.

34 Subd. 8. Fisheries

35 (a) Pilot Fish Pond Complex - Fisheries

36 Development and Education 250,000

37 This appropriation is to the
38 commissioner of natural resources for a

1 grant to the Leech Lake Band of
2 Chippewa Indians to develop fish ponds
3 for production of sportfish and
4 baitfish.

5 (b) Aquaculture Facility Purchase and
6 Development and Genetic Gamefish
7 Growth Studies 1,200,000

8 This appropriation is to the University
9 of Minnesota, College of Natural
10 Resources, to acquire and develop an
11 aquaculture facility and to continue
12 research on genetically engineered
13 gamefish.

14 (c) Cooperative Urban Aquatic Research
15 Education Program 340,000

16 This appropriation is to the
17 commissioner of natural resources to
18 expand urban fishing opportunities and
19 awareness.

20 (d) Catch and Release Program 35,000

21 This appropriation is to the
22 commissioner of natural resources to
23 accelerate the catch and release
24 portion of the CORE program for
25 matching grants to local anglers clubs
26 for promotion of catch and release
27 statewide. The work must be done in
28 cooperation with the Minnesota
29 Sportfishing Congress and other
30 interested groups.

31 (e) Metropolitan Lakes Fishing
32 Opportunities 75,000

33 This appropriation is to the
34 commissioner of natural resources to
35 study metropolitan area lakes to
36 determine if recreational fishing
37 opportunities are being maximized. The
38 study must be done in cooperation with
39 the Minnesota Sportfishing Congress and
40 other interested groups.

41 (f) Lake Minnetonka Bass Tracking 85,000

1 This appropriation is to the
2 commissioner of natural resources to
3 study the impacts of bass fishing
4 contests. The study must be done in
5 cooperation with the Minnesota
6 Sportfishing Congress and other
7 interested groups.

8 (g) Stocking Survey 35,000

9 This appropriation is to the
10 commissioner of natural resources to
11 survey organizations to determine the
12 level of interest in public and private
13 fish stocking activities. The survey
14 must be done in cooperation with the
15 Minnesota Sportfishing Congress and
16 other interested groups.

17 Subd. 9. Wildlife

18 (a) Insecticide Impact on Wetland

19 and Upland Wildlife 650,000

20 This appropriation is from the
21 Minnesota environment and natural
22 resources trust fund to the
23 commissioner of natural resources to
24 research the effect of insecticides on
25 wetland and upland wildlife and
26 habitats.

27 (b) Biological Control of Eurasian

28 Water Milfoil 100,000

29 This appropriation is from the
30 Minnesota environment and natural
31 resources trust fund to the
32 commissioner of natural resources to
33 continue a cooperative research program
34 between the department of natural
35 resources, Freshwater Foundation, and
36 the University of Minnesota leading to
37 biological control of Eurasian water
38 milfoil. This appropriation must be
39 matched by \$200,000 from the Freshwater
40 Foundation.

41 (c) Microbial and Genetic Strategies for

42 Mosquito Control 150,000

1 This appropriation is to the University
2 of Minnesota, Department of Entomology,
3 to enhance mosquito control by
4 development of microbial agents that
5 are environmentally safe and specific
6 for mosquitoes.

7 (d) Minnesota County Biological Survey 1,000,000

8 This appropriation is from the
9 Minnesota environment and natural
10 resources trust fund to the
11 commissioner of natural resources to
12 continue the biological survey in
13 Minnesota counties previously funded by
14 Laws 1989, chapter 335, article 1,
15 section 29, subdivision 3, item (t).

16 (e) Data Base for Plants of Minnesota 130,000

17 This appropriation is from the
18 Minnesota environment and natural
19 resources trust fund to the University
20 of Minnesota to computerize the data
21 base for Minnesota plants, including
22 precise information on the
23 distribution, ecology, history, and
24 management of each species.

25 (f) Aquatic Invertebrate Assessment

26 Archive 130,000

27 This appropriation is from the
28 Minnesota environment and natural
29 resources trust fund to the
30 commissioner of the pollution control
31 agency, in cooperation with the Science
32 Museum of Minnesota, to continue work
33 on a record system for aquatic
34 invertebrates and assign pollution
35 tolerance values and to develop a
36 monitoring and information system for
37 the zebra mussel.

38 (g) Wetlands Forum 40,000

39 This appropriation is from the
40 Minnesota environment and natural
41 resources trust fund to the
42 commissioner of natural resources to
43 improve communication and information
44 exchange regarding wetlands in the
45 metropolitan area. This appropriation

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1 must be matched by \$40,000 from the
2 Freshwater Foundation.

3 (h) Easement Acquisition on Restored
4 Wetlands 400,000

5 This appropriation is from the
6 Minnesota environment and natural
7 resources trust fund to the board of
8 water and soil resources to contract
9 with the United States Fish and
10 Wildlife Service and the Isaak Walton
11 League to acquire permanent easements
12 on federally restored wetlands.

13 (i) Swan and Heron Lake Area Projects 1,000,000

14 This appropriation is to the
15 commissioner of natural resources.
16 First priority is for acquisition that
17 qualifies for federal match. Second
18 priority is for land management
19 activities. Federal and other matching
20 money is appropriated.

21 (j) Wildlife Oriented Recreation
22 Facilities at Sandstone Unit National
23 Wildlife Refuge 9,000

24 This appropriation is to the
25 commissioner of natural resources to
26 contract with Rice Lake National
27 Wildlife Refuge for recreation facility
28 development and access at the Sandstone
29 Unit of Rice Lake National Wildlife
30 Refuge.

31 (k) Reinvest in Minnesota Critical
32 Habitat Match 1,000,000

33 This appropriation is from the
34 Minnesota environment and natural
35 resources trust fund to the
36 commissioner of natural resources for
37 transfer to the critical habitat
38 private sector matching account under
39 Minnesota Statutes, section 84.943.

40 (l) Acquisition and Development of

1 Scientific and Natural Areas 300,000

2 This appropriation is to the
3 commissioner of natural resources to
4 acquire and develop scientific and
5 natural area sites consistent with the
6 state scientific and natural areas plan.

7 (m) Black Bear Research in East
8 Central Minnesota 100,000

9 This appropriation is to the University
10 of Minnesota, Bell Museum of Natural
11 History, to develop landscape ecology
12 concepts and better understand the
13 problem of bear damage to crops to
14 enable managers to mitigate crop damage.

15 (n) Partnership for Accelerated Wild
16 Turkey Management 50,000

17 This appropriation is to the
18 commissioner of natural resources to
19 increase wild turkey stocking. This
20 appropriation must be matched by
21 \$50,000 from the National Wild Turkey
22 Federation.

23 (o) Restore Thomas Sadler Roberts
24 Bird Sanctuary 50,000

25 This appropriation is from the
26 Minnesota environment and natural
27 resources trust fund to the
28 commissioner of natural resources for a
29 grant to the Minneapolis Park and
30 Recreation Board to restore and improve
31 public access to the Thomas Sadler
32 Roberts Bird Sanctuary. This
33 appropriation must be matched by
34 \$50,000 of local money.

35 (p) Changes in Ecosystem on Biodiversity
36 of Forest Birds 300,000

37 This appropriation is from the
38 Minnesota environment and natural
39 resources trust fund to the
40 commissioner of natural resources to
41 monitor forest songbird populations and

1 to develop geographic information
2 system tools to correlate forest bird
3 populations with dynamics of the forest
4 landscape. This appropriation must be
5 matched by \$200,000 from a combination
6 of nonstate funds and the state nongame
7 wildlife program.

8 (q) Establish Northern Raptors

9 Rehabilitation and Education Facility 75,000

10 This appropriation is to the University
11 of Minnesota, Raptor Center, to
12 establish a raptor rehabilitation and
13 release facility at the Audubon Center
14 of the Northwoods.

15 (r) Effect of Avian Flu Virus in

16 Mallard Ducks 16,000

17 This appropriation is to the University
18 of Minnesota, Department of Veterinary
19 Pathobiology, to research the effects
20 of Avian influenza on Mallard ducks.

21 Subd. 10. Land

22 (a) Base Maps for 1990s 1,900,000

23 This appropriation is from the
24 Minnesota environment and natural
25 resources trust fund to the
26 commissioner of state planning to
27 provide the state match for a federal
28 program to complete a major portion of
29 the statewide air photo and base map
30 coverage. The federal share is
31 appropriated.

32 (b) Accelerated Soil Survey 1,270,000

33 This appropriation is to the University
34 of Minnesota, Agriculture Experiment
35 Station, to complete the soil survey in
36 counties under contract as of July 1,
37 1988. Up to \$270,000 is for initiation
38 of a survey in Koochiching county,
39 provided that the county share of the
40 cost of the survey shall be one-third
41 of the cost, reduced by a percentage
42 equal to the percent of land located in
43 the county that is owned by the federal

1 or state government that exceeds five
2 percent, and further adjusted by the
3 ratio of the adjusted net tax capacity
4 per capita of the county to the
5 adjusted net tax capacity per capita of
6 the state.

7 (c) Statewide National Wetlands

8 Inventory, Protected Waters Inventory,

9 Watershed Map Digitization 750,000

10 This appropriation is from the
11 Minnesota environment and natural
12 resources trust fund to the
13 commissioner of natural resources to
14 complete the digitization of the
15 national wetlands inventory, protected
16 water inventory, and watershed
17 boundaries.

18 (d) Statewide Land Use Update 338,000

19 This appropriation is to the
20 commissioner of state planning for a
21 grant to The International Coalition to
22 complete a statewide land use update of
23 all land and water resources outside
24 the Twin City metropolitan area.

25 (e) Local Geographic Information

26 System Program 143,000

27 This appropriation is to the
28 commissioner of state planning for a
29 grant to The International Coalition to
30 expand the applicability and use of
31 geographic information by developing
32 programs and providing training at the
33 local level.

34 (f) GIS Control Point Inventory 175,000

35 This appropriation is to the
36 commissioner of state planning to
37 produce a statewide inventory of known
38 public land survey control points using
39 data from all levels of government.

40 (g) Land Use and Design Strategies to

41 Enhance Environmental Quality 100,000

1 This appropriation is to the University
2 of Minnesota, College of Architecture
3 and Landscape Architecture, to develop
4 a land use and design concept for
5 typical sites on light rail transit and
6 freeway systems. The work must be done
7 in consultation with the Metropolitan
8 Council.

9 (h) Model Residential Land Use

10 Guidelines 150,000

11 This appropriation is to the University
12 of Minnesota, Department of Landscape
13 Architecture, to illustrate and
14 disseminate residential land
15 development guidelines that address a
16 broad range of environmental concerns.
17 The work must be done in consultation
18 with the Metropolitan Council.

19 Subd. 11. Minerals

20 (a) Subsurface Greenstone Belts in

21 Southwestern Minnesota 120,000

22 This appropriation is to the University
23 of Minnesota, Minnesota Geologic
24 Survey, to apply aeromagnetic
25 interpretation techniques and test
26 drilling to determine greenstone and
27 associated mineral potential in
28 southwestern Minnesota.

29 (b) Direct Smelting 500,000

30 This appropriation is to the University
31 of Minnesota, Mineral Resources
32 Research Center, to research a new
33 environmentally sound process for iron
34 making particularly applicable to
35 Minnesota using taconite concentrate
36 and western coal. This appropriation
37 must be matched by a total private
38 sector and iron range resources and
39 rehabilitation board contribution of
40 \$1,600,000.

41 Subd. 12. Waste

42 (a) Remediation of Soils by

1 Co-Composting with Leaves 135,000

2 This appropriation is to the office of
3 waste management for a grant to the
4 Minneapolis Community Development
5 Agency to develop a treatment method
6 for soils contaminated with
7 semi-volatile compounds by
8 co-composting with leaves.

9 (b) Land Spreading of Yard Wastes 100,000

10 This appropriation is to the office of
11 waste management for a grant to the
12 University of Minnesota, Soils Science
13 Department, to determine the maximum
14 and optimum rates that yard wastes can
15 be applied to soils without reducing
16 yields or endangering the environment.

17 (c) Cellulose Rayons for

18 Biodegradable Packaging 150,000

19 This appropriation is to the office of
20 waste management for a grant to Bemidji
21 State University, Center for
22 Environmental Studies, to research and
23 develop cellulose rayons.

24 Subd. 13. Energy

25 Tree and Shrub Planting for Energy in

26 Minnesota Communities 300,000

27 This appropriation is to the
28 commissioner of natural resources to
29 develop research-based guidelines and
30 publications and to provide matching
31 funding for energy conservation tree
32 planting.

33 Subd. 14. Oil Overcharge

34 The appropriations in this subdivision
35 are from oil overcharge money, as
36 defined in Minnesota Statutes, section
37 4.071, in the special revenue fund.

38 (a) Traffic Signal Timing and

39 Optimization Program 500,000

1 This appropriation is to the
2 commissioner of administration for
3 transfer to the commissioner of
4 transportation. \$125,000 is for
5 traffic signal retiming and
6 optimization training and \$375,000 is
7 for a cost share program for signal
8 retiming.

9 (b) Waste Crumb Rubber in Roadways 100,000

10 This appropriation is to the
11 commissioner of administration for
12 transfer to the commissioner of
13 transportation to improve hot-mix
14 asphalt pavement performance through
15 the use of crumb tire rubber and
16 selected polymer additives. The
17 process will use waste tires generated
18 in Minnesota. This appropriation must
19 be matched by \$100,000 from other
20 sources.

21 (c) Biodegradable Plastics - Microbial
22 and Crop Plant Systems 150,000

23 This appropriation is to the
24 commissioner of administration for a
25 grant to the University of Minnesota,
26 Department of Agronomy and Plant
27 Genetics, to genetically engineer yeast
28 and crop plants to produce low-cost
29 polyhydroxybutyric, a biodegradable
30 plastic, to substitute for
31 petroleum-based plastics.

32 (d) Agricultural Energy Savings
33 Information 150,000

34 This appropriation is to the
35 commissioner of administration for a
36 grant to the Agricultural Utilization
37 Research Institute to conduct a series
38 of conferences, communication products,
39 and intensive workshops in order to
40 transfer the results of state-funded
41 research to agricultural practitioners.

42 (e) Residential Urban Environmental
43 Resource Audit 150,000

1 This appropriation is to the
2 commissioner of administration for a
3 grant to the St. Paul Neighborhood
4 Energy Consortium to develop and
5 implement neighborhood workshops and
6 one-on-one consultations as part of an
7 environmental urban resource audit and
8 a broad educational campaign.

9 Subd. 15. Contingent Account 800,000

10 This appropriation is for acquisition
11 or development of state land or other
12 projects that are part of a natural
13 resources acceleration activity, when
14 deemed to be of an emergency or
15 critical nature. This appropriation is
16 also available for projects initiated
17 by the legislative commission on
18 Minnesota resources that are found to
19 be proper in order for the commission
20 to carry out its legislative charge.

21 This appropriation is not available
22 until the legislative commission on
23 Minnesota resources has made a
24 recommendation to the legislative
25 advisory commission regarding each
26 expenditure from the account. The
27 legislative advisory commission must
28 then hold a meeting and provide its
29 recommendation on each item, which may
30 be spent only with the approval of the
31 governor.

32 Subd. 16. Compatible Data

33 During the biennium ending June 30,
34 1993, the data collected by the
35 projects funded under this section that
36 have common value for natural resource
37 planning and management must conform to
38 information architecture as defined in
39 guidelines and standards adopted by the
40 information policy office. In
41 addition, the data must be provided to
42 and integrated with the Minnesota land
43 management information center's
44 geographic data bases with the
45 integration costs borne by the activity
46 receiving funding under this section.
47 This requirement applies to all
48 projects funded under this section,
49 including, but not limited to, the

1 following projects:

2 Recreation: Subdivision 3, paragraphs
3 (d) and (e);

4 Water: Subdivision 4, paragraphs (a),
5 (b), (c), (f), and (g);

6 Agriculture: Subdivision 6, paragraph
7 (d);

8 Wildlife: Subdivision 9, paragraphs
9 (d), (e), (h), (k), and (p);

10 Land: Subdivision 10, paragraphs (a),
11 (b), (c), (d), (e), and (f);

12 Minerals: Subdivision 11, paragraph
13 (a).

14 Subd. 17. Work Program

15 It is a condition of acceptance of the
16 appropriations made by this section
17 that the agency or entity receiving the
18 appropriation must submit a work
19 program and semiannual progress reports
20 in the form determined by the
21 legislative commission on Minnesota
22 resources. None of the money provided
23 in this section may be spent unless the
24 commission has approved the pertinent
25 work program.

26 Subd. 18. Complement Temporary

27 Persons employed by a state agency and
28 paid by an appropriation in this
29 section are in the unclassified civil
30 service, and their continued employment
31 is contingent upon the availability of
32 money from the appropriation. The
33 positions are in addition to any other
34 approved complement for the agency.
35 Part-time employment of persons is
36 authorized.

37 Subd. 19. Match Requirements

38 Appropriations in this section that
39 must be matched and for which the match
40 has not been committed by January 1,
41 1992, must be canceled. Amounts
42 canceled to the Minnesota future

1 resources fund are appropriated to the
2 contingent account created in
3 subdivision 15.

4 Subd. 20. Patents and Royalties

5 If an appropriation in this section
6 from the Minnesota future resources
7 fund results in a patent and subsequent
8 royalties, payment of 50 percent of the
9 royalties received, net of patent
10 servicing costs, must be paid to the
11 Minnesota future resources fund, until
12 the entire appropriation made by this
13 section is repaid.

14 Subd. 21. Carryforward

15 The appropriation in Laws 1989, chapter
16 335, article 1, section 29, subdivision
17 3, paragraph (e), Development of Forest
18 Soil Interpretations, is available
19 until December 31, 1991.

20 The appropriation in Laws 1989, chapter
21 335, article 1, section 29, subdivision
22 3, paragraph (h), Statewide Public
23 Recreation Map, is available until June
24 30, 1992.

LAWS 1989, CHAPTER 335

ARTICLE 1, SECTION 29

Sec. 29. MINNESOTA FUTURE
RESOURCES FUND

Subdivision 1. Total

Appropriation	9,975,000	8,615,000
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Approved Complement - 36.8

The appropriations in this section are from the Minnesota future resources fund.

The amounts that may be spent from this appropriation for each activity are more specifically described in the following subdivisions.

For all appropriations in this section, if the appropriation for either year is insufficient, the appropriation for the other year is available for it.

Subd. 2. Legislative Commission

on Minnesota Resources	340,000	340,000
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For the biennium ending June 30, 1991, the commission shall review the work programs and progress reports required under this section.

Subd. 3. Department of Natural

Resources	2,189,000	2,089,000
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Approved Complement - 21

The amounts that may be spent from this appropriation for each activity are as follows:

(a) Acquisition of Private Exploration Data
\$ 75,000 \$ 75,000

Approved Complement - 2

To acquire and catalog private drill core and other materials, microfilm appropriate data, and make all this

information permanently available for public use.

(b) St. Louis County Tract Index
\$ 40,000 \$ 40,000

This appropriation is for a grant to St. Louis county to develop a computerized tract index system that will make it possible to easily determine severed mineral ownership on tracts with potential mineral development possibilities. This appropriation is contingent upon a \$100,000 match from St. Louis county.

(c) Groundwater Sensitivity
\$362,000 \$362,000

Approved Complement - 1

To provide guidelines describing where contamination has or is likely to reach the groundwater supply as determined by hydrogeologic conditions, water use, land use, or other factors and make these tools available for appropriate state and local action.

(d) River Bank and Meander Management
\$100,000 \$100,000

This project shall address the need to reduce losses due to river flooding by developing comprehensive information on river reaches prone to channel shifts and low-cost erosion and sedimentation control techniques.

(e) Development of Forest Soil Interpretations
\$ 25,000 \$ 25,000

This appropriation is for a grant to Beltrami county to develop a system of forest soil interpretations and characteristics in which the information from county soil surveys is put into a computerized format, thus insuring optimum utilization of the survey information in forested counties.

(f) Urban Forestry
\$ 50,000 \$ 50,000

Approved Complement - 1

To accelerate the community forestry assistance program.

(g) Impacts of Forest Road Systems
\$ 85,000 \$ 85,000

To determine how present and planned forest road networks expansion and upgrading will impact forest uses.

(h) Statewide Public Recreation Map
\$285,000 \$285,000

Approved Complement - 3

To publish and provide for sale a statewide series of recreational maps displaying the location of various public recreational opportunities, including county-managed facilities. When this project is completed, the map project is expected to be self-sustaining. This project is to serve as a pilot for the development of a comprehensive geographic information system in the department.

(i) Camper Survey
\$ 15,000 \$ 15,000

For a cooperative matching program contingent upon the office of tourism providing \$30,000 and the Minnesota Association of Campground Owners providing \$10,000 to better understand and market camping in Minnesota.

(j) American Youth Hostel Pilot Program
\$130,000 \$130,000

Approved Complement - 2

To establish as a demonstration project an American Youth Hostel facility at an appropriate site. Consultation with the Minnesota historical society is expected.

The commissioner may contract for the operation of the pilot youth hostel project without complying with the

competitive bidding requirements of Minnesota Statutes, chapter 16B.

(k) Trails Planning and Management
\$ 64,000 \$ 64,000

Approved Complement - 1

To prepare a statewide trail plan that coordinates the appropriate agencies, including the department of transportation's rail banking program, and addresses the issue of acquisition and development priorities, procedures, and responsibilities for linear corridor opportunities.

(l) Trail Right-of-Way Protection
\$ 75,000 \$ 75,000

To provide for innovative ways of obtaining public opportunity to use high priority linear corridors for recreation, with emphasis on less than fee interests, and for appropriate betterments.

(m) Ridgeline Hiking Trail
\$ 78,000 \$ 78,000

Approved Complement - 1

This appropriation is for a grant to the Superior Hiking Trail Association for planning, development, and limited use of easement acquisition of at least a segment of the trail between Gooseberry Falls and Two Harbors. The use of conservation corps resources is strongly encouraged. Up to \$70,000 is available to the department for planning and administrative assistance. Available federal and private money is appropriated.

(n) North Shore Harbors Study
\$100,000 \$ -0-

This appropriation is for a grant to the North Shore Management Board to determine the best location for protected harbors on the north shore of Lake Superior.

(o) Duluth Area Breakwater

The appropriation for this purpose in Laws 1987, chapter 404, section 30, subdivision 3, item (g), remains available until June 30, 1991.

This carryforward appropriation is contingent upon additional funding of \$500,000 from the city of Duluth and state and federal money necessary for total funding of a breakwater and public access on Lake Superior within the city of Duluth.

In the event that the required match from the city of Duluth is not provided, this appropriation shall be made available for implementation of the north shore harbor study funded in this section.

(p) Mississippi River Interpretive
Center Planning
\$ 30,000 \$ 30,000

This appropriation is for a grant to the city of Winona to plan for an upper Mississippi river interpretive center as outlined in the state historic interpretive center plan.

(q) Urban Fishing Program
\$175,000 \$175,000

Approved Complement - 1

To expand urban fishing opportunities and awareness.

(r) North American Waterfowl Plan
Coordination
\$100,000 \$100,000

Approved Complement - 1

To coordinate the implementation of waterfowl and wetland protection and enhancement programs and to survey lakes.

(s) Swan Lake Area Wildlife Project

Approved Complement - 2

The appropriation for this purpose in Laws 1987, chapter 404, section 30, subdivision 3, item (j), remains available until June 30, 1991.

The appropriation may be spent for acquisition, habitat development, management, and evaluation. Matching money is appropriated.

(t) County Biological Survey
\$ 75,000 \$ 75,000

Approved Complement - 2

To continue and expand assessment of Minnesota's rare natural resources in a systematic county-by-county manner.

(u) Purple Loosestrife Research
\$100,000 \$100,000

To initiate cooperative research with the University of Minnesota to document the genetic diversity and study the biology and ecology of Minnesota purple loosestrife populations to enhance the use of nonchemical control methods and evaluate the potential use of biological control agents, thereby providing alternatives to chemical control methods. Matching money is appropriated.

(v) Local Volunteer Coordination
\$ 25,000 \$ 25,000

This appropriation is for a grant to Polk county central cities community center to improve coordination between volunteer groups and resource managers, which can act as a model for other agencies. Matching money is appropriated.

(w) Accelerated Land Exchange
\$100,000 \$100,000

Approved Complement - 2

To complete for presentation to the land exchange board a package for exchange of school trust fund lands in state parks and accelerate the exchange

of school trust fund lands in the BWCA and other state units.

(x) Alternative Dispute Resolution
\$ 60,000 \$ 60,000

Approved Complement - 1

To increase the understanding and utilization of alternative dispute resolution techniques.

(y) LAWCON Administration
\$ 40,000 \$ 40,000

Approved Complement - 1

The appropriation is for administration of the federal land and water conservation fund.

Subd. 4. Pollution Control Agency 1,466,000 1,466,000

Approved Complement - 12.8

Two of these positions are for contractual work with the department of natural resources in the groundwater sensitivity program.

The amounts that may be spent from this appropriation for each activity are as follows:

(a) Redesign Ambient Groundwater Monitoring Program
\$ 98,000 \$ 98,000

Approved Complement - 1.5

To examine the current ambient groundwater monitoring program's shortcomings, analyze state and local groundwater quality information needs, and recommend an improved design for the statewide monitoring program.

(b) Minnesota River Basin Water Quality Monitoring
\$350,000 \$350,000

Approved Complement - 2

A joint effort of federal, state, and

local government units that will assess mainstem, major tributary, and groundwater nonpoint source inputs to the Minnesota river for the purpose of targeting future water quality management programs. Equal match of state dollars is required, including local units of government coordinated through the south central planning project, who will provide in-kind service or local money to assist in data gathering. Matching money is appropriated.

(c) PCB's and Mercury in Public Waters
\$250,000 \$250,000

Approved Complement - 1

To identify the sources and pathways of PCB's and mercury to the St. Louis river and Mississippi river systems, Sand Point, and Crane Lake to develop processes and procedures to reduce the sources and conditions causing mercury accumulation in fish.

(d) Biological Manipulation of Wastewater Treatment Ponds
\$ 73,000 \$ 73,000

Approved Complement - 1

To determine what factors cause daphnia to thrive in some sewage stabilization ponds and not in others, in order to decrease sewage treatment costs.

(e) Municipal Solid Waste Materials Recovery
\$200,000 \$200,000

Approved Complement - 1

To determine the changes municipal solid waste undergoes when incinerated and to measure how removing specific waste streams from municipal solid waste will affect the operation of incinerators.

(f) Medical Waste Incinerator Evaluation
\$125,000 \$125,000

Approved Complement - 1

To evaluate air and ash pollutants from medical waste incinerators to determine the variety and quantity of the pollutants and to determine what standard pollution control strategies are necessary and cost effective.

(g) Dioxin From Incinerator Emissions
\$148,000 \$148,000

Approved Complement - 1

To monitor and study the pathways dioxin travels from a waste incinerator into the human food chain, in order to evaluate and improve the existing health risk assessment model currently used in the environmental review and permitting process for incinerators.

(h) Household Batteries Recycling and Disposal
\$ 45,000 \$ 45,000

Approved Complement - 1

To study the impacts of battery management on the environment, alternative management methods or other identified research needs regarding the disposal of household batteries.

(i) Ash as Soil Amendment
\$ 50,000 \$ 50,000

Approved Complement - .3

To research and promote the beneficial use of solid waste incinerator ash in agriculture.

(j) Health Risk Assessment Modeling for Composting
\$ 40,000 \$ 40,000

To develop a health risk assessment model for municipal waste compost and compare risks with other waste management methods.

(k) Contaminants in Minnesota Wildlife
\$ 87,000 \$ 87,000

Approved Complement - 1

To determine the amount and extent of toxic contaminants in Minnesota wildlife.

Subd. 5. Department of Trade
and Economic Development
Recreation Grants Program
\$1,250,000 \$ -0-

The appropriation is for acquisition and development of recreation open space projects requested by local units of government. Priority is for projects that receive federal grants. This appropriation is for grants of up to 50 percent of the total cost, or 50 percent of the local share if federal money is used. The per project limit for state grants is \$400,000. During the biennium, notwithstanding any other law to the contrary, grants are not contingent upon the matching of federal grants. State grants are limited to one per local unit for the biennium.

One-half of this appropriation is for projects outside the metropolitan area.

Subd. 6. State Planning Agency	280,000	280,000
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The amounts that may be spent from this appropriation for each activity are as follows:

(a) Statewide Land Use Update
\$225,000 \$225,000

The appropriation is for a grant to the International Coalition to do a statewide land use update of all land and water resources.

(b) Hydrologic Model Applications
\$ 55,000 \$ 55,000

The appropriation is for a grant to the International Coalition to produce a state-of-the-art tool for water decision making that combines standard watershed modeling and geographic information systems technology.

Subd. 7. Department of Health

369,000

369,000

Approved Complement - 2

The amounts that may be spent from this appropriation for each activity are as follows:

- (a) Pesticide Breakdown Products Survey
\$165,000 \$165,000

Approved Complement - 1

To identify the occurrence and level of pesticide breakdown products in selected public and private water wells.

- (b) Abandoned Well and Monitoring
Well Technologies
\$100,000 \$100,000

To research and apply technical methods used in the petroleum industry to remove obstructions from wells so that they can be properly abandoned, and to research and develop methods of detecting leaking monitoring wells.

- (c) Indoor Air Quality Assessment
Protocol
\$ 54,000 \$ 54,000

Approved Complement - 1

To develop a method for assessing and mitigating indoor air quality problems in homes, and to transfer this information to the private sector for implementation.

- (d) Community Lead Abatement Project
\$ 50,000 \$ 50,000

The appropriation is for a grant to the community lead abatement project to determine the benefits of cleanup of lead contaminated exterior and interior dust on children's blood levels.

Subd. 8. Department of Agriculture

295,000

295,000

Approved Complement - 1

The amounts that may be spent from this appropriation for each activity are as follows:

(a) Pesticide Use Survey
\$ 45,000 \$ 45,000

Approved Complement - 1

To develop an accurate map of pesticide use, through the use of surveys, and then compare that use with the distribution and quality of the state's water resources.

(b) Biological Control of Pests
\$250,000 \$250,000

To collect and identify potential biological control agents, and to develop and test biological control agents for a variety of pests. A grant request to supplement this appropriation must be submitted to the U.S. Department of Agriculture and the results reported to the legislative commission on Minnesota resources.

Subd. 9. Minnesota Historical Society

347,000 347,000

The amounts that may be spent from this appropriation for each activity are as follows:

(a) State History Center Exhibit Planning
\$100,000 \$100,000

To plan exhibits for the new state history center. Matching money is appropriated.

(b) County and Local Historical Outreach
\$ 40,000 \$ 40,000

To transfer preservation principles and options to county and local historical societies.

(c) Historical Data Base
\$ 50,000 \$ 50,000

The appropriation is to organize and automate one quarter of the collections, which will increase public awareness and significantly improve management of these rare materials. Matching money is appropriated.

(d) Heritage Trails
\$ 50,000 \$ 50,000

The appropriation is for a project to interpret and preserve historic trails for public use and tourism.

(e) Heirloom Seeds
\$ 20,000 \$ 20,000

To provide a gardening and "heirloom seeds" interpretation for the Oliver H. Kelly farm. A by-product of this proposal will be the sale of "heirloom seeds." It is anticipated that sale of seeds will allow the program to be self-supporting. Matching money is appropriated.

(f) Preservation of Historic Shipwrecks
\$ 37,000 \$ 37,000

To comply with federal law, a process must be developed to complete an extensive literature search of North Shore wrecks and gather available field data. Results will yield a plan for further exploration and historical designation of important wrecks.

(g) Implement Plan for Archaeological Resources.
\$ 50,000 \$ 50,000

To develop a project with the Institute for Minnesota Archaeology and with the state archaeologist that will further aid in the development and identification of the state's archaeological resources. The project must be in accordance with Minnesota Statutes, sections 138.31 to 138.42 and 307.08.

Subd. 10. Science Museum of

Minnesota

255,000

255,000

The amounts that may be spent from this appropriation for each activity are as follows:

- (a) Water Education for Minnesota
\$150,000 \$150,000

For a cooperative effort involving the Science Museum of Minnesota, the Freshwater Foundation, and the department of education to develop a program to better inform Minnesotans about crucial issues of water use and quality.

- (b) North Central Minnesota Water Quality Education
\$ 75,000 \$ 75,000

For a contract with the central Minnesota water quality project to provide water quality education and information to 14 north central counties.

- (c) Aquatic Invertebrate Data Base Development
\$ 30,000 \$ 30,000

To develop a central data base on aquatic invertebrates that are sensitive indicators of surface water quality.

Subd. 11. University of Minnesota 2,469,000 2,459,000

The amounts that may be spent from this appropriation for each activity are as follows:

- (a) Aeromagnetic Survey
\$315,000 \$315,000

The appropriation is to the Minnesota geological survey for the sixth and final biennium of an effort to electronically acquire and interpret geophysical data, including ground truth-drilling.

- (b) Biogeochemical Prospecting
\$ 75,000 \$ 75,000

The appropriation is to the Natural Resources Research Institute to address the relationship between heavy metals related to mineral deposits and bioconcentration of heavy metals in plants and mapping of the resulting vegetative differences using remote sensing techniques.

(c) Research in Taconite Refinement
\$100,000 \$100,000

To the Natural Resources Research Institute to assist in the development of new methods to produce taconite concentrates acceptable as preferred ore for new steel-making technologies. This appropriation is contingent upon a \$50,000 match from the iron range resources and rehabilitation board.

(d) Program Design for Groundwater Research
\$ 10,000 \$ -0-

To develop plans and proposals to bring increased federal funding to the university for groundwater research, training, and information transfer.

(e) Program Design for Lake Superior Studies
\$ 25,000 \$ 25,000

This appropriation is not available until the university has financed and submitted to the legislative commission on Minnesota resources a report on a study using outside consultants that recommends the appropriate research directions necessary to protect Lake Superior. This appropriation is for a study by the University Natural Resources Research Council to determine the best way to organize the research work within the university structure.

(f) Land Use Impacts on Lake Superior
\$120,000 \$120,000

To the Natural Resources Research Institute to measure and model the impacts of changing land use practices

on erosion rates, water quality, and biological communities on the near shore waters of Lake Superior. Matching funds must be applied for and the results reported to the legislative commission on Minnesota resources.

(g) County-Level Groundwater Data Management
\$ 43,000 \$ 43,000

The appropriation is to the Minnesota geological survey to provide tools and training to counties that want an enhanced capability to use the computerized county well index in local water planning.

(h) Chemical Transport in Groundwater
\$150,000 \$150,000

The appropriation is for the civil and mineral engineering department to develop, test, and implement interactive models to simulate groundwater transport of chemicals.

(i) Lake Aeration Techniques and Hydrologic Forecasting
\$414,000 \$414,000

The appropriation is for the St. Anthony Falls Hydraulics Laboratory to conduct engineering and hydraulics research in three water resource areas: (1) \$338,000 to optimize lake aeration techniques; (2) \$440,000 to develop forecast methods for: groundwater, hydropower effects on water quality, operation of wastewater treatment ponds, and for ice-induced flooding; and (3) \$50,000 to test several new techniques for measurement of ice in rivers and lakes.

(j) Wetland Plant Communities
\$ 45,000 \$ 45,000

The appropriation is for the College of Natural Resources for research to identify the optimal mix of plants that remove nutrients from wetlands. A grant application must be submitted to the National Science Foundation and the

Environmental Protection Agency to supplement this appropriation and the results reported to the legislative commission on Minnesota resources.

(k) Water Filter for Iron Removal
\$ 14,000 \$ 14,000

The appropriation is to the Institute of Technology for the development of a cost-effective membrane system for removing iron from water so the processed water can be used in a variety of industrial and domestic situations where high iron content is undesirable. A grant application must be submitted to the National Science Foundation to supplement this appropriation and the results reported to the legislative commission on Minnesota resources.

(l) Simulation of Future Forestry Economy
\$ 50,000 \$ 50,000

The appropriation is to the College of Natural Resources to develop methods and evaluate opportunities for supporting forest land economic development in Minnesota from a statewide strategic viewpoint.

(m) Oak Wilt Research
\$ 44,000 \$ 44,000

The appropriation is to the College of Natural Resources for research aimed at biological control of oak wilt using a special fungus, improvement of root barriers to limit spread of the disease, and an educational program on how best to control oak wilt. If this work results in a patent and subsequent royalties, the university shall repay 50 percent of the royalties received, net of patent servicing costs, until the entire appropriation is repaid, into the Minnesota future resources fund.

(n) Lignin-Based Engineering Plastics
\$ 54,000 \$ 54,000

The appropriation is to the College of Natural Resources for fabricating engineering plastics based upon industrial by-product lignins and corresponding raw materials from wheat straw. If this work results in a patent and subsequent royalties, the university shall repay 50 percent of the royalties received, net of patent servicing costs, until the entire appropriation is repaid, into the Minnesota future resources fund.

(o) High Flotation Tire Research
\$ 20,000 \$ 20,000

The appropriation is to the College of Natural Resources in cooperation with the Mille Lacs Area Community Development Corporation for a grant to study the impact of high flotation tires on soil and regeneration of aspen and evaluate the economic feasibility of installing and using this equipment.

(p) Aquaculture Development and Education
\$100,000 \$100,000

The appropriation is to the College of Natural Resources for development of aquaculture demonstration projects and education.

(q) Sonar Measurement of Fish Population
\$ 30,000 \$ 30,000

The appropriation is to the College of Biological Sciences to develop electronic procedures for measuring the abundance of fish in lakes and for preparing lake maps.

(r) Accelerated Soil Survey
\$600,000 \$600,000

The appropriation is to the agricultural experiment station for the seventh biennium of a seven-biennium effort to provide the appropriate detailed survey based on the adopted federal, state, and local cost share. It may be spent only in counties where the survey was under way or the

agreement signed and survey scheduled by July 1, 1988.

(s) Test Emissions from Densified-RDF
\$ 75,000 \$ 75,000

The appropriation is to the Natural Resources Research Institute to study emissions at the bench scale from incinerated densified refuse derived fuel and to develop baseline combustion data.

(t) Peat for Containment of Municipal Incinerator Ash
\$ 75,000 \$ 75,000

The appropriation is to the Natural Resources Research Institute to work in cooperation with the pollution control agency and the department of natural resources to design a passive containment system for municipal incinerator ash using peat. The institute must apply to the Minnesota Waste Management Association for financial support.

(u) Evaluation of Peat in Poultry Waste Treatment
\$ 65,000 \$ 65,000

The appropriation is to the Natural Resources Research Institute to develop environmentally sound treatment methods utilizing peat for the disposal and recycling of poultry wastes and to integrate these processes into manure management systems.

(v) Urban Gardening Program
\$ 45,000 \$ 45,000

The appropriation is to the Minnesota extension service in cooperation with the Minnesota State Horticultural Society and the Self Reliance Center to provide gardening information and technical assistance in community gardening.

Subd. 12. State University Board	215,000	215,000
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The amounts that may be spent from this

appropriation for each activity are as follows:

(a) Groundwater Quality Assessment
Procedure

\$ 45,000 \$ 45,000

The appropriation is for Bemidji state university to develop a procedure for the assessment of regional groundwater quality based on the usual sources of available groundwater data in the Mississippi headwaters region.

(b) Pilot County Groundwater Mapping

\$170,000 \$170,000

The appropriation is for Mankato state university to develop a groundwater atlas and information system for 13 counties to be used as a tool for state and local government and provide education on groundwater.

Subd. 13. Contingent Account

500,000

500,000

This appropriation is for acquisition or development of state land or other projects that are part of a natural resources acceleration activity, when deemed to be of an emergency or critical nature. This appropriation is also available for projects initiated by the legislative commission on Minnesota resources that are found to be proper in order for the commission to carry out its legislative charge.

This appropriation is not available until the legislative commission on Minnesota resources has made a recommendation to the legislative advisory commission regarding each expenditure from the account. The legislative advisory commission must then hold a meeting with the governor and provide its recommendation on each item, which may be spent only with the approval of the governor.

Subd. 14. Compatible Data

During the biennium ending June 30, 1991, the data collected by projects

funded under this section that has common value for natural resource planning must be provided and integrated into the Minnesota land management information system's geographic and summary data bases according to published data compatibility guidelines. Costs associated with this data delivery must be borne by the activity receiving funding under this section. This requirement applies to all projects funded under this section, including but not limited to, projects under subdivision 3, clauses (c), (e), (g), (h), (k), (r), and (t), subdivision 4, clauses (a) and (b), subdivision 5, clauses (a) and (b), subdivision 7, clause (a), subdivision 8, clause (h), subdivision 9, clause (c), subdivision 10, clauses (a), (g), (h), and (r), subdivision 11, clause (b).

Subd. 15. Work Programs

It is a condition of acceptance of the appropriations made by this section that the agency or entity receiving the appropriation must submit work programs and semiannual progress reports in the form determined by the legislative commission on Minnesota resources. None of the money provided in this section may be spent unless the commission has approved the pertinent work program.

Subd. 16. Complement Temporary

Persons employed by a state agency and paid by an appropriation in this section are in the unclassified civil service, and their continued employment is contingent upon the availability of money from the appropriation. When the appropriation has been spent, their positions must be canceled and the approved complement of the agency reduced accordingly. Part-time employment of persons is authorized.

SUMMARY OF RESEARCH PROJECTS COMPLETED IN PREVIOUS BIENNIUM
(Period ending June 30, 1989)
These projects were supported by the
Minnesota Future Resources Fund (MS 116P.13)

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Glacial Drift Geochemistry for Strategic Minerals
Program Manager: Marty Vadis (612) 296-9565
Project Geologist: Richard Buchheit (218) 262-6767

Department of Natural Resources, Division of Minerals
M.L. 1987, Chp. 404, Sec. 30 Subd. 31
\$196,000

DNR Minerals Division has performed an orientation geochemical survey on a reconnaissance scale by sampling appropriate types of glacial drift over the Duluth Complex, primarily for the strategic metals of chromium, cobalt, and platinum group elements. The objective was to evaluate the usefulness of new combinations of evaluation techniques targeted at the strategic metals in this glacial drift covered terrain and to build upon current industry exploration interest in the area. Techniques for the platinum group minerals are very new, with little information in the literature, so this survey has been on the leading edge. Areas were selected to test the methods, based on recent work including the LCMR-funded MGS aeromagnetic survey and core repository programs, surveys of rock-chemistry, lake sediments, peat bogs, eskers and MRRC chrome and platinum evaluations. Recent technical advances in assaying platinum group elements have permitted direct analysis of glacial drift samples to a background platinum detection level of ten parts per billion. DNR has chemically analyzed samples of specific types of glacial drift for trace amounts of strategic metals and geochemically mapped their distribution. MGS was contracted to fulfill certain aims of the program. The data generated includes geochemical maps, bedrock and glacial geology, and other support information which has been added to the digital database developed through LMIC by MGS and DNR for Minnesota geology and mineral potential evaluation.

Publication on file at Legislative Reference Library: *Glacial Drift Geochemistry for Strategic Minerals; Duluth Complex, Lake County, MN* DNR Division of Minerals Report #262 1989

Mercury Toxicity
Program Manager: Marvin Hora
(612) 296-7215

Pollution Control Agency - Division of Water Quality
M. L. 1987, Chp. 404, Sec. 30 Subd. 4e
\$294,000

A study assessing mercury contamination in Minnesota waters concluded that atmospheric deposition is responsible for most of the mercury found in Northeastern Minnesota lakes. Findings also stated that mercury levels were increasing two to five percent per year in sediments and fish, and that lake water chemical conditions affected fish mercury concentrations. Because high mercury concentrations in fish were found in lakes where zooplankton are high in mercury, it is clear that the structure of the food web is important in determining levels and locations of bioaccumulation. The mercury concentration of zooplankton is, in turn, correlated with other factors including lake-water mercury concentrations, pH, and zooplankton density. The report, while recognizing that controlling mercury sources to the atmosphere may require national and international solutions, recommends that in-state contributions be identified, quantified and controlled.

Publication on file at Legislative Reference Library: *Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams*. Includes Executive Summary.

Current LCMR Funding for further evaluation: M.L. 89 Ch. 335 Art. 1 Section 29, Subd. 4(c)

Biological Control

Program Manager: Dr. Dharma Sreenivasam (612) 296-1350

Department of Agriculture, Plant Industry Division
M.L. 1987, M.S. Chapter 404, Section 30, Subd. 6(a)
\$480,200

Develop natural enemies needed to control several plant and animal pests as an alternative to pesticides; a cooperative research effort between the Minnesota Department of Agriculture and the University of Minnesota Entomology Department.

MDA European corn borer (ECB) larval collections, 2,258 larvae from 47 counties yielded 7 Eriborus terebrans, 13 Macrocentrus grandii, 1 Sympiesis viridula and 1 Eumea caesar; 513 were dead from diseases and unknown causes, and the balance of 1,723 pupated and emerged as moths. MDA lab is now capable of producing 187,000+ ECB egg masses and reared 600,000+ Trichogramma (egg parasitoid) in a single season's release.

Determined the composition of the natural enemy fauna of European corn borer egg masses in Minnesota and discovered a naturally occurring egg parasitoid, Trichogramma minutum. Conducted three releases of T. nubilale at an organic sweet corn farm, and observed >50% parasitism during a six day period. Established two colonies of Trichogramma spp. and improved the quality of one colony, and determined several factors that affect parasitism rates. Completed plans and some construction on the insect rearing facility, and developed a monitoring system to rear European corn borers without disease.

Lab and field experimentation was initiated to evaluate corn rootworm biological control in Minnesota by the nematode Steinernema feltiae and the fungus Beauveria bassiana. Bioassay of western corn rootworm with the nematode for the lab indicated an LD 50 (lethal dose required to kill 50 percent of test insects) of 34 nematodes per insect. Field testing at 50 and 200 nematodes per foot of corn plant row began on June 21 at Rosemount Experiment Station. These will be compared with an untreated check and a soil insecticide (terbufos). Field performance of fungal spores at 10, 20 and 30 pound rates is being evaluated against the corn rootworm and compared with an untreated check and a soil insecticide (chlorpyrifos).

Two of the seven parasitoids were investigated for overwintering survival and parasitization rates. More parasites survived over winter to attack in spring if fall manure was stored indoors. Nasonia vitripennis survived a little better (30%) indoors. Date of placement did not affect overwintering survival. In contrast, Muscidifurax zaraptor survived much better (70%) indoors. Furthermore, chance of surviving seemed related to date of stinging; the earlier, the greater the survival indoors. Parasitism rates were statistically equivalent ($P>0.05$) indoors and

outdoors for the two dates , October 21-25 and November 3-8, whereas parasitism was higher indoors than outdoors in both October 25-28 and November 14-17 batches. These findings suggest conservation of M. zaraptor might be affected by storage of fall exposed hosts indoors, provided they have developed beyond egg and initial larval stages.

New isolates of microbial (protozoal, fungal and bacterial) pathogens of the European corn borer were collected from 14 counties in Minnesota. They were identified and cryopreserved for future studies. Methods for producing two protozoa, Nosema and Vairimorpha, in the laboratory were developed. The pathogenicity of these laboratory produced microorganisms for the corn borer was confirmed using bioassays. Biochemical tests were done to characterize the DNA and proteins that will be used as markers when the field efficacy of these corn borer pathogens is determined.

LCMR continued funding in the current biennium - M.L. 89 Ch. 335, Art 1, Sec. 29, Subd. 8 (b).

Optimization of Winter Lake Aeration Methods
Program Manager: Dr. Hans Stefan
University of Minnesota

\$96,040

M.L. 87, Chapter 404, Sec. 30 Subd. 8a

Design criteria and laboratory testing of a novel design concept for a winter lake aerator were the focal points of activity. In order to provide an oxygenated water refuge for fish in an ice-covered lake without destroying the ice-cover, the following criteria were developed: (a) the water to be aerated must not be withdrawn from the bottom of the lake because flow velocities induced near the lake bed will increase oxygen demand very significantly and therefore reduce the net benefit of lake aeration, (b) the temperature stratified water layer below the ice cover must not be withdrawn or destroyed by the aerator because this will cause melting of the ice cover, and (c) as a consequence, it is the water at mid-depth that must be aerated.

A system of water withdrawal and water reinjection that operates at very low velocities and affects only the midsection of the very weakly temperature stratified lake was designed. A 1:4 scale model of the discharge diffuser/selective withdrawal device was built and tested for velocity distributions in a laboratory channel. The device, which in full-scale resembles a "sandwich" 12" thick, 8 ft long and 4 ft wide, will withdraw and discharge water at 0.05 ft/s velocity over its rectangular end-sections. Between intake and discharge, the water is aerated by an enclosed system which can be on land (eg, a cascade) or submerged in the lake (eg air bubble, limnobag system). The selective withdrawal/intake system tested well in water of uniform temperature. An experimental set-up was subsequently constructed to test the water withdrawal and reinjection system for the winter lake aerator in a temperature stratified environment representative of conditions under an ice cover. The experimental facility is a 15-ft. diameter tank in which a controlled temperature stratification can be reproduced. The facility has a cover representing an ice cover in a lake. The tank is equipped with a thermister chain system to monitor the evolution of water temperature stratification in time. The withdrawal and discharge diffuser worked well under design conditions. For comparison, a regular manifold system was also tested, and, as expected, found unsuitable. Additional tests were conducted to determine the optimal placement in depth of the winter aerator.

The new design concept was discussed with DNR staff on two occasions and with their encouragement a plan for field testing was developed. A prototype section is under construction.

The temperature stratification which is crucial for the functioning of the aerator was documented in two different ways: (a) by automatic recordings from a thermister chain placed in Ryan Lake, a small urban winter kill lake and (b) by synoptic water temperature

profiling in 10 different lakes on two different periods. One record provided the temporal variability, the others the spatial variations.

Optimization of Winter Lake Aeration Methods
On file at the Legislative Research Library

Gas Permeable Membrane Water Treatment

Program Manager: M.J. Semmens, Ren Qin and A. Zander, Department of Civil and Mineral Engineering, University of Minnesota
M.L. 1987, Chapter 404, Sec. 30, Subd. 8b
\$171,500

The use of microporous polypropylene hollow fibers for separating volatile organic compounds from water was evaluated. The water was pumped through the lumen of the fibers and organic free air was pumped countercurrently on the outside of the fibers. The rate of VOC removal was modeled on the basis of known empirical correlations and the experimental data compared favorably with theoretical predictions.

The use of a membrane in the air stripping process offers a number of potential advantages over conventional packed tower aeration, including higher overall mass transfer coefficients ($K_L a$), a reduced dependence of $K_L a$ on gas flowrate, no upper limit on gas flowrate that can be used, no need for mist elimination and no need for tall structures.

Additional Federal research dollars have been secured and private sector interest in commercial development is occurring.

Innovative Water Treatment Process Research (formerly called Gas Permeable Membrane Water Treatment) on file in the Legislative Research Library.

**Development of Processes and Strategies for Elimination of Dioxins
Associated with the Manufacture of Bleached Kraft Pulp**

**M.L. 1987, Chapter 404 Sec. 30 Subd. 8c
\$294,000**

**Program Manager: David J. Mladenoff (218) 720-4279, Natural
Resources Research Institute, University of Minnesota, Duluth**

The project exceeded the expectations of the original plan in compiling a database on dioxin contamination at targeted areas of the state, both by compiling existing data from other sources (MPCA, WIS, DNR, Ontario), consisting of over 300 samples, and 97 new samples collected and analyzed for this project. Priority sample sites with verified dioxin contamination include the Rainy, St. Louis and Mississippi Rivers, and St. Louis Bay. All data will be provided to PCA.

Biodegradation Experimental Studies

We have made significant progress according to our original planned approach of 1) locating naturally occurring microbes which may degrade dioxins and related compounds, and 2) developing the more easily degradable related compounds which may assist the microbial breakdown of dioxins. We were not successful in completing all the objectives for the biodegradation studies, specifically in demonstrating the degradation of dioxins in a laboratory pilot study. We were successful in obtaining industrial sludge as microbe source material, which has further unexploited value. We have developed methods to synthesize the related analogue compounds, and most significantly, shown that they are degraded in our experiments. We believe that this is noteworthy progress and that this remains a fruitful approach to the degradation of dioxins. However, our work and that of others in the past two years has shown that the dioxins are among the most difficult compounds to degrade that exist.

*Development of Processes and Strategies for Elimination of Dioxins
Associated with Bleached Kraft Pulp on file at the Legislative
Reference Library.*

Engineering Solutions to Water Problems
M.L. 87, Chapter 404, Sec. 30, Subd. 8d
St. Anthony Falls, Hydraulic Laboratory, University of Minnesota
Department of Civil and Mineral Engineering

(This program has three individual programs and will be listed as such.

(1) Effect of Ice on Flooding and Intake Problems in Minnesota
\$686,000

Ice covers on rivers affect runoff by additional resistance and may turn into ice jams during snowmelt flood runoff. The collection of field data, which can be transmitted to the international coalition water planning process among others, analysis of ice resistance to flood flow and ice breakup mechanics, and problems during spring flooding have been undertaken. Studies have also been undertaken to study the effects of natural and waste heat inputs on ice covers and ice jams. The ice/flooding research has resulted in a better understanding of the ice breakup process and its effect on flooding in Minnesota's rivers. A computer model of winter ice formation plus spring breakup has been developed based on the field data taken near the Coon Rapids Dam. The effects of waste heat from powerplants on prevention of ice jams and safety have been evaluated. The analysis and fieldwork will enable engineers to identify the causes and potential solutions to ice jam problems in Minnesota. The data collected under the field program will be used in the development of the flood prediction model. Recent advances in research on river ice, further research development and application of this research to specific Minnesota problems can alleviate the significant damage and economic loss which may be attributed to river ice problems. The mathematical model developed under this program will help more accurate spring flood forecasting in Minnesota's river.

Year-round Simulation of Hydrothermal Processes in Cold Climate Lakes, by R. Gu and H. Stefan are available in the Legislative Reference Library.

(2) Erosion and Deposition in Minnesota Rivers

The major objectives of the research program are embodied in two Ph.D. theses, and are presented in two reports.

The first of these concerns the theory of river meanders, with applications to rivers in Minnesota. A flexible model of meander channel shift has been developed, verified and applied to six stream reaches in Minnesota. The model is embodied in a computer program that can be used to predict channel erosion. It is intended that the model be made available to the interested public.

The second concerns the prediction of sedimentation in reservoirs and the removal by means of sluicing. Experiments and field

information were used to develop a numerical model for predicting the rate and way in which a reservoir fills with sand. The same model was used in reverse to predict sediment removal from dams by the release of water from low sluice gates. This has actually been tried on the Byllesby Reservoir in Minnesota. An example based on the reservoir at Granite Falls on the Minnesota, which is actually silted up, is presented.

(3) Pollutant Transport in Real (Heterogeneous) Aquifers

This research presents a methodology for an optimal design of regional groundwater monitoring networks. The design of a monitoring network consists of defining the number, location and measurement frequency of observation wells. The groundwater monitoring program is known to be an expensive, time consuming and uncertain process. Of significant current interest is the problem of developing a sampling plan which will yield information that meets pre-specified criteria set by a decision maker and satisfies budget constraints.

The proposed methodology demonstrates the design and analysis of a regional groundwater monitoring network. The developed technique combines three methods: (1) stochastic groundwater flow simulation with first and second moment analysis to evaluate the effects of parameter uncertainty; (2) variance simulation algorithm for obtaining the variances of the piezometric level estimates at the end of sampling horizon; (3) branch and bound algorithm for solving the mathematical programming problem of finding an optimal monitoring network alternative. A particular attention is given to account for different sensitivity areas in the regional network design. The sensitivity process reveals a different degree of sensitivity for some areas based on future land use and other local parameters related to groundwater management policies. It becomes an important issue for an optimal groundwater monitoring network design. The suggested procedure also provides an optimal spatial and temporal sampling tradeoff. This spatial and temporal consideration of the monitoring network enables a decision maker to optimize a groundwater monitoring network according to the monitoring budget and manpower availability.

The solution for the considered application is obtained from a finite set of chosen network alternatives. The best one is selected as a solution to the mathematical programming formulation. The application results show that the optimal monitoring network depends on the estimate of hydrogeological parameters and their spatial variability. Furthermore, the optimal network strongly depends on the correlation structure of a water table prediction error, which results from the high spatial variability of the aquifer parameters (hydraulic conductivity, storativity and dispersivity).

The developed and demonstrated methodology can be directly used as a tool to design and analyze, in an optimal manner, a groundwater monitoring network quantitatively and/or qualitatively for any site

of interest.

Summary Results on Research available at Legislative Reference Library:

Theory of River Meanders. Ph.D. Thesis and St. Anthony Falls Project Report No. 278, Johannesson and Parker, November 1988.

Reservoir Sedimentation and Sediment Sluicing: Experimental and Numerical Analysis." Ph.D. Thesis (complete) and St. Anthony Falls Project Report, Hotchkiss and Parker, 1989.

Groundwater Quality

Project Manager: Jim Anderson (612) 625-8209

University of Minnesota - College of Agriculture - Soils Dept.
M.L. 1987, Chapter 404 Sec. 30 Subd 8e

\$155,000

Field research on the movement of nitrates and herbicides out of the root zone and to the groundwater was conducted at the Rosholt Water Quality Research Farm in eastern Pope County and the Steve Lawler Farm in Olmsted County.

At the Rosholt Farm the soils are an irrigated coarse textured Estherville loamy sand shallow to the regional watertable at 12 feet. The Lawler farm site has a permeable Port Byron silt loam formed in materials 7 to 9 feet thick over creviced limestone bedrock.

Results at the Lawler farm showed that for continuous corn nitrogen (N) should not be applied in excess of recommended rates and that it should not be applied in the fall on these kinds of soil. Nitrate concentration in the soil water increase rapidly where the rate of application is increased and when fall application techniques are used.

Nitrogen management results at the Rosholt farm showed similar results even though the soils are very different. There were corn yield responses to increased nitrogen fertilizer rates. The higher rates tended to have higher concentrations of nitrate-N in the soil profile. Results show that recommended rates should not be exceeded, nitrogen fertilizers should not be applied in the fall or preplant. A sidedress or split application program should be followed and a nitrification inhibitor may have some benefit.

These data were used and incorporated into the Regional Best Management Practices (BMP's) that were drafted by the Nitrogen Fertilizer Task Force. BMP's are being discussed in education programs conducted by the Minnesota Extension Service and others on a statewide basis.

These data indicated that future research should be directed toward studies that investigate the effects of manure utilization and legumes in the rotation (alfalfa, soybeans, and others) on the movement of nitrates toward groundwater.

Research on herbicide (atrazine and alachlor) movement at these same sites showed some significant results. Although results were dependent on the amount of rainfall in a given year at a location, some generalizations can be made. In general, at the Rosholt Farm atrazine was more persistent and found at deeper depths than alachlor. There was no difference in herbicide movement under the four tillage systems (chisel plow, moldboard, no-till and ridge till) investigated.

Results from the Lawler farm also showed no difference in movement due to tillage. Atrazine was more persistent and found at deeper depths than alachlor. At both locations up to 20 percent of atrazine applied in one year carried over to the next year. There was no significant carryover for alachlor.

General conclusions are that under day to day management conditions trace amounts of atrazine can move through these soils toward groundwater due to slower rates of decomposition.

The challenge for future field research on the movement of herbicides will be to focus on the effects of reduction in the amount of herbicides applied, such as through banding applications and evaluating alternative weed control methods.

Clean Water - Everybody's Concern: Herman Rosholt Water Quality Research Farm by Jim Anderson - Minnesota Extension Service, University of Minnesota. Available at the Legislative Reference Library.

Simple Water Assay

Program Manager: Robert E. Carlson (612) 448-4337

**University of Minnesota, Gray Freshwater Biological Institute
M.L. 1987, Chapter 404 Sec. 30 Subd 8f**

\$49,000

This program attempted to develop a low cost and readily useable test to detect various water pollutants by the development of Colorimetric Methods to detect the presence of selected heavy metals, chlorinated industrial solvents and selected herbicides. This project was not successful in reaching its objectives.

Biomass Cash Crop Nursery
Project Manager: Wendell Johnson

University of Minnesota, Crookston
Office of Biomass Research

M.L. 1987, Chapter 404, Section 30(1)
\$180,320

The Biomass Energy Cash Crop Project advanced research and development of SRIC (short rotation intensive culture) through the completion of activities in five principal areas, including:

1. Development and harvest of farm scale stands of hybrid poplar.
2. Studies of productivity of woody biomass.
3. Combustion testing in residential, commercial and industrial scale combustion systems.
4. Study of the potential markets available for woody biomass crops.
5. Economic analysis of the total production system.

The project's objectives were to:

1. Manage the established research and demonstration plantation near Oklee, MN to further the research started there.
2. Produce planting material of hybrid poplar for growers who are interested in establishing nurseries for production of cuttings for larger acreages.
3. Provide the services of a University of Minnesota, Crookston SRIC Technician to work with cooperating growers in their nursery and plantation establishments.
4. Develop extension information for production of hardwood biomass in wet mineral and organic soils.
5. Conduct periodic economic and market analyses and disseminate information to growers and consumers.
6. Demonstrate the soil conservation benefits of hybrid poplar trees.
7. Establish research and demonstration plots at Lamberton and Waseca, to screen clones for adaptability to south central and southwest Minnesota.

Conclusions:

The Program successfully completed the activities proposed for the project and was able to adapt to immediate demands brought about by the Conservation Reserve Program and changes in expectations regarding future markets. Although the establishment of nurseries became relatively less important than originally expected, the

experience gained in assisting growers in the establishment of field-sized plots has improved the ability of the project participants to transfer SRIC practices to growers. The project team's efforts in working with the panelboard industry and the identification of slurry fuels as a use for SRIC materials will help to insure that viable markets are available in the future.

In summary, the following areas of hybrid poplar growing or farming have been developed or advanced in this project:

- * Application of minimum or no-till site preparation in addition to traditional tillage
- * Herbicide application and rates
- * Soil nutrient testing protocol
- * Fertilizer application timing
- * Levels of weed tolerance
- * Use of grass buffer strips
- * Recommended clones for Northwest, North Central, Southwest and Southern Minnesota
- * Preparation, storage and sizing of cuttings
- * Tree planter modification for various soil preparation methods.
- * Establishment of procedures to incorporate the benefits of the CRP in production plans
- * Reclamation of SRIC utilized lands
- * The use of using hybrid poplars for controlling erosion

Biomass Cash Crop Nursery Establishment Program - Final Report is Available at the Legislative Research Library.

Undrained Peatlands for Short Rotation Forestry
Program Manager: William E. Berguson

University of Minnesota, Duluth
Natural Resources Research Institute
\$113,680
M.L. 1987, Chp 404, Sec 30 Subd 8 (i)

This project had two research goals - plantation establishment and economic analyses. With the purpose of this project to determine the potential to establish SRIC (short rotation intensive culture) plantations on undrained peatlands, study plantations were established at the Fens Research Facility, a 500 acre peatland administered by the NRRI. Based on initial results of clonal screening studies at this site, four clones were chosen for use in these studies, two willow and two hybrid poplar. Using a variety of plant material, the effect of mounding on a genus more adaptable to poorly drained conditions (willow) and one less adaptable to these conditions (poplar) could be compared.

Based on results of research to date, the potential exists to successfully establish short rotation forests on undrained peatlands using mounding techniques. Plantations of hybrid poplar, in particular, are positively affected by mounding. Also, results of soil moisture analyses show that these plantations are significantly impacting the drainage of the site even at a relatively young stage of the plantation. The narrow drainage of these sites is likely to increase in direct proportion to the development of the forest canopy.

Undrained Peatlands for Short Rotation Forestry is available at the Legislative Reference Library.

Compost and CoCompost Research
Program Manager: Thomas R. Halbach (612) 625-3135
University of Minnesota, Department of Soil Science

M.L. 1987, Chap. 404, Section 30, Subd. 8j

\$171,500

Compost for greenhouse production of bedding plants was evaluated. The results of this research indicate that solid waste composts may differ substantially from one another in character. The most appropriate use for each compost will depend upon its characteristics. Decisions regarding suitability of composts for use in the production of greenhouse crops should be made on an individual basis.

A study of nitrogen mineralization from municipal solid waste compost was conducted. This study suggests that water soluble carbon may be a more useful compost management tool than total carbon when trying to balance the initial carbon/nitrogen ratios of compost.

An educational package was developed which includes an 18 minute video tape that demonstrates how to conduct an earthworm bio-assay for determining the stability and toxicity of compost. A fact sheet was also written to go with the video to help people conduct this bio-assay on their own.

The following is available at the Legislative Reference Library:

Evaluation of Solid Waste Compost As A Medium Amendment For Greenhouse Production of Bedding Plants

Nitrogen Mineralization from Municipal Solid Waste Composts, M.T. Martindale, C.E. Clapp, J.A.E. Molina and M.P. Russelle

Testing Compost for Toxicity: The Earthworm Method, J.E. Zachman and J.A.E. Molina, July 1989

Gamefish Growth Enhancement

Program Manager: Anne R. Kapuscinski (612) 624-3019

University of Minnesota, Department of Fisheries and Wildlife

M.L. 1987 Chapter 404 Sec. 30 Subd. 8k

\$630,140

We have successfully inserted two model genes (one into northern pike and walleye and one into goldfish) and growth genes into northern pike, trout and walleye. The growth genes used in our most recent experiments (Spring 1989) are derived from salmon. Our results demonstrate that the inserted genes are expressed in the fish tissues. The data on growth of the northern pike shows that the fish containing inserted growth genes are growing significantly faster than the controls. Finally, we have constructed DNA "cassettes" that are derived entirely from fish DNA. In addition to aiding the insertion of growth genes into fish, these "cassettes" significantly increase the levels of transferred gene expression compared to non-fish cassettes used in the past.

Gross, M., J. Schneider, N. Moav, C. Alvarez, S. Myster, Z. Liu, C. Hew, E. Hallerman, P.B. Hackett, K.S. Guise, A.J. Faras and A.R. Kapuscinski. Molecular analysis and growth evaluation of northern pike (Escox lucius) microinjected with growth hormone genes. Aquaculture: Submitted December 1990. Will be available at the Legislative Reference Library - spring 1991.

Evaluation of Mosquito Control - Activities on Waterfowl
Program Manager: James A. Cooper (612) 624-1223
University of Minnesota, Department of Fisheries and Wildlife

M.L. 1987, Chp. 404, Sec. 30, Subd. 8 (1)
\$117,600

1. We investigated the potential effects of mosquito larvaciding using methoprene briquets on brood rearing in mallard ducks (Anas platyrhynchos).

2. Results from experiments using divided wetlands suggest that treatment of wetlands with methoprene briquets may affect the growth and behavior of mallard ducklings. Broods on methoprene-treated wetlands moved greater distances per day than controls. Growth of the first duckling experimental group on the wetlands appeared to be suppressed by treatment at the age of 5 days, while growth of the second experimental group was not affected. Methoprene also may change patterns of habitat use and behavior in ducklings.

3. We found no statistically significant effect of methoprene briquets on densities of either benthic invertebrates or emerging insects.

4. Our results suggest that the efficacy of the methoprene briquet may have been low in these types of marshes. Possible reasons include the potential effects of high organic wetland bottom conditions on the efficacy of the briquets.

5. Further research is necessary to evaluate potential effects of methoprene and other mosquito larvacide treatment of wetlands on brood rearing in mallard ducks, particularly if the methoprene delivery protocol is shifted from briquets to more effective techniques. Culicid bioassays or chemical analyses or both must be included in future experiments to determine whether the control technique effectively delivers methoprene.

Mallard Duckling Growth and Behavior in Methoprene Treated Wetlands is available at the Legislative Research Library.

Biotechnology Applications in Forestry
Project Manager: Carl Mohn (624-7281)
College of Natural Resources, U of M

\$164,460

M.L. 1987, SSI Chap 404, Sec 30, Subd 8 (q)

The project focused on two areas: 1) the development of tissue culture and micropropagation techniques for Minnesota's conifers and 2) the biodegradation of lignin.

Progress in the first area includes: Development of an improved micropropagation system for white pine. Under this system a single embryo can be used to produce up to 250 plants. This "cloning" technique will be used in the selection and multiplication of genetically superior trees. A long-term objective is the development of white pine strains resistant to blister rust, a serious disease in parts of Minnesota. Additional progress was made in the development of systems for "cloning" mature white pine and in developing screening techniques for blister rust resistance in the laboratory. Success in these areas will dramatically increase the effectiveness of genetic improvement work with white pine.

Tissue culture based on propagation systems for white and black spruce are not yet efficient, but were greatly improved. When fully developed, they will reduce the time required to incorporate improved strains of these species into planting programs.

The biodegradation of lignin component of this project focused on the utilization of naturally occurring fungi and the enzymes they produce to modify paper mill waste. An eventual outcome of this line of research could be the conversion of these wastes/pollutants to useful industrial chemical feedstocks. A strain of fungus which completely degraded lignin was isolated. Conditions under which the fungus could survive and degrade Kraft lignin were defined in order to facilitate the isolation and characterization of the enzyme(s) involved. The presence of a lignin degrading enzyme(s) outside the fungus was confirmed. However, complete isolation of the enzyme was not achieved. The identification of the fungus strain, its partial characterization and the development of culture technique may contribute to the eventual utilization of lignin byproducts.

(To be published 1991) *Plantlet Multiplication from White Pine (pinus strobus L) in Embryos in Vitro in Plant Cell Tissue and Organ Culture*. Chesick, E.E., Mohn C.A., Hackett, W.P.

Sludge Ash Pilot Project

Project Manager: K.J. Reid (612) 625-3344

University of Minnesota, Mineral Resources Research Center

\$196,000

M.L. 1987, Chapter 404, Sec. 30 Subd. 8 (r)

The environmentally acceptable ultimate disposal of the sewage sludge ash residues produced at the Metro plant of the Metropolitan Waste Control Commission (MWCC) is a matter of considerable regional concern. University research has identified a potential route to process the ash into a sintered lightweight aggregate with structural properties equal to or better than currently used materials.

Product testing has indicated that the highest quality products are produced from 100% sludge ash and that the sludge ash/waste lime mixtures have decreasing properties as the lime content increases. However, pellets with approximately 50/50 mixtures were of sufficient strength to meet some lightweight concrete standard specifications. The ability to increase product tonnage by blending with other wastes is important to improve overall economics. Capital and operating cost estimates combined with current disposal costs indicate that the production of sintered lightweight aggregate would not be economically viable with the low tonnages available even with the two fold increase potentially available by blending.

Production of Lightweight Aggregates from MWCC Sludge Ash, December 89: Principal Investigators: Javed I. Bahtty, Marion J. Murawa, Kenneth J. Reid, Director - on file at the Legislative Reference Library

Non-energy Peat Development

Program Manager: Steven A. Spigarelli (218) 755-2910
Bemidji State University, Center for Environmental Studies

M.L. 1987, Chapter 404, Sec. 30 Subd 9a

\$98,000

Peat Waxes as Commercial Products

Waxes and bitumens were extracted from Minnesota peats before and after various other treatments. Yields and quality of extracted waxes/bitumens vary considerably due to these procedural differences and provide numerous products with various potential applications in industry. Samples of these wax and bitumen products are being tested for specific industrial applications. This research has provided information needed to optimize yields and quality of bitumen products, and to give technical support for the initiation of a wax production facility.

Expand Studies of Other Non-energy Uses for Peat

Plant Growth Stimulants:

Our studies have investigated the horticultural properties of whole and extracted peats, as well as peat fractions. Generally, whole and dewaxed peats are equally good horticultural media, while dehumified peats support significantly less plant growth. Humic fractions extracted from peat and added to planting media significantly increase plant growth. This indicates that various peat derivatives have potential for being developed into specialty horticultural products, and that whole peats can be processed to produce waxes, horticultural products and other useful products. A paper summarizing results of studies of the effects of liquid peat extracts on plant growth was presented at the 3rd International Peat Symposium, hosted by Bemidji State University, May 16-19, 1989.

Toxicity of Wet Carbonization Filtrates

If a peat fuel industry should develop in Minnesota, it is likely that peats will be wet carbonized to increase BTU content and decrease water content. Wet carbonization also increases the effective yield of bitumens and waxes from peat. However, the wastewater (filtrate) resulting from wet carbonization has been shown to be very toxic and has a high oxygen demand, necessitating treatment prior to disposal. We have studied this wastewater with the goal of identifying the toxic components and developing economical techniques for treatment prior to disposal.

Microbial Treatment of Peat

These studies have focused on microbial treatment of wet carbonization filtrates and production of useful products through

microbial conversion of peat. The high concentrations of organic compounds in peat filtrates, which cause the high BOD/COD values, have been effectively reduced using various biodegradation schemes. Microbes that are indigenous to peat are very effective at degrading the organic load in peat filtrates; however, the toxicity of filtrates is not reduced by these biological treatments. Studies of microbial conversion of peat to useful products have continued with emphasis on protein and ethanol. In addition to previous methods using commercially available microbes, we have tested various species native to local peatlands. Some of these organisms are very effective at degrading peat and producing useful products.

Waste Treatment Media

The purpose of these studies is to evaluate whole and modified peats as sorbent materials that could serve as waste treatment media. Whole and dewaxed peats are equally effective at removing cationic heavy metals (Cu^{+2} , Cr^{+3}), while wet carbonation reduces the cation exchange capacity of peat by reducing the number of functional acid groups. Batch and column tests indicate that whole and dewaxed peats have somewhat lower cation exchange capacities than synthetic resins, but the lower cost advantage of peat is significant.

A report summarizing results of these studies was presented at the 3rd International Peat Symposium, hosted by Bemidji State University May 16-19, 1989. This report is on file at the Legislative Reference Library.

FOR A COPY OF APPENDIX A

STRATEGIC PLAN

for

MINNESOTA'S ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

please call the LCMR office at (612) 296-2406