



Minnesota Board of Water and Soil Resources.
Minutes.

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BOARD OF WATER AND SOIL RESOURCES
HOLIDAY INN-NORTH
2540 NORTH CLEVELAND AVENUE
ROSEVILLE, MINNESOTA
JANUARY 24, 1990

Appointed Members in Attendance

Donald Ogaard
John Williamson
John Boulton
Don Warner
Loni Kemp
Natalie Haas Steffen
James Hoese
Loren Harste
Jack Graba
Howard Peterson
John Brooks, Jr.
William Cofell

Others in Attendance

D'Wayne DeZiel and Bob Pigeon, Minnesota Association of Soil and
Water Conservation Districts
John Sumption, Minnesota Association of Conservation District
Employees
Curt Sparks, Minnesota Pollution Control Agency
George Foster, University of Minnesota
Gary Nordstrom, Soil Conservation Service
Glen Yackel, Minnesota Department of Natural Resources
Al Dornfeld, Minnesota Association of Watershed Districts
Paul Burns, Minnesota Department of Agriculture
Franklin Denn, Minnesota Association of Townships
Tim Scherkenbach, Minnesota Pollution Control Agency
Lawrence Foote and Frank Pafko, Minnesota Department of
Transportation
Ed Ross, Minnesota Department of Health

Staff in Attendance

Jim Birkholz
Wayne Edgerton
Steve Miller
Tom Wenzel
Greg Larson
Mel Sinn
Brian Dwight
Bruce Sandstrom
Chris Hughes
Doug Thomas
Mark Nelson
Denice DeFrates
Mary Jo Anderson

Meeting Called to Order - Chairman Ogaard called the meeting to order at 9:10 a.m.

**
90-01 Adopt Agenda - Moved by Peterson, seconded by Cofell, to adopt the agenda as presented with additions. Affirmative: Ogaard, Williamson, Boulton, Warner, Kemp, Steffen, Hoese, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

John Brooks, Jr., distributed copies of "A Plan of Action" published by Clearwater County for the Board's information.

**
90-02 Approval of Minutes of December 20, 1989 - Moved by Cofell, seconded by Harste, to approve the minutes of December 20, 1989 as circulated. Affirmative: Ogaard, Williamson, Boulton, Warner, Kemp, Steffen, Hoese, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

Chairman's Report - Chairman Ogaard reported that the Bemidji regional office held a two-day workshop for district board members and staff, which he attended. The Headwaters Regional Development Commission provided staff assistance. Chairman Ogaard stated that the session was very good; boards and staff had an opportunity to learn about and discuss their roles and how to best carry out their responsibilities.

The Dispute Resolution Committee met this morning regarding adjustments to the Forest Lake WMO Plan. The Dispute Resolution Committee will make a report on the Forest Lake WMO Plan at the February meeting.

Chairman Ogaard reported briefly on his work with Canadians on conservation and natural resource issues.

Executive Director's Report - Jim Birkholz reported that the Strategic Plan final draft has been prepared. He requested board member participation to review the document prior to sharing the Strategic Plan with the full Board. Howard Peterson, Bill Cofell, John Williamson, and Natalie Haas Steffen volunteered to review the document. Staff will send copies of the draft Strategic Plan out to members.

The Minnesota Association of Watershed Districts has agreed to participate in an ad hoc committee to recommend future direction for the working relationship between watershed districts and the BWSR. Staff requested a committee of Board members to work with staff and MAWD. John Boulton, Jack Graba, and John Brooks, Jr., volunteered to form a committee to work with staff and MAWD.

Staff has received 40 applications for proposals for the Environmental Agriculturalist Education Program. Jim stated that

\$1.6 million was applied for, with \$400,000 available. A review team will rate the proposals. The team will bring the proposals and recommendations before the Board at the February meeting.

Congress allocated money through EPA to the Minnesota Pollution Control Agency for 319 nonpoint source pollution control implementation. MPCA invited the Board to become part of the Minnesota Application for Federal 319 Nonpoint Source Grants. Jim reported that draft proposals were sent to MPCA, one proposal was to establish an Ag Engineer position to assist SWCDs to install high priority ag waste management systems, and the other to fund special projects with a water quality emphasis. Natalie Haas Steffen suggested that education needs should also be included in the proposal. Staff will make that adjustment to the proposal.

Jim reported on the status of the capital budget request and other legislative initiatives.

EOB/Water Resources Committee Report - Loni Kemp reported that the Water Resources Committee met on January 11. The Minnesota Water 1990 conference has been scheduled for April 9 and 10. The work plan for the State Water Plan was discussed at the meeting. Three additional chapters of the plan are: local water issues; comprehensive water resource monitoring; and information and education plan. Loni stated that there will be intensive public involvement, including focus group meetings. The inter-agency LCMR proposals were discussed. Loni distributed an invitation from the Environmental and Energy Study Institute regarding a conference on "Federal Farm Policies and Groundwater Protection: A Midwestern Perspective". The conference will be held on February 5, 1990, in Des Moines, Iowa. Loni encouraged Board members, agencies, and others to attend the conference.

Dispute Resolution Committee Report - Chairman Ogaard reported that the Dispute Resolution Committee met to discuss the Forest Lake WMO response to its requested plan amendments. Bruce Sandstrom distributed a chronology of the Forest Lake WMO plan review as of January 24, 1990, for the Board's information. Bruce reported that the Forest Lake WMO has agreed to address the BWSR Dispute Resolution Committee recommendations. Bruce stated that the WMO has a very good plan, but that the DRC has been working to get issues raised at the public hearing addressed.

Southwest Administrative Region Report - Brian Dwight gave a presentation on activities in his area. 48 applications were received from the 14 SWCDs in his area on the last RIM sign-up. Concerns exist for additional staff to assist with the RIM program. Brian reported on the counties in his area that are working on comprehensive local water plans. A few of the proposals in the plans are: tax reduction on lands protected by resource management systems, creation of lake improvement districts, and finding and

sealing abandoned wells. Good communication links between local agencies has come out of working on the water plans. Other interests in Area 5 are the Wellner-Hageman upland treatment program; Pomm de terre project; North Heron Lake Restoration Project; Mountain Lake Commission (clean water partnership project). The need is there for the PCA feedlot assessment. There is a need to emphasize waste utilization, also cost-sharing on feedlot waste management systems. These issues should be addressed on the PCA 319 Nonpoint Proposal. Brian commended Loren Harste for his efforts on water issues in the Upper Minnesota River watershed district. Brian also commented on meetings and discussions on the Antelope Valley in the Yellow Medicine Watershed District. The Minnesota Association of Conservation District Employees (MACDE) is very strong in Area 5. The MACDE has published a coloring book, which is available nationwide. The Area 5 MACDE will be receiving an education award on February 2, 1990 from the Soil and Water Conservation Society for their fine efforts.

Chairman Ogaard called for a break in the meeting at 10:40 a.m. The meeting reconvened at 10:50 a.m.

Wetland Mitigation Program - Dr. Lawrence Foote, Director of the Environmental Services Section with the Minnesota Department of Transportation, distributed a fact sheet and additional information on "Wetland Habitat Mitigation Banking" for the Board's information. He also gave a slide presentation on wetland protection.

BWSR Policy: RIM Wetlands/Mitigation - Wayne Edgerton read the following draft policy for the Board's approval.

"It shall be the policy of the Minnesota Board of Water and Soil (BWSR) that wetlands enrolled in the RIM Reserve Program cannot be used to mitigate for illegally drained wetlands. It is the BWSR's overall intent that wetlands restored or created by the RIM Reserve Program be voluntary and be "net gain" wetlands and not used for "no net loss" mitigation.

The BWSR may enter into agreements with other agencies or conservation groups to allow certain RIM Reserve wetlands to be used for wetland banking. These supplemental agreements must be approved by the BWSR before they can become effective with consideration given to comparative wetland values. In all cases, any consideration of RIM Reserve wetlands involvement is premised on being legally drained."

Discussion followed. Natalie Haas Steffen suggested that this information be well circulated.

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90-03

Moved by Cofell, seconded by Steffen, to approve the draft policy for using RIM wetlands for wetland mitigation, with appropriate public dissemination. Affirmative: Ogaard, Williamson, Boulton,

Warner, Kemp, Steffen, Hoese, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

Proposed Modification of Gary Kearns RIM Reserve Easement (55-11-86-1) Acreage Exchange - Wayne Edgerton reviewed the proposed acreage exchange for the Board's information. Staff recommendation is to approve the proposed modification with the stipulation of a ten-year marginal ag land easement effective from today's date. Moved by Graba, seconded by Williamson, to approve the proposed modification of Gary Kearns RIM Reserve Easement (55-11-86-1) acreage exchange with the stipulation of a ten-year marginal ag land easement effective from today's date. Affirmative: Ogaard, Williamson, Boulton, Warner, Kemp, Steffen, Hoese, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

**
90-04

Chairman Ogaard recessed the meeting for lunch at 12:00 p.m. The meeting reconvened at 1:00 p.m.

Status Report - MPCA Feedlot/Animal Waste Committee - Bill Cofell reported that the MPCA Feedlot Advisory Group met on January 11. Bob Pigeon, MASWCD, added that things are coming together and the committee is moving ahead. Tim Scherkenbach, MPCA, stated that it was a good meeting, with open communication and good working relationships. Tim distributed copies of the report, "Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams" for the Board's information.

Advisors' Comments

Gary Nordstrom, Soil Conservation Service, reported on the Food Security Act activities which had a target date of January 1, 1990. As of December 31, 35,000 highly erodible plans have been developed. Gary complimented SCS staff and SWCDs on their work. Gary reported that over 77,000 wetland determinations have been processed, with over 100,000 yet to be completed. Gary stated that SCS does not know yet if there will be a tenth CRP sign-up available. He stated that there is emphasis on changing criteria for CRP, when SCS is informed, he will notify the Board. Gary requested to make a presentation on ACP cost-sharing at a future Board meeting.

Al Dornfeld, Minnesota Association of Watershed Districts, commented on the "Revenue and Expenditures for Watershed Districts" summary for the Board's information.

John Sumption, Minnesota Association of Conservation District Employees, reported that the MACDE Policy and Training Committee will meet next week to discuss funding a training coordinator position. John reported that the MACDE Board of Directors will be meeting on February 21, at the Holiday Inn in St. Cloud.

D'Wayne DeZiel, Minnesota Association of Soil and Water Conservation Districts, reported that the National Association of Conservation Districts national convention will be held February 4-8, at the Town and Country Hotel in San Diego, California. D'Wayne stated that he and Jim have been meeting with legislators at the capitol before the session begins. D'Wayne reported that "Earth Day" stewardship kits are now available from the MASWCD office for statewide distribution.

Franklin Denn, Minnesota Association of Townships, reported that Nan Cole, formerly a national township association lobbyist and now an EPA staff member, will be attending the MAT's legal seminar on February 1-2. Franklin stated that Jim Birkholz has been invited to attend the MAT's board meeting on January 31, to address BWSR activities.

110B Comprehensive Local Water Plans

- Douglas County - Doug Thomas reported that final review of the plan has been completed. Douglas County is in the process of delivering the final plan to the adjacent counties. Action will be recommended at the February Board meeting on the Douglas County water plan.

Doug reported that the 15 Red River Valley county plans close-out meeting for review will be held on February 6, with possible action at the February Board meeting.

- Cass County water plan overview was given by Doug Thomas and John Sumption. John reported that a director will be hired for the Environmental Services Department (which is a new department). He stated that environment is the number one priority for the 1990's for Cass County. The Cass County water plan has further developed good working relationships for people in Cass County. John commended Dan Steward on the tremendous job he has done in Cass County, they truly appreciate his assistance.

Natalie Haas Steffen suggested that the Minnesota Association of Townships promote an ordinance on septic systems, using Cass County as an example.

- Southeast Minnesota Nine Counties (Zumbro/Root River County Comprehensive Water Management Plan) - Chris Hughes distributed an overview for the Board's information.

- Brown County - Chris Hughes introduced Chuck Enter, Brown County Planning and Zoning Officer. Mr. Enter gave an overview of the Brown County Comprehensive Water Plan for the Board's information. Mr. Enter thanked Chris for his assistance on this plan.

- Martin County - Chris Hughes distributed an overview of the Martin County Comprehensive Water Plan and introduced Linda Meschke, who summarized the plan for the Board. Chairman Ogaard thanked Ms. Meschke, for the very informative overview.

Al Dornfeld stated that he would like the process for identifying abandoned wells, ~~to be identified in the plan.~~

Review of Draft Rule for Local Water Plan Implementation Grants - Greg Larson distributed "1991 Estimated Expenditures for Water Planning and Implementation Activities for the State of Minnesota" and also the most recent draft rules for the "Local Water Resources Protection and Management Program" for the Board's information. Greg stated that the goal is to make the rulemaking process open and also responsive to all users and agencies. The BWSR will adopt the rules, funding will be available July 1st or when the rules are promulgated. Natalie Haas Steffen suggested adding the Metro Inter-County Association to the list of agencies on page seven. Natalie also suggested that local agencies receiving pass-through funds must provide an audit.

Chairman Ogaard called for a break in the meeting at 3:40 p.m. The meeting reconvened at 3:45 p.m.

Metropolitan Water Plans

- Brown's Creek WMO - Bruce introduced Tim Fredbo, Washington County, and Lyle Kreso, Stillwater City Administrator. Bruce reviewed the Findings of Fact for the Board's information. Moved by Boulton, seconded by Steffen, to approve the Brown's Creek WMO plan. Affirmative: Ogaard, Williamson, Boulton, Warner, Kemp, Steffen, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

- Lower Rum WMO - Bruce Sandstrom distributed an overview for the Board's information.

- Prior Lake-Spring Lake WMO - Bruce Sandstrom gave an overview for the Board's information.

- 509 Plan Update - Bruce Sandstrom reported that the Shingle Creek, West Mississippi, and Forest Lake Metropolitan Water Plans will be brought before the Board for action at the February meeting.

Bruce asked for feedback from the Board on the overview process. Natalie Haas Steffen stated that visuals are helpful, as well as a one-page overview sheet. Loni Kemp stated that the staff assessment is very good. It was suggested that the overviews of plans for discussion be on the agenda in the morning rather than in the afternoon.

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90-05

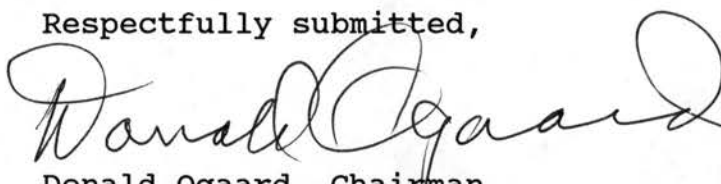
LCMR Proposals - Jim Birkholz distributed a list of the Board's LCMR proposals for the Board's information. He reviewed the proposals with the Board, and reported that the deadline for submitting the proposals is February 16. Loni Kemp and Natalie Haas Steffen suggested that demonstration farms, education, and oak wilt need to be written into the LCMR proposals. Moved by Kemp, seconded by Haas Steffen, to include demonstration farms, oak wilt trees, and education needs, to be rewritten in the LCMR proposals. Affirmative: Ogaard, Williamson, Boulton, Warner, Kemp, Steffen, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

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90-06

Moved by Warner, seconded by Kemp, to adjourn the meeting at 4:50 p.m. Affirmative: Ogaard, Williamson, Boulton, Warner, Kemp, Steffen, Harste, Graba, Peterson, Brooks, Jr., and Cofell. Opposed: None. Carried.

**
90-07

Respectfully submitted,

A handwritten signature in cursive script, reading "Donald Ogaard". The signature is written in dark ink and extends across the width of the page, with a long horizontal flourish at the end.

Donald Ogaard, Chairman

Environmental and Energy Study Institute

122 C Street, N.W., Suite 700

Washington, D.C. 20001

(202) 628-1400

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January 5, 1989

Dear Friend:

The Environmental and Energy Study Institute (EESI), in cooperation with the Iowa Department of Natural Resources, the Iowa Department of Agriculture and Land Stewardship, the Public Policy Center at the University of Iowa, the Agricultural Law Center at Drake University, the Leopold Center for Sustainable Agriculture and the Iowa State University Cooperative Extension Service, is pleased to invite you to attend a conference on Federal Farm Policies and Groundwater Protection: A Midwestern Perspective. The conference will be held on Monday, February 5, 1990, from 8:30 a.m. to 3:00 p.m. in the auditorium of the Historical Building, East 6th and Grand Avenues, in Des Moines, Iowa.

Congressmen Fred Grandy (R-Iowa), Jim Jontz (D-Ind.) and Tom Tauke (R-Iowa) and will chair the meeting, and Senators Charles Grassley (R-Iowa), Tom Harkin (D-Iowa) and Patrick Leahy (D-Vt.) will co-sponsor the event.

The conference will explore options for revising current federal farm policies which encourage intensive agricultural chemical use and groundwater contamination and options offering incentives to farmers to adopt practices that protect groundwater. This discussion will provide Members of Congress and congressional staff with valuable input for the 1990 farm bill.

The agenda includes an overview presentation on the relationship between current farm policies and groundwater contamination. It features roundtable discussions between the Members of Congress and panels of farmers, environmental and farm groups, researchers, agricultural chemical industry representatives and state legislators. A luncheon presentation and discussion will address the economic benefits of sustainable agricultural practices.

(over)

The conference will provide an opportunity for you to share your ideas and experiences with Members of Congress during time set aside for questions and comments from the audience.

The conference is open to the public. There will be a \$20 registration fee, payable at the door, to help defray lunch and administrative costs. To make lunch reservations, please call the Iowa Department of Natural Resources at (515) 281-8941 by Wednesday, January 31, 1990.

We are looking forward to a productive meeting and hope you can join us in Iowa.

Sincerely,

Judy Campbell Bird
Judy Campbell Bird
Groundwater Program
Director

Janet Edmond
Janet Edmond
Project Assistant

P.S. For those unable to attend the conference, transcripts will be available. An order form is enclosed.

Environmental and Energy Study Institute

122 C Street, N.W., Suite 700

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FARM POLICIES TO PROTECT GROUNDWATER: A MIDWESTERN PERSPECTIVE

Monday, February 5, 1990

8:30 a.m. - 3:00 p.m.

Historical Building, East 6th and Grand Avenues
Des Moines, Iowa

Sponsored by
ENVIRONMENTAL AND ENERGY STUDY INSTITUTE

in cooperation with
IOWA DEPARTMENT OF NATURAL RESOURCES
- IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
UNIVERSITY OF IOWA'S PUBLIC POLICY CENTER
DRAKE UNIVERSITY'S AGRICULTURAL LAW CENTER
LEOPOLD CENTER FOR SUSTAINABLE AGRICULTURE
and
IOWA STATE UNIVERSITY COOPERATIVE EXTENSION SERVICE

Chaired by
CONGRESSMAN FRED GRANDY (R-IOWA)
CONGRESSMAN JIM JONTZ (D-IND.)
CONGRESSMAN TOM TAUKE (R-IOWA)

Co-sponsored by
SENATOR CHARLES GRASSLEY (R-IOWA)
SENATOR TOM HARKIN (D-IOWA)
SENATOR PATRICK LEAHY (D-VT.)

8:30 a.m. Welcome: Congressional Co-Chairs
8:45 a.m. Do Current Federal Farm Policies Encourage
Agricultural Practices That Contaminate
Groundwater? An overview by George Hallberg,
Iowa Department of Natural Resources
9:00 a.m. Federal Farm Programs and Groundwater Protection:
What revisions are necessary in farm programs
to remove impediments to farming practices
that protect groundwater and yet maintain
farm income?
Panelists:
Chuck Hassebrook, Center for Rural Affairs,
Nebraska
Local farmer, Wisconsin
Chris Wilson, Kansas Grain and Feed Association
Jack Kintzle, National Corn Growers Association,
Iowa
Paul Johnson, Iowa State Legislature
11:00 a.m. Audience Participation

(over)

11:30 a.m.

Lunch. What are the economic benefits of sustainable agricultural practices? A presentation by Mike Duffy, Iowa State University.

12:30 p.m.

Farm Policy Incentives to Protect Groundwater:

What incentives are needed to encourage farming practices to protect groundwater?

Panelists:

Farmer, Iowa Demonstration Farm Project

Kendall Cole, Illinois Farm Bureau

Bob Warrick, Land Stewardship Project, Nebraska

Dan Freeberg, Agricultural Chemical Dealer, Iowa

Steve Morse, Minnesota State Legislature

2:30 p.m.

Audience Participation

Partial funding for this conference is provided by the Joyce Foundation and the Educational Foundation of America.

**Forest Lake WMO "509" Plan Review Chronology
as of 1/24/90**

July 6, 13, 1989	BWSR published Notice of Filing of FLWMO Plan
July 26, 1989	Overview of FLWMO Plan by staff at regular Board meeting.
July 28, 1989	Field tour of FLWMO watershed by staff
Aug. 7, 1989	Staff letter sent to FLWMO regarding necessary and suggested changes to Plan.
Aug. 7, 1989	William House requested a hearing on the Plan
Aug. 11, 1989	Milton Jeans requested a hearing on the Plan
Aug. 23, 1989	FLWMO invited Messrs House and Jeans to attend their Sept. 7, 1989 meeting to discuss the concerns they had with the Plan.
Sept. 8, 1989	BWSR issued its Order for Hearing
Sept. 14, 21, 1989	BWSR Order and Notice of Hearing Published
Oct. 24, 1989	BWSR held hearing at the Forest Lake Town Hall. The hearing record was held open for ten days to allow for the submittal of additional data. Messrs House and Jeans provided additional documentation to the BWSR during this time.
Nov. 17, 1989	FLWMO sent a letter to BWSR which outlined certain actions they would take with regard to BWSR's letter of Aug. 7, 1989.
Nov. 22, 1989	BWSR Dispute Resolution Committee met prior to the BWSR regular Board meeting to make a recommendation to the Board.
Nov. 28, 1989	FLWMO was advised in writing as to the decision and recommendation of the Dispute Resolution Committee.
Dec. 15, 1989	FLWMO requested the DNR to hold a hearing to establish the ordinary high water level.
Jan. 4, 1990	DNR, DOW Director Nargang set a letter to FLWMO to advise them of their decision to not hold a hearing to establish the OHWL.
Jan. 8, 1990	FLWMO sent a letter to the BWSR which outlined their response to BWSR's letter of Nov. 28, 1989.

Page 2
FLWMO Plan Review Chronology
Jan. 24, 1990

Jan. 11, 1990	BWSR sent a letter to DNR in attempt to clarify certain aspects of the decision to not hold a hearing on the OHWL.
Jan. 11, 1990	BWSR sent a letter to FLWMO in an attempt to clarify it's position with regards to the testimony at the Oct. 24, 1989 hearing.
Jan. 24, 1990	BWSR Dispute Resolution Committee meets prior to BWSR Board meeting to discuss progress towards resolution of issues relating to Plan deficiencies.

A:FLWMO.chr

Minnesota Department of Transportation

WETLAND HABITAT MITIGATION BANKING

Status for 1894 through 1989

<u>Mn/DOT District</u>	<u>Debits</u>	<u>Credits</u>	<u>Balance</u>
Duluth	-6635	+ 2290	- 4345
Bemidji	-5838	+ 5502	- 336
Brainerd	-2562	+34278	+31716
Detroit Lakes	- 882	+ 3623	+ 2741
Golden Valley	-1155	+ 2518	+ 1363
Oakdale	- 868	+ 920	+ 52
Rochester	- 831	+ 9	- 822
Mankato	- 349	+ 2354	+ 2005
Willmar	- 332	+ 200	- 132
Totals:	-19452	+51694	+32242

(Average per-acre wetland values are approximately 80 points, i.e., 6635 Debits represent approximately 83 acres of impact.)

Wetland Mitigation Areas by Type of Mitigation Measure

<u>Measure</u>	<u>Total # of Sites</u>	<u>Total # of Acres</u>
Improvement	14	264
Restoration	2	540
Creation	24	272
- - - - -		
<u>Measure</u>	<u>Total # of Sites</u>	<u>Total # Acres</u>
Impoundment	14	964
Excavation	26	112

**Wetland Habitat Mitigation Banking (WHMB)
Debit Acceptance Form For Mn/DOT Projects**

Metro District - Oakdale, S.P. 1901-122, TH 13 Burnsville, Dakota County

Project document/date issued: PPR/EA June 1987, Study Report Nov 1989

Construction date: summer of 1991

Project description: The project will involve upgrading the existing two-lane highway to a four-lane divided highway.

Field reviewed by WHMB bank managers:

The project was field reviewed by DOT (Sarima Jatnieks-Straumanis), USFWS (Jerry Decker) and (DNR) Conrad Christianson on January 9, 1990.

Wetland types and acreages: impacts are based on preliminary design plans and standard values are used for wetland HSI. Two wetlands will be affected: a type 2 and a type 6.

impacts: type 2; acreage 0.29; HSI 72; HUs 21
 type 6; acreage 0.29; HSI 75; HUs 22

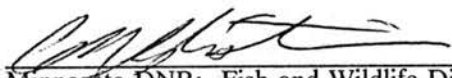
Total: 0.58

Total: 43

Wetland mitigation:

It is agreed that there are no practical alternatives which avoid wetlands and that all reasonable measures for minimizing harm to wetlands have been considered. On-site mitigation is being proposed for this project and will consist of excavating upland to create ponds adjacent to the proposed wetland fill. At the type 2 wetland site, the post-construction (type 5) pond will be 0.09 acres larger than the original wetland. At the type 6 wetland site, the post-construction pond will be 0.12 acres larger than the original wetland. It is therefore agreed that the unavoidable, transportation-related, wetland impacts from this project will be entered into the District's WHMB account. Any excess credits from this project will be credited toward the District's account.

 1/10/90
U.S. Fish and Wildlife Service: St. Paul Field Office / Date

 1-10-90
Minnesota DNR: Fish and Wildlife Division / Date

WETLAND HABITAT MITIGATION BANKING

Federal and state regulations require transportation agencies constructing transportation projects to avoid or minimize impacts to wetlands and to mitigate for unavoidable losses caused by construction. In Minnesota, much of this is accomplished by using Wetland Habitat Mitigation Banking, a formalized procedure initiated by the Minnesota Department of Transportation that quantifies both wetland impacts and wetland mitigation. This process encourages mitigation at every opportunity and projects proceed with fewer delays.

The agencies directly involved in this banking procedure are the Minnesota Department of Transportation, the U.S. Fish and Wildlife Service (USFWS), and the Minnesota Department of Natural Resources. The Federal Highway Administration's major involvement consists of approval and oversight of the banking process.

Banking consists of treating wetland impacts as debits and wetland mitigation as credits. The process whereby these debits and credits are balanced is the Wetland Habitat Mitigation Banking account.

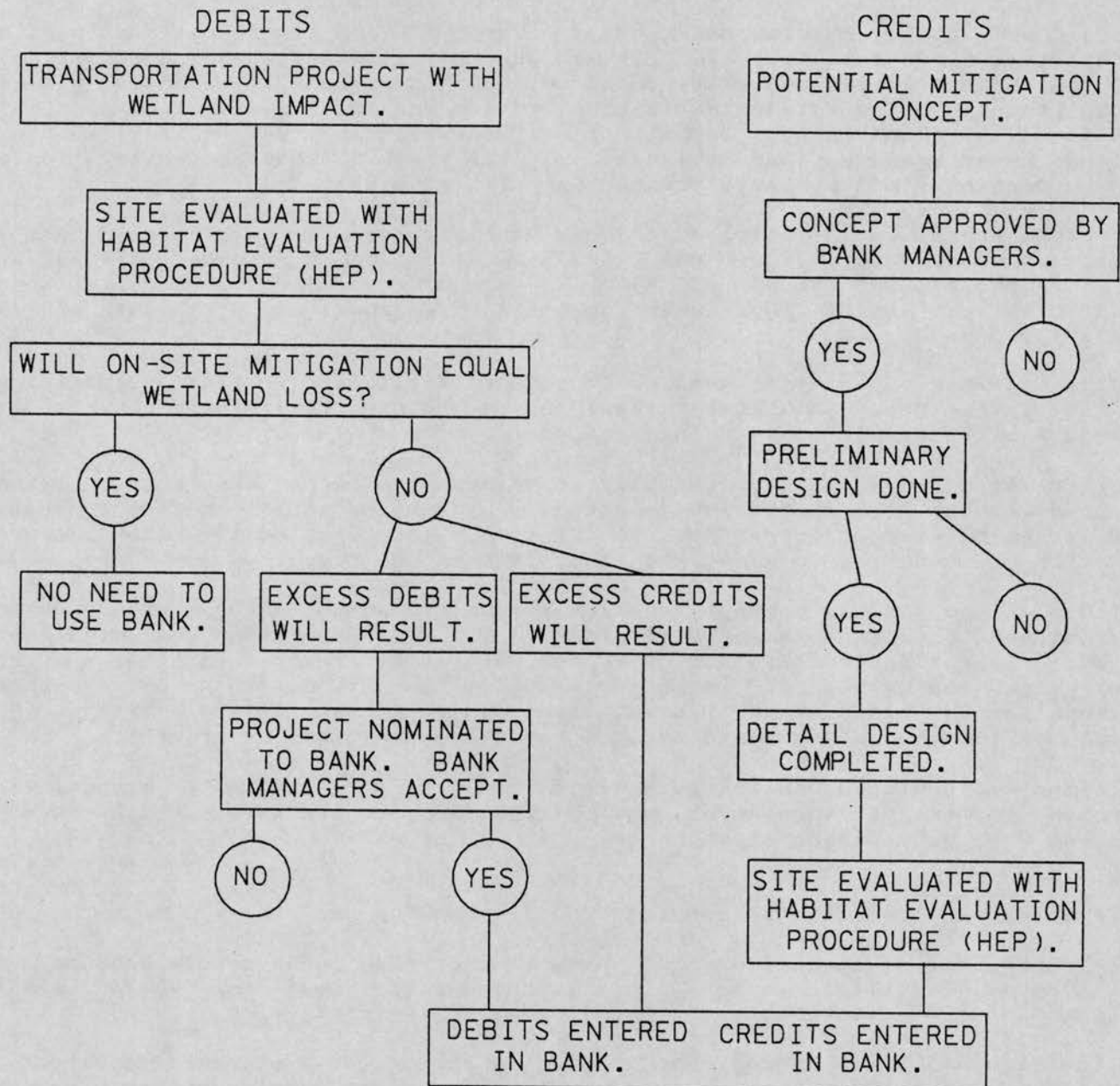
In order for a project to successfully go through the bank, there must be mutual agreement among all the agencies. A single dissenting party can keep a project outside the banking process. Thus, no one agency is obligated to follow a course of action or subscribe to a decision that it does not support.

The use of the banking concept requires a common denominator or currency which can represent both impacts and mitigation. The procedure which generates this currency is the Habitat Evaluation Procedure or HEP. Patterned after a method developed by the USFWS, HEP is an ecologically based procedure which evaluates wetlands on the basis of their size, type and value as wildlife habitat. HEP yields quantitative assessments both of impacts and mitigation efforts.

Decisions made within banking guidelines result in a consistent, standardized approach to impact assessment and mitigation requirements, which remains constant even with personnel turnover.

There are several additional benefits to this banking process:

1. Transportation agencies do not have to undertake unreasonable measures to mitigate all impacts on site. This is especially beneficial where on-site mitigation is not practicable or would not be cost-effective.
2. The required inter-agency coordination is expedited. A standardized approach to mitigation satisfies the requirements of the various regulatory agencies, and reduces the potential for inter-agency conflict.
3. Establishment of a few large mitigation areas may be used to compensate for many small impacts from different projects. This will save time, avoid project delays and increase the cost-effectiveness of mitigation efforts. Large mitigation areas have been shown to be more valuable to wildlife than an equivalent series of small sites. This results in more benefits to the environment, to wildlife, and ultimately to the taxpayer.
4. Since even minor losses and gains are accounted for, there is an incentive to minimize impacts and maximize mitigation efforts. This encourages taking advantage of every opportunity.
5. The creation of large wetland areas not only enhances wildlife and recreational opportunities, it also provides public relations benefits to any agency willing to use the Wetland Mitigation Banking process.



For further information about Wetland Habitat Mitigation Banking in Minnesota, write or call:
 Minnesota Department of Transportation
 Environmental Services Section
 Room 704 Transportation Building
 St Paul, MN 55155
 (612) 296-5770



Wetland Mitigation Banking—How It Works in Minnesota

Sarma A. Jatnleks-Straumanis and Lawrence E. Foote

Minnesota widely advertises its 10,000 lakes, but it has many more wetlands. The glaciers that created Minnesota's famous lakes also formed thousands of low areas which eventually developed into wetlands. These wetlands vary according to the state's major ecological units or biomes. Northeastern Minnesota is characterized by boreal forests and extensive peat bogs. Western Minnesota is characterized by tallgrass prairie with its pothole wetlands. Southeastern Minnesota is characterized by hardwood forests and high plateaus which are dissected by numerous streams and floodplain forest wetlands.

Wetlands provide valuable and essential habitat for fish and wildlife and maintain environmental quality by removing excess nutrients and sediments from watercourses. Since settlement, the draining or filling of wetlands for agriculture and urban development have caused the loss of many of the state's wetlands. The Minnesota Department of Transportation (Mn/DOT) fills wetland habitat in the course of improving and maintaining the state's highway system. During the past two decades, actions affecting wetlands have been regulated by a variety of federal and state laws and regulations. To insure that wetland impacts were assessed and mitigated in an appropriate and efficient manner, Mn/DOT in coopera-

tion with other state and federal agencies has developed wetland mitigation banking. In this banking system the loss of unavoidable wetland habitat is offset by wetland enhancement, restoration and creation.

Activities in Minnesota's wetlands are regulated by the Army Corps of Engineers (in consultation with the U.S. Fish and Wildlife Service) and the Minnesota Department of Natural Resources. When federally funded transportation projects affect wetlands, it is Mn/DOT's responsibility to mitigate these losses (Executive Order 11990). Wetland Habitat Mitigation Banking is a formal procedure that quantifies and qualifies both wetland impacts and wetland mitigation. It encourages maximum use of resources and opportunities available on or adjacent to highway projects. Mitigation banking promotes cost effectiveness by allowing projects affecting wetlands to proceed without costly delays.

Mn/DOT has, in the past, mitigated wetland impacts without a mitigation banking process. However, the old ad hoc approach to mitigation sometimes resulted in problems including high cost for the amount of mitigation gained, project delays, and loss of the wetland resource. Significant and moderate level impacts were mitigated, but much time was spent in coordination and negotiation with natural resource agencies. Coordination was done on a case-by-case, piecemeal basis. Agreements reached on a given project might not necessarily apply to other projects. Cost effec-

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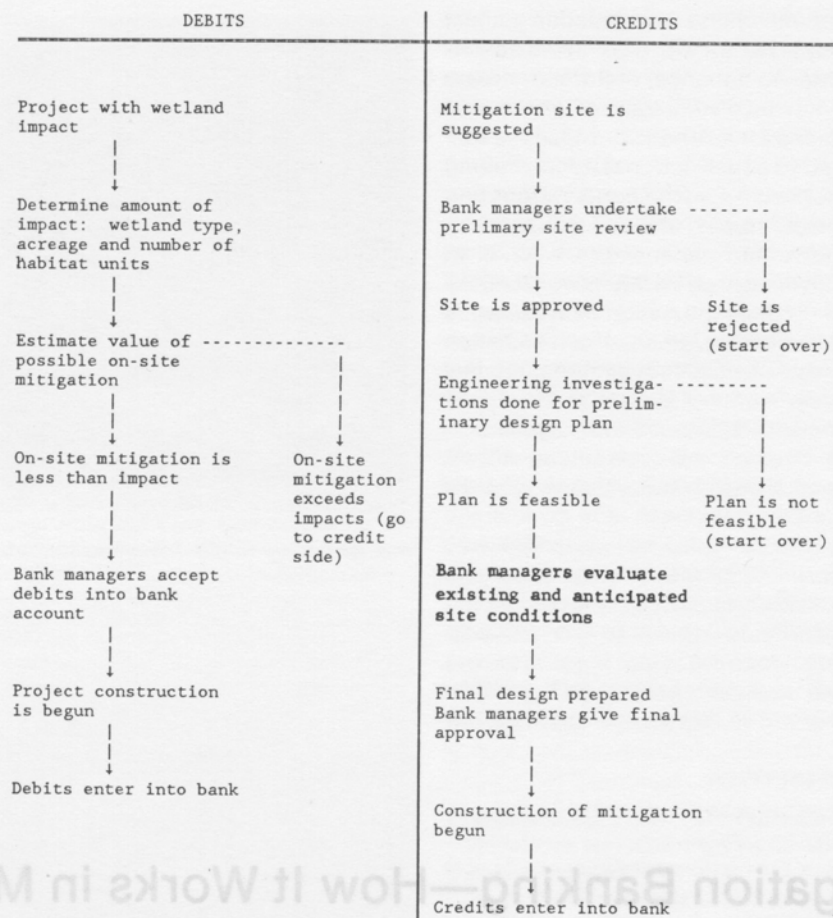


Fig. 1. Mitigation banking flow chart for debits and credits.

tiveness of on-site mitigation was variable. High costs were not always indicative of the quality of the benefit received by the wetland resource.

Sometimes extra mitigation measures were possible on a given project, but there was no incentive to do a better job than warranted by the project's impacts. When mitigation more than compensated for project impacts, the extra effort went unrewarded. Small impacts, not mitigated on-site and too small to warrant off-site mitigation, caused much work and costly delays. Sometime they "fell through the cracks" and were not mitigated. This meant a loss to the wetland resource with all the concomitant adverse impacts to wildlife and to the human population.

The banking guidelines were developed with the active involvement of the cooperating federal and state agencies: Federal Highway Administration, U.S. Fish and Wildlife Service and the Minnesota Department of Natural Resources. They were issued in the form of a Minnesota Department of Transportation Technical Memorandum, which is binding on Mn/DOT's operating districts.

The banking process has solved the problems identified above by speeding up inter-agency coordination, standardizing the approach to mitigation requirements, and outlining a means of mitigation acceptable to all agencies involved (see Figure 1). An accounting system keeps track of both impacts and mitigation to make sure that maximized mitiga-

tion efforts are being rewarded. Banking also provides Mn/DOT with the opportunity to mitigate off-site, if on-site mitigation is not practicable. WHMB consists of treating wetland impacts as debits and wetland mitigation as credits. The accounting process where the two cancel one another out is the bank account. Similar to a checking account, the WHMB account ideally maintains a positive balance.

Debits come about when a construction project (1) affects wetlands, (2) on-site mitigation is *not* feasible, and (3) the entire impact is debited. These kinds of projects typically involve little or no right-of-way acquisition and include bridge replacements, shoulder regrading and addition of turn lanes. Debits can also enter the account when a construction project (1) impacts wetlands, (2) onsite mitigation *is* feasible but does not entirely compensate for the impacts, and (3) the excess impact is debited. These kinds of project involve some right of way acquisition (where ponds can be created or small wetlands enhanced within right of way limits) including straightening of dangerous curves and upgrading from two lane to four lane divided highway.

Credits come about when a construction project (1) impacts wetlands, (2) on-site mitigation *more than* compensates for the impact, and (3) the excess mitigation is credited to the bank. Such projects include borrow areas where the removal of material needed for construction leaves behind depressions that extend down to the ground water table.

Credits also enter the account when a construction project *does not* incur wetland impacts, but Mn/DOT takes advantage of on-site opportunities to enhance, restore, or create wetlands. Such projects may involve rest areas where wetlands are created or enhanced for aesthetic purposes as well as wildlife habitat. When pond construction is needed along the roadway for stormwater detention, the pond designs can incorporate features (gradual slopes, shallow depths, etc.) which makes them attractive and beneficial to wildlife. In addition to on-site mitigation measures, WHMB gives Mn/DOT the opportunity to provide off-site mitigation in areas away from highway projects where enhancement and restoration can be undertaken on a larger scale. Off-site mitigation may be accomplished on public lands or private lands. Easements or fee title are obtained by Mn/DOT, and the improvement project is constructed. Usually the completed mitigation project is turned over to natural resource agencies for upkeep and management.

To use a banking concept, a common denominator or currency is needed to represent both impacts (debits) and mitigation (credits). To derive this currency, wetlands are evaluated on their particular quality as well as type and size. The procedure used in Mitigation Banking is a modified version of the Habitat Evaluation Procedure (USFWS 1976). Patterned after the USFWS method, it is an ecologically based procedure which evaluates wetlands on the basis of quality, type, and size. A habitat value is derived by evaluating the food, cover, and reproductive potential of a wetland for eight species of wildlife representing four feeding niches and four reproductive niches. This habitat value represents the value of a particular wetland on a per-acre basis. This per-acre value is then multiplied by the total acreage of the basin to arrive at the number of habitat units representing the wetland's worth.

The habitat evaluation procedure allows a numerical value to be assigned to a given wetland based on its type, size and particular value to wildlife. In the banking procedure the same analysis is applied to impact areas as well as mitigation areas, thus insuring a consistent method for accounting of both debits and credits. Because the wetlands in Minnesota's ecological regions vary in frequency of occurrence and species composition, consistency is also maintained by locating mitigation in the same ecological region as the wetland losses.

Examples of Mitigation Banking Projects in Minnesota

On-site mitigation measures have included the creation or enhancement of small wetlands within highway-right-of-way. Off-site mitigation measures have included restoration of drained wetland basins, enhancement of existing wetlands (Figures 2 and 3) and wetland creation during borrow operations (Figures 4 and 5).

Lamperts Marsh, a 28 acre wetland in the northern prairie pothole region, was enhanced by adding an elbow to the highway centerline culvert at its inlet (Figure 2). The water level increase of approximately one foot changed Lamperts Marsh from a seasonally inundated, cattail-choked basin, with a habitat value of approximately 65 points per acre, to an open water marsh, with a habitat value of approximately 92



Fig. 2. Spring runoff flows over the culvert outletting Lamperts Marsh. Before the elbow was added, much of this water drained off, leaving the marsh in a seasonally wet condition.



Fig. 3. While the center of Lamperts Marsh opens up, remnants of the dense cattail stand are still visible.

points per acre, (Figure 3). The cost of the venture was estimated at \$2,000. The amount of wildlife habitat units gained can offset future impacts to approximately 8 acres of marsh habitat in the prairie pothole region.

The Lake George Borrow Pit was created when borrow removal penetrated the ground water table in the boreal forest region. The 40-acre borrow site, adjacent to the highway for which the borrow was needed, contains 8 small wetland basins of various sizes and depths (Figure 4). When the site has completely revegetated, it will support a 12-acre wetland complex including fresh meadow, shallow marsh, and deep marsh wetland types (Figure 5). The habitat value gained was approximately 84 points per acre. Because the borrow was needed for highway improvements, the project was done at little extra cost to Mn/DOT. These gains can offset future impacts to approximately 12 acres of marsh habitat in the boreal forest region of Minnesota.

The banking mitigation process insures that decisions



Fig. 4. Excavation of borrow from the Lake George Borrow Pit resulted in a series of basins that will eventually become a wetland complex.



Fig. 5. The Lake George Borrow Pit wetlands complex is in Minnesota's northern boreal forest region.

made within banking guidelines follow a consistent, standardized approach to impact assessment and mitigation requirements between various agencies (Figure 1). Mutual agreement among all the agencies is needed for a project to successfully go through the bank. While this means a single no-vote can stop the progress of a project, it also means no one agency must follow a course of action it does not want.

Mitigation banking was not intended to apply to all projects. Its purpose is to make coordination and mitigation easier for most projects, especially those with small areas of impact. Banking as a process will become ineffective if burdened by controversial projects or projects that require special documentation, such as those projects affecting public park lands or federal management areas.

The importance of mitigation banking for the resource and for the various agencies involved is that the agency responsible for construction projects does not have to mitigate all impacts on site, especially where mitigation would not be cost-effective. The establishment of a few large mitigation areas can compensate for many small impacts. This saves time by avoiding project delays and increases the cost-effectiveness of mitigation efforts. Large mitigation areas (15–20 acres or more) are considered to be of more benefit to wildlife. The overall result is increased benefits to the wetland resource as well as the taxpayer.

References

- Executive Order 11990. 1977.** Protection of wetlands. Federal Register, Vol. 42, No. 101—Wednesday May 25, 1977.
- U.S. Fish and Wildlife Service. 1971.** Fish and Wildlife Service Circular 39, Wetlands of the United States.
- U.S. Fish and Wildlife Service. 1976.** Habitat evaluation procedures. Division of Ecological Services, Washington, D.C.

Examples of Mitigation Banking Projects in Minnesota

On-site mitigation measures have included the creation or enhancement of small wetlands within highway-right-of-way. Off-site mitigation measures have included restoration of drained wetland basins, enhancement of existing wetlands (Figures 2 and 3) and wetland creation during borrow operations (Figures 4 and 5).

Lambda Marsh, a 28 acre wetland in the northern prairie pothole region, was enhanced by adding an elbow to the highway centerline culvert at its inlet (Figure 2). The water level increase of approximately one foot changed Lambda Marsh from a seasonally inundated, cattail-choked basin, with a habitat value of approximately 85 points per acre, to an open water marsh, with a habitat value of approximately 95

MINNESOTA DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES DIVISION
TECHNICAL MEMORANDUM NO. 87-28-ENV-2
June 18, 1987

To: Distribution 57 I J & E
From: E. E. Ofstead *E. E. Ofstead*
Assistant Commissioner
Technical Services Division
Subject: GUIDELINES FOR IMPLEMENTATION OF WETLAND HABITAT MITIGATION
BANKING (WHMB)

These procedures have been agreed to by the Minnesota Department of Natural Resources (Mn/DNR), the U.S. Fish and Wildlife Service (USFWS), the Federal Highway Administration (FHWA) and the Minnesota Department of Transportation (Mn/DOT) (see letters of concurrence in Appendix 5).

OBJECTIVES

- 1) To facilitate compliance with Executive Order 11990, Protection of Wetlands, by providing cost-effective mitigation for unavoidable transportation related wetland impacts while maximizing benefits to the natural environment.
- 2) To facilitate compliance with state statutes concerning protected waters by providing acceptable mitigation for unavoidable transportation related impacts to wetland habitat.
- 3) To simplify the required inter-agency wetland mitigation coordination by developing a method for tracking unavoidable transportation related wetland impacts (debits) and mitigation areas (credits) as agreed to by all agencies involved.
- 4) To outline a consistent scientific method-- a Habitat Evaluation Procedure (see Appendix 3)--for evaluating wetland impacts and mitigation projects in terms of wildlife habitat value.

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DEFINITIONS

Bank	An account representing accrued debits and credits, arrived at through the WHMB process. One bank account will be established and maintained for each Mn/DOT District.
Bank Managers	Within the bank managers team, Mn/DOT will be jointly represented by the appropriate district (by designated district liaison) and by ES. Representing the cooperating agencies will be a Mn/DNR biologist, a USFWS biologist and a representative from the FHWA. Each Mn/DOT District will have its own team of bank managers: the ES and DNR representatives will be the same for each of the nine teams, while representation from the District and USFWS will vary between the Districts. The bank managers will be responsible for deciding which projects are accepted into WHMB (as debits or credits).
Cooperating Agencies	The primary cooperating agencies are the Mn/DNR, the USFWS, the FHWA and the Mn/DOT. On a project specific basis, other agencies; Federal, State or local, may constitute a cooperating agency.
Credit	A positive habitat unit value, gained by wetland creation, enhancement or preservation.
Credit Area	A mitigation site which has been accepted into the bank by the bank managers: a wetland, created, or enhanced through habitat management (or preserved from imminent destruction) that provides habitat unit credits to a WHMB account.
Credit Balance	A credit balance results when the mitigation accomplished on a given project more than offsets the wetland impacts incurred.

Debit A negative habitat unit value, resulting from an unavoidable transportation-related wetland impact.

Debit Area An unavoidable transportation-related impact which has been accepted into the bank by the bank managers: wetland habitat that will be unavoidably impacted through project construction, therefore requiring compensation for its lost habitat value by withdrawal of habitat units from the WHMB account.

Debit Balance A debit balance results when all of the mitigation required for a given project is not economically or biologically feasible on-site and is not accomplished on the specific project.

District Bank Account An account, kept for a Mn/DOT District, which represents created habitat units (credits) and habitat unit losses (debits) accruing within that District.

District Liaison A designated representative from each Mn/DOT District who serves as a bank manager.

Habitat Evaluation Procedure (HEP) The habitat evaluation procedure used in determining the value of debit areas and credit areas (see appendix 3). This procedure will be used by the HEP team to quantify wetland wildlife habitat value, in terms of habitat units.

HEP Team The HEP team will be composed of biologists representing the primary cooperating agencies. A given wetland area will be evaluated by the HEP team, with other bank managers present as observers. The responsibility of the HEP team will be to evaluate debit and credit areas.

Habitat Units (HUs) The "currency" used in the WHMB process to quantify the value of wetland debit areas as well as credit areas. HUs equal habitat value (quality rated on a scale of 0 to 100) multiplied by habitat quantity (acreage).

Habitat Value

The value a given wetland has for wildlife species as determined through HEP.

Moments of Opportunity

Conditions arising during the project development process (preliminary and detail design or construction phases of a project) that provide opportunity for mitigation (wetland enhancement or creation for WHMB credits) within or adjacent to Mn/DOT owned right of way.

Principal Bookkeeper

A Mn/DOT Environmental Services Section representative.

Unavoidable Impact

An impact for which a feasible or practicable alternative cannot be found.

Wetland

In WHMB, wetlands will be designated by types according to the USFWS publication, Circular 39, titled Wetlands of the United States.

Wetlands, as defined by Executive Order 11990 are: "those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction."

For those wetlands which come under Army Corps of Engineers (COE) Section 404 permit authority, the following definition applies: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. (33 CFR 323.2(c))

The E.O. and COE definitions are essentially the same, differing only in that the COE definition states that wetlands are areas that do support wetland vegetation, while the E.O. definition states that wetlands are areas that do or would support such vegetation. (In actual operation, there does not seem to be any difference in these two definitions.)

WETLAND HABITAT MITIGATION BANKING

Procedural Provisions

Wetland Functions covered by WHMB

WHMB is limited to wetland wildlife habitats directly impacted by transportation projects governed by the authority of Mn.DOT and it is not intended to mitigate other environmental losses (i.e., flood storage, groundwater recharge, recreation, etc.) Mitigation for these other environmental losses will be determined separately.

The previous statement, however, does not preclude designing a WHMB eligible site to also mitigate other environmental losses. Any wetland wildlife habitat values created by mitigation in these other areas of concern will be credited to WHMB upon approval by the bank managers .

The WHMB process is established primarily to facilitate compensation of impacts to wetland wildlife habitat. (Impacts to or enhancement of, fisheries habitat may be handled in a manner similar to WHMB on a case by case basis. These accounts will be kept separate, i.e., fisheries credits will not be used to offset wildlife wetland debits and vice versa.)

Projects Eligible for WHMB

Projects currently under development or construction are considered to be covered by WHMB if their initial project documents (Project Memo, Project Path Report, Environmental Assessment of Draft Environmental Impact Statement) were being circulated for review after January 1, 1984 or if they were proposed as bank candidates in either a project document or an agency comment letter before January 1, 1984. This retroactive date applies to wetland impact areas (hereafter referred to as debit areas) as well as wetland mitigation areas (hereafter referred to as credit areas). Highway projects which underwent wetland review prior to January 1, 1984, but have since undergone design changes which have appreciably changed the number of debits incurred or the number of credits created, may be considered for WHMB - on a case by case basis.

Mn/DOT must comply with E.O. 11990 and proceed through the steps outlined in DOT Order 5660.1A, i.e., demonstrate that practicable alternatives to avoid wetlands and practicable measures to minimize harm have been considered, before employing WHMB. Mitigation for project impacts under the WHMB process can be implemented only after practicable measures to avoid, minimize, or accomplish on-site mitigation (resulting in no excess of HUs) have been

considered. Mitigation measures can include enhancement of wetlands or creation of new wetlands. The 23 CFR 777 requires that first consideration be given to mitigation within highway right of way. Second consideration is to be given to mitigation sites that are contiguous to the highway right of way of the project incurring the impacts. When these options are not practicable or feasible, off-site mitigation sites may be investigated.

The WHMB Process (see appendix 4)

Mn/DOT will make the first decision about whether a project is eligible for the WHMB process. Should Mn/DOT decide not to "bank" a project through WHMB, mitigation for that project will be coordinated independently. An example would be when on-site mitigation completely offsets wetland impacts, thus resulting in no excess debits or credits.

Once Mn/DOT submits a project to the bank, the agencies represented by the bank managers have the opportunity to approve its inclusion into the bank. There must be a consensus among these agencies at each step of the WHMB process in order for a project's debits or credits to be included in the bank. If a project does not have the unanimous approval of the bank managers, mitigation for the project will be coordinated outside the bank.

Coordination of the WHMB process will be carried out by the bank managers. The responsibility of the district liaison will be to coordinate with appropriate District personnel and local agencies such as drainage authorities. The responsibility of the ES representative will be to coordinate with appropriate Mn/DNR, USFWS and FHWA personnel.

Upon letting, the debits or credits resulting from a given project will be entered into the appropriate District's WHMB account. If there is an appreciable change in the design of a project from the original plans, during or after construction, Mn/DOT will notify the appropriate cooperating agencies of such changes. The bank managers will then decide if a re-evaluation needs to be conducted by the HEP team.

WHMB Account Keeping

WHMB accounts will be established within each Mn/DOT District for projects within that District. Exceptions may be made with concurrence of the bank managers. WHMB accounts will be kept at the Central Office of the Mn/DOT in ES, which will perform the duties of the principal bookkeeper. Statements of accounts will be circulated to the Districts, cooperating agencies and the FHWA on a semi-annual basis (July and January) or as requested. Credit areas will be established to maintain a positive balance in a

District's bank account.

Debit areas and credit areas will have a number of debits or credits assigned to them upon letting. These numbers will be a result of preconstruction estimates of the wetland wildlife habitat value of these areas. These preliminary estimates will become the final number of debits and credits if there are no appreciable changes in design. If there are design changes which appreciably alter the anticipated outcome of a project, the final number of debits or credits will be determined by the re-evaluation of the impacts of the mitigation. The need for the HEP team to re-evaluate a project will be determined by the bank managers.

In those cases where mitigation is accomplished on private land which is acquired by Mn/DOT, the final number of HUs gained will not be affected by transfer of ownership to another public agency.

Debit Area and Credit Area Evaluations

Debit areas and credit areas will be evaluated using a habitat evaluation procedure (HEP) developed by the participating agencies (see appendix 3). Evaluations will be conducted by the HEP team, with other bank managers present as observers. Input regarding local wildlife populations will be solicited from the Mn/DNR Area Wildlife Manager and other knowledgeable persons. Input regarding site development and construction will be solicited from appropriate District personnel.

Most debit areas will be assigned standardized habitat values (HEP values) already agreed to by the cooperating agencies for the various wetland types. These standardized HEP values have been determined by a team of biologists from the cooperating agencies (see appendix 3). Credit areas will be evaluated on an individual basis.

Once the wetland wildlife habitat quality for a credit area has been decided upon, the next step is to determine what portion may be applied as credit to the bank. This amount of credit may be dependent upon the anticipated longevity of the credit area:

- Credit areas in public ownership will be awarded 100% of their HEP value.
- Credit areas secured by easements on private land will be awarded less than 100% of their HEP value according to the length of the easements.
- Credit areas, for which neither titles nor easements can be secured, will be awarded an amount of credit determined by the number years they remain in their enhanced or created wetland condition. While they will initially receive 100% of their HEP

value, an appropriate amount of credit will be deducted from this original HEP value if these areas should be filled or drained at some later date. The amount deducted will be determined by the HEP team on a project specific basis. The procedure used by the HEP team will be a procedure mutually agreed upon by the bank managers.

WHMB Debit Areas

Debit areas will be nominated as candidates to a District's bank account in the early stages of project documentation. The wetlands section of the project analysis should note that avoidance, minimization and onsite mitigation measures (resulting in no excess of either wetland impact or mitigation) have been investigated in order to consider WHMB as a mitigation measure. The acceptance of debit areas into the bank will normally be noted in inter-agency letters of coordination. Debits will be entered into a District's bank account upon project letting.

For Class I (Environmental Impact Statement - EIS) actions, wetland mitigation will be included in the inter-agency early coordination. Early coordination will normally involve inter-agency field review. The types of wetlands affected and potential amounts of impact should be determined in the DEIS. The types of mitigation proposed for a project (on-site, off-site or a combination of both) should be discussed at the DEIS stage. Commitments to specific mitigation should be included in the FEIS. Additional specific information regarding mitigation sites can be presented in the ensuing Study Report (SR).

For Class II (Categorical Exclusion) actions, the potential for wetland impact should be noted in the draft Project Memo (PM) or draft Project Path Report (PPR) stage to alert ES that a potential debit situation could arise. ES will then determine if a field review is necessary. If a field review is not necessary, ES will assign standard HEP values to the wetlands that may be affected. If a field review is necessary, ES will handle the coordination. In the case of a PM, amount of wetland impact should be identified in the final PM if possible. If construction limits have not been determined by the issuance of the PM, it should be noted in the document that the Bank Managers will be notified of the amount of the wetland impact when the construction limits have been determined. In the case of a PPR, the approximate amount of wetland impact should be identified in the PPR, while the actual wetland impact can be determined by the SR stage. The wetland sections of these documents should note WHMB as a potential mitigation measure by nominating the wetland impact as a debit to the District's bank account. If it turns out that project-specific mitigation is able to offset the impact, the nomination can be withdrawn and the WHMB process need not be used for that particular project. Signed copies of the PM or PPR should be sent to the USFWS

and DNR bank managers.

For Class III (Environmental Assessment - EA) actions, the possibility of using WHMB as a mitigation measure should be discussed during early coordination. Early coordination will normally involve inter-agency field review. The type and amount of wetland affected should be determined by the draft EA stage. The types of mitigation that are feasible for a project (on-site, off-site or a combination of both) should be proposed before an EA goes to FHWA for approval. A commitment to one or more of these types of mitigation can be made after the public hearing and at the time of a request for a Finding Of No Significant Impact. Additional specific information regarding mitigation sites can be presented in the ensuing SR.

When candidate debit areas involve Mn/DNR protected waters, DNR permits will be required. In such cases, preliminary contact will be made with the respective Mn/DNR Area Hydrologist to evaluate potential permit problems. Mitigation determination for protected waters will be made as part of the formal protected waters permit application process, as required under Mn/DNR Division of Waters operational procedures. This mitigation determination will be concurrent with the WHMB process (the Mn/DNR bank manager will coordinate with Mn/DNR Division of Waters) and will normally be finalized by the time the permit is actually requested.

WHMB Credit Areas

Selection of Credit Areas

In the selection of credit areas, "moments of opportunity" should be utilized to the fullest. Such opportunities may arise during the design and construction phases of a project, e.g., alignment shifts, changes in drainage patterns, stormwater ponding areas, borrow pits, etc.

Suggestions for credit areas can originate with any interested party, but should be nominated to WHMB by the bank managers. The feasibility of establishing a particular credit area can be investigated by all cooperating agencies, however, the final decision rests with the appropriate Mn/DOT District. The cost feasibility of off-site credit areas will be determined by Mn/DOT and will be a major factor in the District's final decision.

Mn/DOT will be responsible for wetland improvements and securing any required permits and approvals. If some of these responsibilities or funds for development are undertaken by another agency, Mn/DOT may receive a reduced amount of credit for the credit area (as mutually agreed upon by the bank managers).

Securement of Credit Areas

First consideration will be given to mitigation within Mn/DOT owned right of way. While on-site mitigation may preclude the need to use the WHMB process, banking should be used in those cases where excess debits or credits will result. It is here that "moments of opportunity" are most likely to occur. Future transportation projects having impacts on wetlands within Mn/DOT owned right of way will be governed by these WHMB guidelines.

Second consideration will be given to mitigation contiguous to highway right of way, preferably contiguous to a project in which wetland impacts are being incurred.

When the above options are neither feasible nor practicable, the following measures may be investigated:

- Presently owned state or federal land on which wetlands can be created or improved.
- Private land acquisition from a willing seller for wetland creation or enhancement with subsequent conversion to another public agency for the purpose of management.
- Easement agreements with private landowners, for wetland creation or enhancement on their land.
- Enhancement of privately owned wetlands for which neither title nor easements are obtained.
- Acquisition or preservation of existing wetland on privately owned land. Such acquisition will qualify if it can be sufficiently demonstrated that the wetland is in real danger of destruction. Such areas would then remain in public ownership.

Acceptance of Credit Areas into the Bank

Upon final approval of a credit area into WHMB, the bank managers will draft a statement containing the following information (see appendix 2):

- 1) State Project number and stationing for on-site credit areas and legal description for off-site credit areas (including the designated name).
- 2) Mitigative measures that will take place at the site, i.e., site development plans, design specifications. These will constitute the conditions that will have to be met in order to receive credit.

3) The results of a preliminary HEP, i.e., the number of HUs to be gained.

4) A provision stating that once the site has been constructed, the site will be re-evaluated.

5) Signatures of the bank managers, affirming the site's acceptance into WHMB.

The District will then be able to use this "sign-off" sheet when processing programming and right of way acquisition requests.

Agreements regarding Credit Areas

Written agreements between Mn/DOT and the appropriate public agency will be necessary, on a site specific basis, to determine each agency's responsibilities for work involving a credit area on public land or land to be turned over to public ownership other than Mn/DOT. Responsibilities for aspects such as funding, liability, design, engineering, construction, etc., will be agreed to and documented.

Written agreements between Mn/DOT and the proposed custodial agency will also be necessary, on a site-specific basis, in the event that credit sites established on privately owned land are converted to another agency for public ownership.

Appendix 1

Mandates and Provisions Applying to Federally Funded Projects
Involving Wetland Impacts

Mandates and provisions that apply to Federally funded projects involving wetland impacts:

Executive Order 11990 Protection of Wetlands requires that federal agencies take actions to minimize destruction or degradation of wetlands.

Pursuant to E.O. 11990 all practicable measures must be undertaken to avoid or minimize wetland impacts before WHMB can be considered for a specific project.

U.S. Department of Transportation (DOT) Order 5660.1A Preservation of the Nation's Wetlands is based on E.O. 11990 and defines the DOT's policy towards wetlands as one that assures the protection, preservation, and enhancement of wetlands to the extent practicable during the development of transportation projects.

Specifically, DOT Order 5660.1A states " Alternatives which would avoid new construction in wetlands must be studied, giving consideration to environmental and economic factors. If use of wetlands is proposed, the alternatives analysis for major actions should have demonstrated that there is no practicable alternative to the use of the wetlands and that all practicable measures to minimize harm to the wetlands have been included".

23 CFR 777 et. seq. Mitigation of Environmental Impacts to Privately Owned Wetlands provides policy and procedures by which the Federal Highway Administration (FHWA) and a State Highway Administration (SHA) can evaluate and mitigate adverse impacts to privately owned wetlands in order to qualify for federal highway aid.

Pursuant to 23 CFR 777 et seq., first consideration is given to mitigation within highway right of way. In those cases where acquisition of privately owned land is required for mitigation, FHWA participation is limited to acre for acre replacement; however, no such limit is placed on state funded projects where private land is purchased to improve or restore an existing wetland as long as such measures are cost-effective and reasonable.

After avoidance and minimization measures have been undertaken, wetland mitigation measures can be initiated. The 23 CFR 777 states: "First consideration must be given to the mitigation of wetland impacts within the highway right of way limits [on the project causing the impacts]. This should include the enhancement of existing wetlands and the creation of new wetlands in the highway median, borrow pit areas, interchange areas, and along the roadside."

The FWCA mandates that fish and wildlife conservation receive equal consideration with the other purposes of programs that affect water resources. In accordance with the FWCA, public or private agencies under Federal permit or license must consult with the USFWS and the State Department of Natural Resources (DNR) before undertaking projects that modify streams, lakes or wetlands for any purpose. Furthermore, the reports and recommendations of the USFWS and the State DNR on the wildlife aspects of such projects will be made an integral part of any report prepared or submitted by an agency of the Federal Government responsible for construction of such projects. Recommendations of the USFWS and the State DNR will be as specific as is practicable and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages.

The USFWS Mitigation Policy (46 FR 7644-7663) outlines internal guidance for all investigations and recommendations for mitigation under the FWCA. The primary focus of these guidelines is mitigation of losses in terms of habitat value. USFWS recommendations are based on the habitat value adversely impacted, rather than the acreage impacted.

Minnesota Statutes Section 105.42 Subdivision 1 authorizes the Minnesota Department of Natural Resources (Mn/DNR) to control the placement of fill into public waters or wetlands (as defined by Section 105.37 subdivisions 14 and 15).

According to these Minnesota Statutes, the Mn/DNR's responsibility is to: 1) minimize encroachment, change, or damage to the environment; 2) regulate the quantity and quality of fill and the purpose for which filling may be allowed based upon the capabilities of the waters to assimilate the material; and 3) maintain consistency with floodplain, shoreland, and wild and scenic rivers management standards and ordinances. Placement of fill is not to be permitted for construction of a roadway or pathway, or to create or improve land access from peripheral shorelands to islands, or to facilitate land transportation across the waters; however, where a project is proposed by a federal, state, or local government agency and this provision would prevent or restrict the project, or create a major conflict with other public purposes or interests, the commissioner may waive this provision provided: 1) there is no other feasible and practical alternative to the project that would have less environmental impact; and 2) that the public need for the project rules out the no-build alternative.

Appendix 2

WHMB Debit Area and Credit Area Acceptance Forms

WETLAND HABITAT MITIGATION BANKING

Credit Area Acceptance Form

District:

State Project:

Proposed Letting Date:

Project Name:

Location:

On-site Habitat Without Project:

Proposed construction measures:

Results of preliminary Habitat Evaluation Procedure:

The preliminary HEP was conducted with certain design specifications in mind (see above or see attached sheet). If these conditions are met, the result will be a habitat value gain of xx points per acre. With the anticipated size of the mitigation area being yy acres, the estimated net gain to the District's WHMB account would be zz Habitat Units (HUs).

Upon completion of the project, the site will be reviewed by the bank managers to determine if conditions have changed enough to warrant a second evaluation to arrive at the final number of HUs. If the bank managers decide a second HEP is not necessary, the number of HUs gained from the preliminary HEP will represent the final amount of credit yielded by the site.

The number of HUs credited to the District's WHMB account will remain in the account until it is depleted by debits resulting from wetland impacts. Transfer of ownership of this mitigation site from Mn/DOT to Mn/DNR, USFWS or another public agency will have no effect on the number of HUs in the District's account.

The undersigned bank managers agree to accept the above named mitigation site into the District X WHMB account upon its letting date.

Date:

Date:

Mn/DOT District X
Representative

Mn/DOT Environmental Services
Representative

Date:

Date:

USFWS St. Paul Field Office
Representative

Mn/DNR Ecological Services
Representative

WHMB Debit Acceptance Form For Mn/DOT Projects

District County S.P. Hwy / Location

Project document path:date issued (circle one for each line)

1. PM:_____, PPR:_____, EA:_____, other_____
2. DEIS:_____, FEIS:_____, N/A
3. SR:_____, N/A

Construction date:_____

Field reviewed by WHMB bank managers: no yes

Wetland impacts:

It is agreed that there are no practicable alternatives to avoid the wetland(s) and that all practicable measures for minimizing harm to the wetland(s) have been considered. It is therefore agreed that the unavoidable transportation-related wetland impacts from this project will be entered into the District's WHMB account in the following manner (circle one):

- a) on-site mitigation is not feasible, therefore the wetland impacts will be debited towards the District's WHMB account.
- b) on-site mitigation is proposed, however, any excess debits or credits resulting from the mitigation will be put towards the District's WHMB account.

US Fish and Wildlife Service

Mn Department Natural Resources

Wetland values for impacts

1. OK to use generic wetland values? yes no
2. individual HEP done? date:
3. impacts: type_____; acres impacted _____; HSI_____; HUs_____

Wetland values for any on-site mitigation

1. OK to use generic values for created wetlands? yes no
2. individual HEP done for created wetlands? date:

APPENDIX 3

Habitat Evaluation Procedure (HEP)

Introduction

Acre for acre, wetlands are among the most productive lands on earth. Besides providing valuable and often essential habitat for fish and wildlife, wetlands also play an equally important role in maintaining environmental quality through removal of excess nutrients, sediments, and chemical and organic pollutants, while providing food which supports a variety and abundance of aquatic life. In addition, wetlands provide a variety of socio-economic values including flood and storm damage protection, erosion control, water supply and groundwater recharge, livestock grazing, harvesting of wetland products and recreation (Tiner, 1984).

The Minnesota Wetland Habitat Mitigation Banking (WHMB) program resulted from a long-standing state and federal recognition of the biological and other functional values of wetlands as they relate to national, state, and public benefits. WHMB is a logical and straightforward process to compensate for unavoidable losses to Minnesota wetlands from state highway projects.

Habitat Evaluation Procedure

A key requirement of the Minnesota WHMB program is the availability of a habitat evaluation methodology to quantify debits and credits. Fortunately, several habitat-based methodologies have been developed to quantify habitat impacts. Our initial challenge was to select a habitat evaluation methodology which would be simple to use, easily understood by biologist and non-biologist alike, and one which would require a minimum expenditure of time and effort. We selected the U.S. Fish and Wildlife Service's Habitat Evaluation Procedures (HEP) as the basis for our evaluation methodology (U.S. Fish and Wildlife Service, 1980). HEP was developed by the Service to quantify habitat losses associated with land and water resource development projects. Its primary use was developing compensation plans to replace habitat losses associated with these projects. It has since evolved into a useful planning tool to evaluate project alternatives at an early stage of planning.

The 1980 version of HEP was developed to quantify habitat impacts for individual species or groups of species, in contrast to the habitat or cover-type approach of the 1976 version (U.S. Fish and Wildlife Service, 1976). In HEP-80, habitat changes are expressed as Habitat Units (HU) lost or gained for individual species or species groups (e.g., 100 HU lost for white-tailed deer). However, experience has shown that it is often more desirable to display habitat losses in terms of habitat or cover types, per the 1976 format (e.g., 100 HU lost for bottomland hardwoods). Subsequently,

HEP-80 has been afforded greater flexibility in providing users the option of tracking habitat, either habitat types or species in the evaluation. We chose to use the option of tracking habitat (wetland) types in the WHMB process.

The HEP methodology selected for use with the WHMB program involves four simple steps: (1) identification of wetland types to be affected by state highway projects in Minnesota, (2) assigning a numerical habitat value to each wetland type (HSI), (3) estimating wetland losses or gains (acres) for debit and credit areas, and (4) quantifying wetland losses in terms of Habitat Units ($HSI \times Acres = HU$). The following is a detailed account of steps used in the habitat evaluation procedure for the Minnesota WHMB program.

Steps Involved in the Habitat Evaluation Procedure

Step 1. Identification of Wetlands Impacted

Circular 39 (Shaw and Fredine, 1956) was used to identify wetland types which may be affected by state highway projects in Minnesota. Circular 39 was used in favor of more recent wetland classifications (i.e., Cowardin, et. al., 1979) because: (1) it is referenced in existing state public waters legislation, (2) the classification scheme has been widely accepted and utilized by state/federal/local agencies in the State, and (3) the system more clearly classifies wetlands into discrete and understandable categories which facilitates use of the HEP procedures and understanding of evaluation results by biologists and non-biologists alike. Based on the Circular 39 classification scheme, the following wetland types were identified as having the potential to be impacted by state highway projects in Minnesota:

Type 1 - Seasonally Flooded Basins or Flats. The soil is covered with water or is waterlogged, during variable seasonal periods but usually is well drained during much of the growing season. This type is found both in upland depressions (classified as Type 1 Seasonally Flooded Basin in WHMB) and in overflow bottomlands (classified as Type 1L Bottomland Hardwoods in WHMB). Along rivers, flooding occurs in late fall, winter, or spring. In the uplands, basins or flats may be filled with water during periods of heavy rain or melting snow.

Vegetation varies greatly according to the season and the duration of flooding. It includes bottomland hardwoods as well as some herbaceous species. Where the water has receded early in the

growing season, smartweed, sedge, grasses, and weeds (such as ragweed and cocklebur) are likely to occur. Shallow basins that are submerged very temporarily usually develop little or no wetland vegetation.

Type 2 - Fresh Meadow. The soil usually is without standing water during most of the growing season but is waterlogged within at least a few inches of its surface. Vegetation includes grasses, sedges, rushes, and various broad-leaved plants. Meadows may fill shallow lake basins, sloughs, or farmland depressions, or these meadows may border shallow marshes on the lakeward side. Hay is often cut from such wetland areas.

Type 3 - Shallow Fresh Marsh. The soil is usually waterlogged during the growing season; often it is covered with as much as 6 inches or more of water. Vegetation includes grasses, bulrush, spikerush, and various other marsh plants such as cattail, arrowhead, pickerelweed, and smartweed. These marshes may nearly fill shallow lake basins or sloughs, or they may border deep marshes on the landward side. They are also common as seep areas on irrigated lands.

Type 4 - Deep Fresh Marsh. The soil is covered with 6 inches to 3 feet or more of water during the growing season. Emergent vegetation includes cattail, burreed, arrowhead, bulrush, spikerush, phragmites, and wild rice. In open areas, both submergent and floating-leaved vegetation dominates including pondweed, coontail, watermilfoil, duckweed, and waterlily. These deep marshes may almost completely fill shallow lake basins, potholes, limestone sinks, and sloughs, or they may border open water in such depressions.

Type 5 - Open Water. Shallow ponds and reservoirs are included in this wetland type. Water is usually less than 10-feet deep and is fringed by a border of emergent vegetation such as cattail and bulrush. Submergent or floating vegetation (mainly at water depths of less than 6 feet) includes pondweed, wildcelery, coontail, watermilfoil, and waterlily.

Type 6 - Shrub Swamp. The soil is usually waterlogged during the growing season, and is often covered with as much as 6 inches of water. Vegetation includes alder, willow, and dogwood. Shrub swamps usually occur along sluggish streams and on floodplains.

Type 7 - Wooded Swamp. The soil is waterlogged to within a few inches of its surface during the growing season, and is often covered with as much as 1 foot of water. Wooded swamps occur mostly along sluggish streams, on floodplains, on flat uplands, and in very shallow lake basins. In Minnesota, tree species include tamarack, white cedar, black spruce, balsam fir, red maple, and black ash.

Type 8 - Bog. The soil is usually waterlogged and supports a spongy covering of mosses. Bogs occur mostly in shallow lake basins, on flat uplands, and along sluggish streams. Vegetation is woody, herbaceous or both. Typical plants include heath shrubs, sphagnum moss, and sedges. In Minnesota, leather-leaf, Labrador-tea, cranberries, and pitcher plants are often present. Scattered and often stunted, black spruce and tamarack are also common in many Minnesota bogs.

Step 2. Determination of Standard Wetland Habitat Suitability Indices (HSI)

In order to reduce travel and personnel expenses associated with conducting many small HEP evaluations, and to provide consistency in conducting HEP evaluations for both credit and debit areas throughout Minnesota, we decided to develop Standard Wetland Habitat Suitability Indices (HSI) for wetland identified in Step 1. This approach is similar to the development of standard HEP values which were successfully used to evaluate habitat impacts associated with a large number of alternative dredged material disposal sites on the Upper Mississippi River (Wege and Palesh, 1983a, 1983b). In addition, since the quality and quantity of wetland types varies between geographic regions of Minnesota, and because the Minnesota Department of Transportation (MNDOT) is decentralized into specific geographic districts, we decided to develop standard HSI values for each of the nine MNDOT Districts.

Our intent is to use standard HSI values to determine habitat losses (debits) for individual highway projects. Standard values can also be used as a starting point in conducting a more extensive HEP evaluation of habitat gains (credits) associated with wetland compensation projects (credit areas). This would be done at the option of the biologists involved in credit area evaluation.

A guilding process was used to select eight evaluation species for each wetland type identified in Step 1. This process involves categorizing species in wetland communities according to feeding and reproductive guilds. The following eight guilds were chosen for use in selecting wetland evaluation species:

1. Terrestrial Surface Nester. Species which nest at or within six inches of the ground surface.
2. Arboreal Nester. Species which nest in vegetation that is higher than six inches above the ground surface.
3. Cavity Nester. Species which nest in a cavity (e.g., tree cavity, burrow, den, etc.).
4. Water Surface Nester. Species which nest at or within six inches of the water surface.
5. Surface/Shallow Water Feeder. Species which feed on the ground or in shallow water that is less than twelve inches deep.
6. Deep Water Feeder. Species which feed at water depths greater than twelve inches.
7. Aerial Feeder. Species which capture their food in the air.
8. Arboreal Feeder. Species which feed in vegetation that is higher than six inches above the ground or water surface.

One species was selected for each guild occurring in each wetland type (Appendix 3-A). Wetland types were evaluated for selected species by consensus of the HEP team (USFWS, DNR and Mn/DOT biologists) using the Rating Criteria for Evaluation Species (Figure 1). These criteria evaluate the food, cover, and reproductive values of wetlands for each of the selected evaluation species. Numerical ratings for each evaluation species are based on a scale of 0-100. A value of 100 indicates that the particular wetland provides ideal habitat for that species. Since eight species were used to evaluate each wetland type, their total score was divided by eight to obtain a mean value; this mean value represents the standard (HSI) for the particular wetland type on a scale of 0-100. Standard HSI values for wetland types were developed for each Mn/DOT District after several interagency meetings during 1985 (Appendix 3-A).

Step 3. Estimation of Habitat Losses/Gains

The HEP evaluation quantifies habitat losses in terms of Habitat Units (HUs) by multiplying the habitat quality (HSI) by the change in habitat quantity (acres). In the case of debits, wetlands impacts are unavoidable losses associated with individual highway projects. Acres lost are determined for each wetland type impacted. This information is supplied by Mn/DOT and included in project documents (i.e., Project Path Report, Study Report). The size of credit areas is usually determined by the HEP evaluation team.

Step 4. Quantifying Habitat Losses and Gains (Debits and Credits)

The final step in the HEP evaluation is to quantify habitat impacts or mitigation in terms of HUs by the general formula:

$$\text{HSI} \times \text{Acres} = \text{HUs}$$

Where HSI represents the quality of the particular wetland and Acres represent the quantity of loss or gain. For minor projects, HUs can easily be calculated by hand. Computer software is available for more extensive projects and applications.

Table 1. Example WHMB account for District X.

<u>Project</u>	<u>Habitat Unit Debits</u>	<u>Habitat Unit Credits</u>
A	402	
B	314	
C	102	
D	203	
E	300	
Credit Area 1		3000

Figure 1. Rating criteria for evaluation species to be used with the Minnesota WHMB Program. These criteria are used to calculate individual (HSI) values for each evaluation species selected. (Refer to text and Appendix 3-A.)

RATING CRITERIA FOR EVALUATION SPECIES

FOOD

Daily, seasonally, or intermittently available forage/prey. Adjacent uplands are not to be considered for evaluating food.

0.0	1.0	2.0	3.0	4.0
Not Used	Poor	Fair	Good	Excellent

COVER

Daily, seasonal, or intermittent shelter from the elements and predators of the species. Included is cover for reproduction, nesting, resting and cover for the young. Adjacent uplands are not to be considered for evaluating cover.

0.0	1.0	2.0	3.0	4.0
Not Used	Poor	Fair	Good	Excellent

REPRODUCTION

Resources necessary for mating and nesting. Adjacent uplands are to be considered when evaluating reproduction.

0.0	1.0	2.0
Not Used	Fair	Excellent

The following examples are provided to illustrate the HEP and WHMB processes. Resulting debits and credits for these examples are shown in Table 1.

Example 1 - Debit Area. Construction of Mn/DOT Project A in District X will result in the unavoidable loss of 5.0 acres of wetland habitat. All practical measures were taken by Mn/DOT to avoid and minimize wetland impacts. Wetland losses include 3.0 acres of Type 3 (Shallow Marsh) and 2.0 acres of Type 6 (Shrub Swamp) wetlands. Standard wetland HSI values for District X are 84.0 and 75.0 for Types 3 and 6 wetlands, respectively. Habitat units lost (debits) for this project are:

Type 3	84.0 HSI x 3.0 AC =	252 HU
Type 6	75.0 HSI x 2.0 AC =	150 HU
	Total:	402 HU

These debits are entered into District X WHMB Account (Table 1).

Example 2 - Credit Area. Credit Area A is located in Mn/DOT District X and is 100 acres in size. The area is predominately Type 2 (Fresh Meadow) wetland habitat. Upon reviewing this potential credit area in the field, the HEP team (FWS, MNDNR, MNDOT biologists) decides that Credit Area A would be acceptable for the District X WHMB Account. Presently, Credit Area A contains 100 acres of Type 2 wetlands. By constructing a water control structure at its outlet along an existing roadway, these wetlands could be converted to Type 3 (Shallow Marsh), a more biologically desirable wetland habitat in District X.

The HEP team visits Credit Area A and must initially quantify its existing (baseline) habitat value. The team reviews the standard evaluation species and HSI values for Type 2 wetlands in District X as a starting point in their baseline evaluation. The team decides that the standard evaluation species and HSI value of 55.0 for Type 2 wetlands are appropriate for Credit Area A. Therefore, Credit Area A provides 5500 Habitat Units in its existing (baseline) condition ($55.0 \text{ HSI} \times 100 \text{ AC} = 5500 \text{ HU}$).

Next, the HEP team must quantify the habitat value of Type 3 wetlands to be created with the addition of the water control structure (with-project conditions). The team reviews the standard evaluation species and HSI value of 85.0 for Type 3 wetlands in District X as a starting point in the with-project evaluation. The team decides that both are appropriate for use in quantifying the habitat value of Type 3 wetlands to be created. Therefore, Type 3 wetlands to be created will provide 8500 Habitat Units through installation, operation, and maintenance of the proposed water control structure ($85.00 \text{ HSI} \times 100 \text{ AC} = 8500 \text{ HU}$). To determine the

net gain (credit) in habitat value for this project, the team merely subtracts the baseline condition (5500 HU) from the with-project condition (8500 HU). A credit of 300 Habitat Units is entered into the WHMB Account for District X (Table 1).

In some cases, the HEP team may decide that standard evaluation species and HSI values are not appropriate for specific wetland evaluations. In these instances, the HEP team may substitute one or more evaluation species, change standard individual species values, or both. The HEP procedure developed for the WHMB provides such flexibility to the user. However, any changes made to the standard species or values must be documented and attached to the HEP evaluation.

REFERENCES

- Cowardin, L.M., V. Carter, F. Golet and E.T. LaRoe. 1979. Classification of wetlands, and deepwater habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C., 103 pp.
- Shaw, S.P., and C.G. Fredine. 1956. Wetlands of the United States. U.S. Fish and Wildlife Service, Washington D.C. Circular 39, 67 pp.
- Tiner, R.W., Jr. 1984. Wetlands of the United States: current status and recent trends. U.S. Fish and Wildlife Service, National Wetlands Inventory, Washington, D.C., 59 pp.
- U.S. Fish and Wildlife Service. 1976. Habitat evaluation procedures. Division of Ecological Services, Washington, D.C., 30 pp.
- U.S. Fish and Wildlife Service. 1980. Habitat evaluation procedures (HEP). Ecological Services Manual 102. Division of Ecological Services, Washington, D.C.
- Wege, G.J., and G.D. Palesh. 1983a. Habitat evaluation of dredged material disposal alternatives using the habitat evaluation procedures (HEP). Pages 80-102 In Proceedings of the thirty-ninth annual meeting. Upper Mississippi River Conservation Committee, March 16-18, 1983. Quincy, Illinois.
- Wege, G.J., and G.D. Palesh. 1983b. Standards for use with the habitat evaluation procedures (HEP) to evaluate dredged material disposal alternatives on the Upper Mississippi River (GREAT-I). U.S. Fish and Wildlife Service, St. Paul Field Office, St. Paul, Minnesota 11 pp.

Appendix 3-A

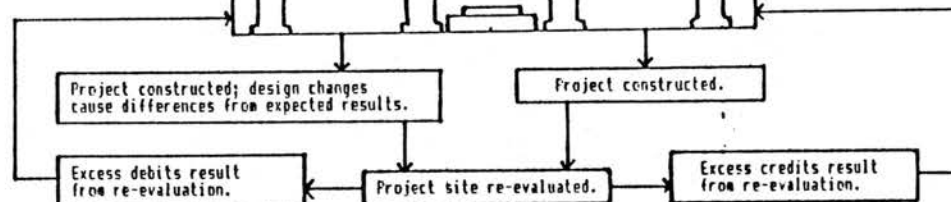
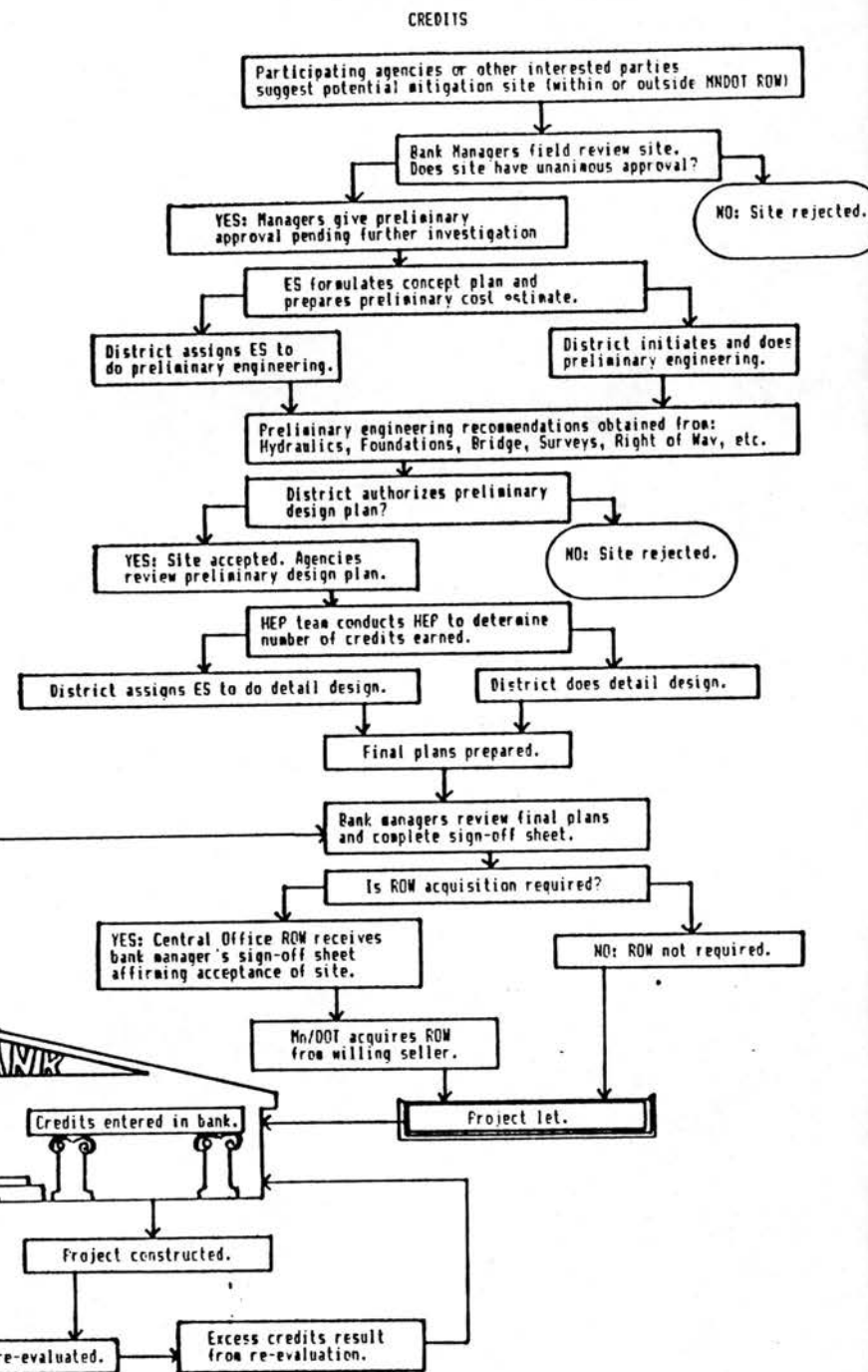
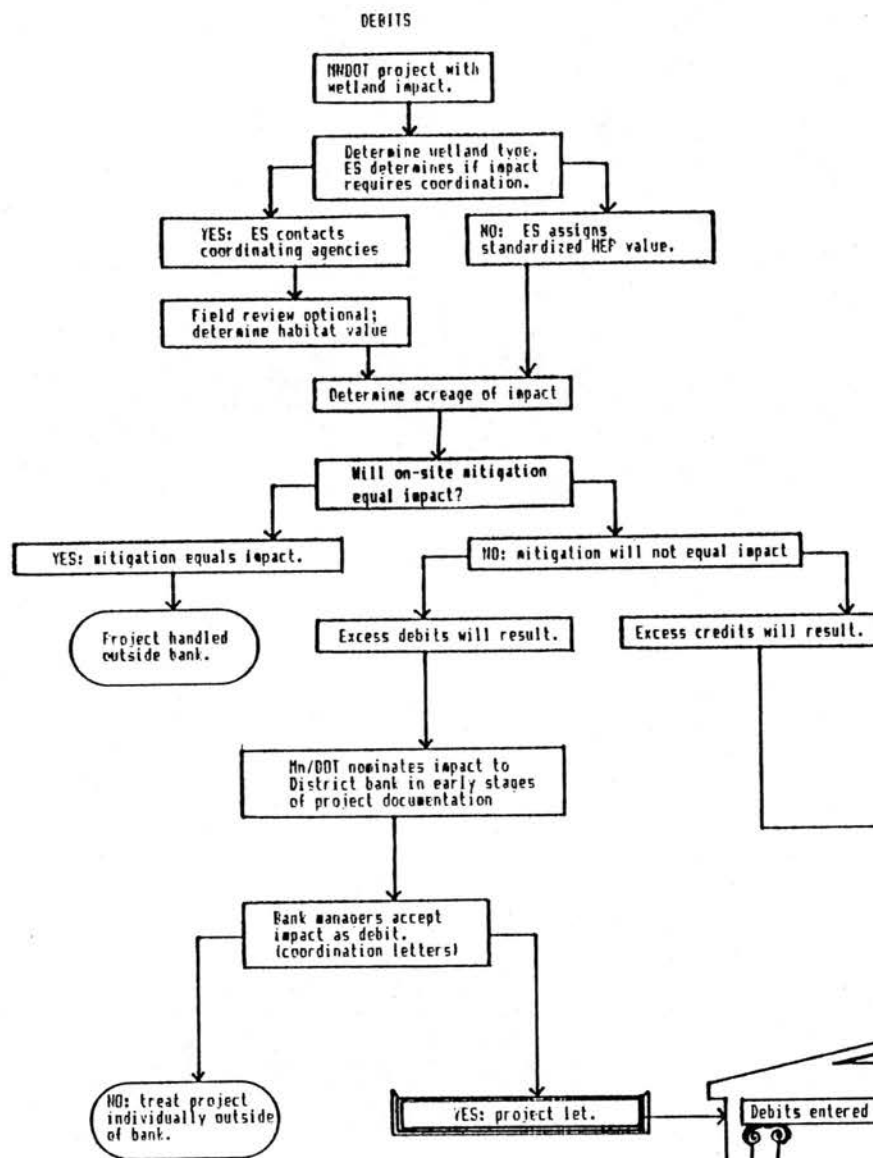
Districtwide HEP analyses for all wetland types

HABITAT SUITABILITY INDICES FOR WETLAND TYPES BY DISTRICT
SUMMARY TABLE

WETLAND TYPE	MN/DOT DISTRICT								
	1	2	3	4	5	6	7	8	9
1a SEASONALLY FLOODED	27	28	28	28	28	29	27	27	28
1b BOTTOMLAND HARDWOODS	70	75	77	75	77	79	76	76	77
2 FRESH MEADOW	66	70	72	70	72	63	62	62	72
3 SHALLOW MARSH	83	91	92	91	92	90	91	91	92
4 DEEP MARSH	92	95	96	95	96	96	95	95	96
5 OPEN WATER	81	80	80	80	80	74	80	80	80
6 SHRUB SWAMP	75	78	75	78	75	76	77	77	75
7 WOODED SWAMP	66	67	67	67	67	NA	NA	NA	67
8 BOG	52	50	50	50	57	NA	NA	NA	57

Appendix 4

WHMB Procedural Flow Chart



Appendix 5

Letters of Concurrence from Cooperating Agencies



United States Department of the Interior

FISH AND WILDLIFE SERVICE
ST. PAUL FIELD OFFICE, (ES)
50 Park Square Court
400 Sibley Street
St. Paul, Minnesota 55101

IN REPLY REFER TO:

March 26, 1987

Mr. E.E. Ofstead
Assistant Commissioner
Technical Services Division
Minnesota Department of Transportation
Transportation Building
John Ireland Boulevard
St. Paul, Minnesota 55155

Dear Mr. Ofstead:

This is to inform you of our concurrence with the Wetland Habitat Mitigation Banking Procedures (Technical Memorandum No. 86-31-ENV-2) dated January 21, 1987.

We are most appreciative for the cooperation extended by your Department and would appreciate your conveying a special thanks to Dr. Foote and his staff for their efforts in the development of the procedures.

We look forward to working with you and your staff in the orderly implementation of the banking procedures. If we can be of additional assistance, please do not hesitate to call.

Sincerely,


Robert F. Welford
Field Office Supervisor

Office Memorandum

DEPARTMENT OF NATURAL RESOURCES

TO: Doug Differt, Deputy Commissioner
Minnesota Dept. of Transportation

DATE: March 10, 1987

FROM: Steven G. Thorne
Deputy Commissioner

PHONE: 6-2540

SUBJECT: GUIDELINES FOR IMPLEMENTATION OF WETLAND HABITAT MITIGATION
BANKING

The Department of Natural Resources has reviewed the final draft (dated January 21, 1987) of the Guidelines for Implementation of Wetland Habitat Mitigation Banking (WHMB), and we find that the document has addressed all our previous concerns. We believe the Guidelines provide a workable process for meeting the important need to mitigate wetland impacts related to highway projects.

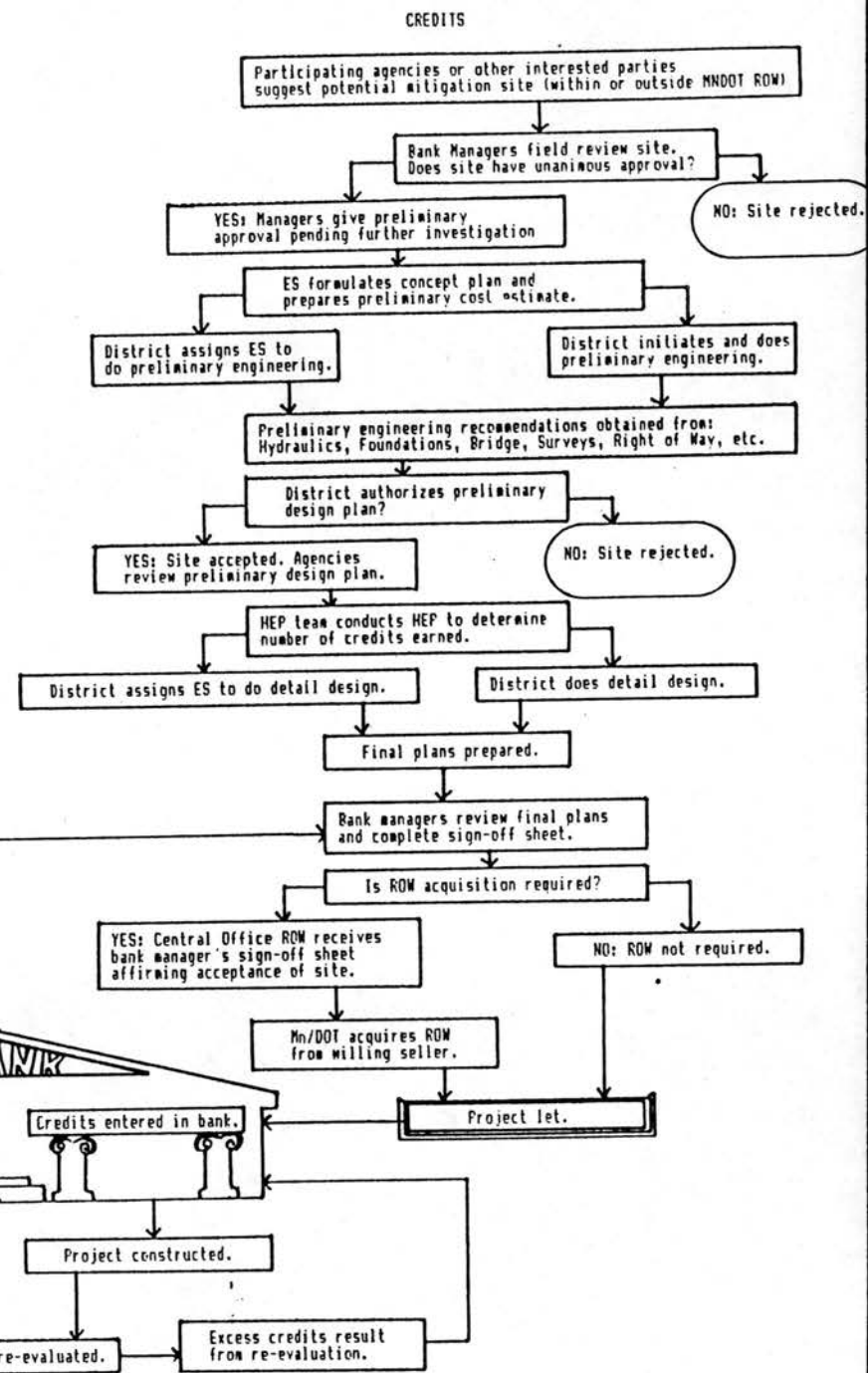
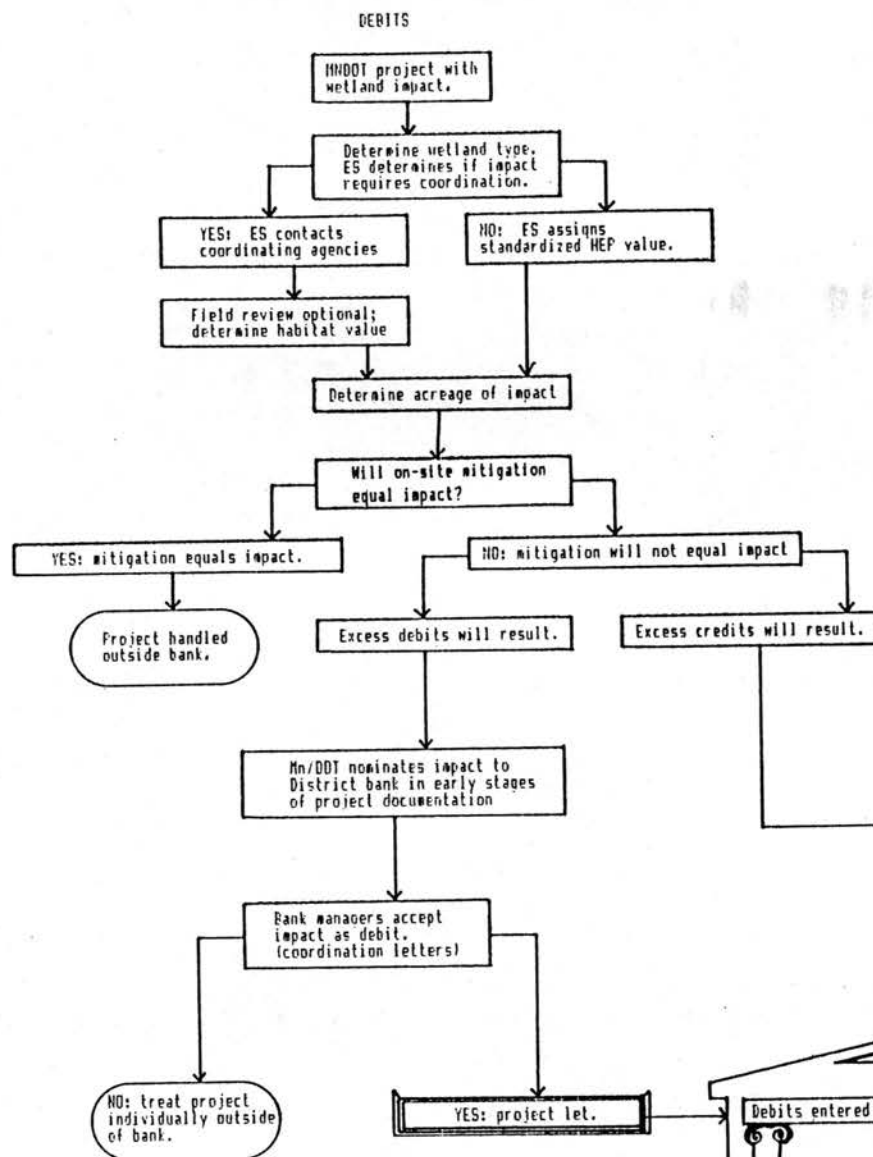
We hereby concur with the provisions of the Guidelines, and agree to participate in the WHMB process in the manner outlined in the Guidelines for our agency.

We are pleased that the Guidelines are finally being formally adopted, and appreciate the work your agency has put into bringing them to this point.

If we can be of further assistance to you in that matter, please contact Ken Wald of our Office of Planning at 6-4790.

c: Larry Shannon
Ron Nargang
Jack Skrypek
Ron Harnack
Frank Pafko ✓

*we need
the
original*



1/24/90

BWSR POLICY FOR USING
RIM WETLANDS
FOR WETLAND MITIGATION

It shall be the policy of the Minnesota Board of Water and Soil Resources [BWSR] that wetlands enrolled in the RIM Reserve Program cannot be used to mitigate for illegally drained wetlands. It is the BWSR's overall intent that wetlands restored or created by the RIM Reserve Program be voluntary and be "net gain" wetlands and not used for "no net loss" mitigation.

The BWSR may enter into agreements with other agencies, local units of government, or conservation groups to allow certain RIM Reserve wetlands to be used for wetland banking. These supplemental agreements must be approved by the BWSR before they can become effective with consideration given to comparative wetland values. In all cases, any consideration of RIM Reserve wetlands involvement is premised on being legally drained.

DRAFT POLICY

1/24/90

BWSR POLICY FOR USING
RIM WETLANDS
FOR WETLAND MITIGATION

It shall be the policy of the Minnesota Board of Water and Soil Resources [BWSR] that wetlands enrolled in the RIM Reserve Program cannot be used to mitigate for illegally drained wetlands. It is the BWSR's overall intent that wetlands restored or created by the RIM Reserve Program be voluntary and be "net gain" wetlands and not used for "no net loss" mitigation.

The BWSR may enter into agreements with *including local units of govt.* other agencies or conservation groups to allow certain RIM Reserve wetlands to be used for wetland banking. These supplemental agreements must be approved by the BWSR before they can become effective with consideration given to comparative wetland values. In all cases, any consideration of RIM Reserve wetlands involvement is premised on being legally drained.

**PROPOSED MODIFICATION OF
GARY KEARNS RIM RESERVE EASEMENT (55-11-86-1)
ACREAGE EXCHANGE**

BACKGROUND:

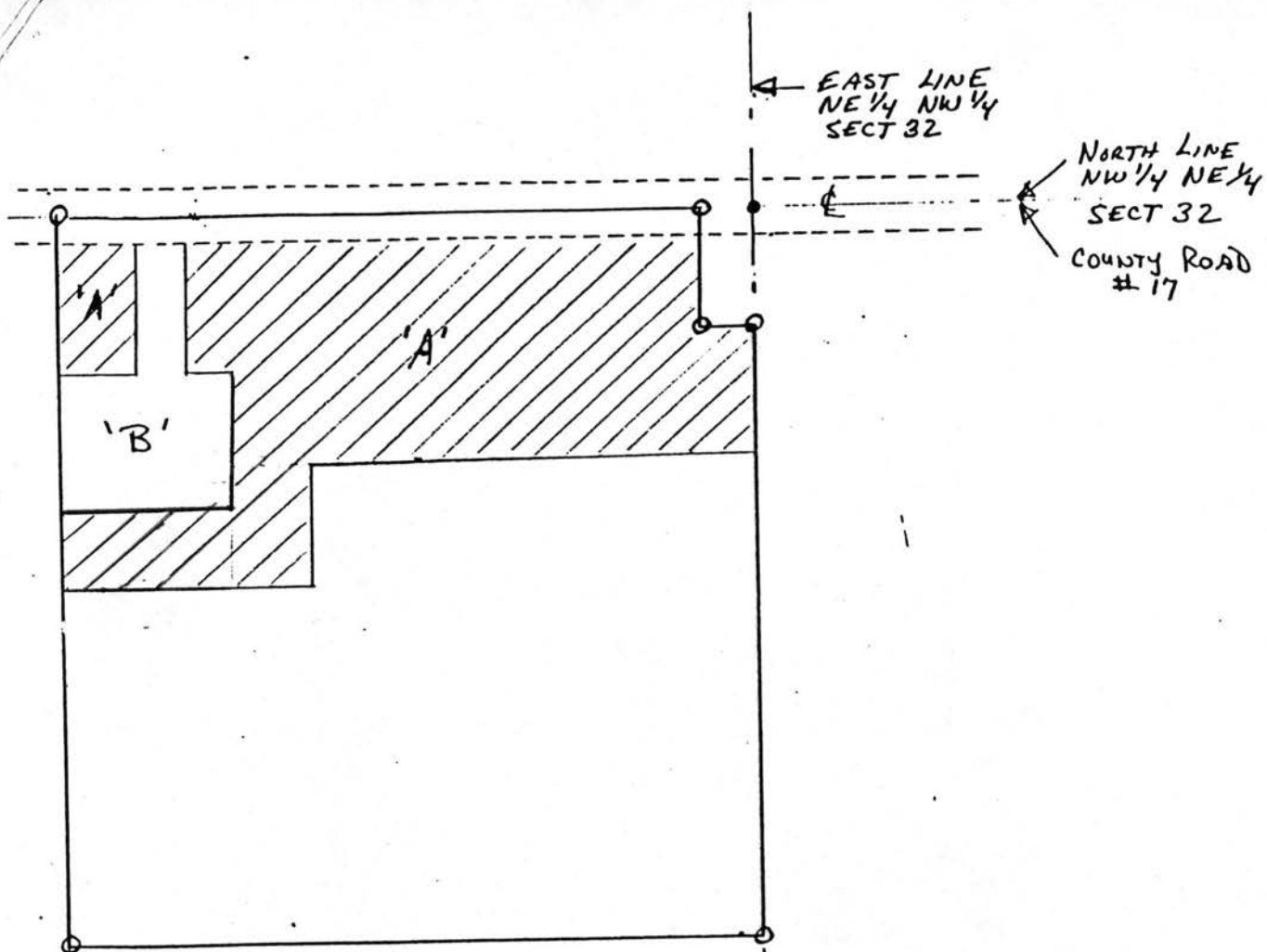
- * Located in Olmsted County
- * Total of 10 acres before and 10 + acres after the exchange.
- * This is a 10 year Marginal Ag. Land easement.
- * The original 10 acre RIM area surrounded a 2 acre exception and all 12 acres were seeded down and have an excellent cover stand now.
- * The original shape of the enrolled area was modified by the landowner at the Southwest corner for better management of the adjacent field. Only the changed area was seeded down. This was not fully approved by the SWCD but doesn't change the total easement area. (See attached FIG. 1 & 2)

PROPOSAL:

- * A one acre portion of the original RIM easement is under purchase agreement to the adjacent owner of a single family home. In addition, an adjacent landlocked parcel to the south owned by the Kearns has been sold with access provided by the field road that was part of the original easement but was not shown on the original Exhibit A.
- * The 2 acre exclusion included in the original easement (FIG 1) will be incorporated into the modified easement area. The new access road right of way of one acre for access to the adjacent field to the south and for the adjacent new home site will be adjacent to the easement on the east.
- * The area included in the revised RIM easement has been measured by SCS and totals 10+ acres as shown in FIG. 2.
- * The new easement area provides the a larger contiguous field than the original easement.
- * The exchange has been approved by the DNR Area Wildlife Manager and the Olmsted SWCD Board.

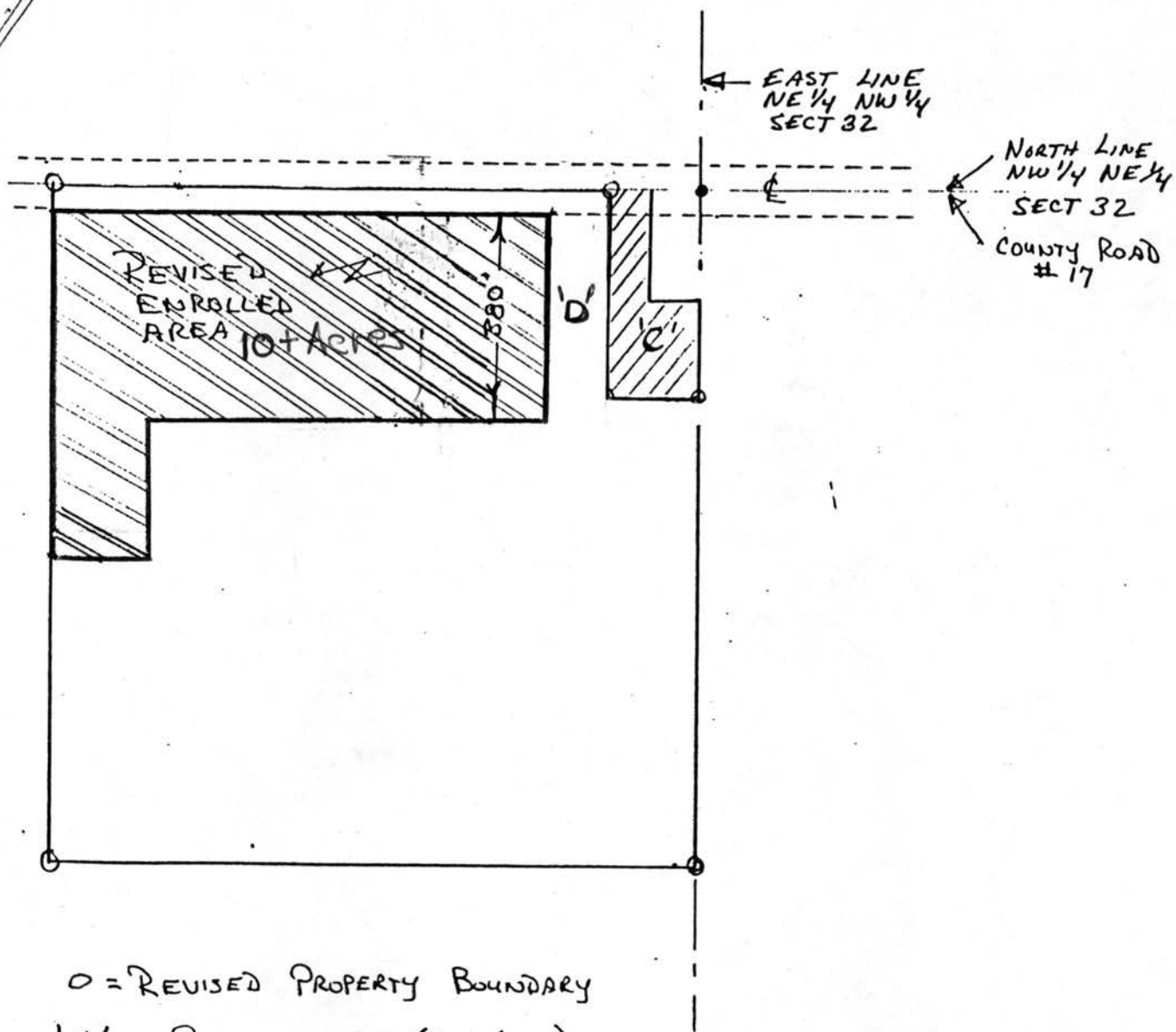
STIPULATION:

- * All cost of the exchange such as title costs, seeding, recording, surveying, etc., will be borne by the landowner.
- * The entire new RIM area must qualify for enrollment in the program.



- = CORNERS OF CURRENT PROPERTY
- 'A' = ENROLLED AREA = 10 ACRES
- 'B' = NOT ENROLLED, BUT SEEDED SAME AS 'A'
- 'A' + 'B' = 12 ACRES

FIGURE 1



O = REVISED PROPERTY BOUNDARY

'C' = PARCEL SOLD (1.0 ACRE)
WAS .9 ACRE RIM, NOW
EXCLUDED

'D' = NEW ACCESS ROUTE
± 1.0 Ae,

FIGURE 2

Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams

**Report to the Legislative Commission
on Minnesota Resources**

Executive Summary



Division of Water Quality
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Assessment of Mercury Contamination in Selected Minnesota Lakes and Streams

Report to the Legislative Commission on Minnesota Resources

EXECUTIVE SUMMARY

Division of Water Quality
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

1989

Edited by Edward B. Swain

This summary was produced with assistance from: Patrick Brezonik, Daniel Engstrom, Gary Glass, Peter Hawksford, Daniel Helwig, Thomas Henning, Marvin Hora, Keren Larson, Carol Mockovak, Carol Pruchnofski, John Sorensen, Curt Sparks, and David Thornton.

CONCLUSIONS

Research in northeastern Minnesota provides persuasive evidence that high levels of mercury contamination of fish are not natural, and that mercury concentrations in fish from some lakes have been increasing. Deposition of mercury from the atmosphere can account for most of the mercury found in these lakes. Analyses of lake sediments show that mercury deposition has increased by a factor of about three since settlement in the mid-1800s. The data suggest two distinct periods of increase in mercury deposition to lakes. The first came between 1860 and 1890, and the second between 1920 and 1950. At present, in-state sources of atmospheric mercury include the combustion of coal for electric power production, mercury additives to latex paint, and waste incineration. The relative importance of each source has not yet been assessed.

Measurement of mercury in precipitation at three Minnesota sites shows an average mercury concentration of 19 nanograms per liter. Mercury deposited on land is strongly bound by soil and only a small fraction of this mercury is transported to lakes. Mercury deposited directly onto lakes is rapidly removed from the water to the sediments, so that the average concentration in lake water is reduced from 19 to about 3 nanograms per liter. Although atmospheric deposition of mercury in northeastern Minnesota is fairly uniform, the quantity entering lakes is higher in lakes with relatively large watersheds.

The concentration of mercury in fish in a given lake is dependent not only on the availability of mercury, but on each lake's water chemistry, which varies greatly across Minnesota. Before mercury is biomagnified through the food chain, it must be converted to methylmercury. The methylation process is highly dependent on each lake's water chemistry, and is poorly understood.

Mercury concentrations in walleye and northern pike tend to be higher in lakes that have low pH (less than 7.0) and in lakes that have yellow coloring, (color is produced by natural humic acids). Colored

water is an indication that the lake's watershed includes highly organic soils produced by forests or peatlands. It is unclear why colored lakes have higher mercury in fish, but hypotheses include: (1) enhanced transport from the watershed to the lake, (2) increased persistence in the lake water, and (3) higher methylation rates. Results from this study indicate that enhanced transport is probably not a major factor, but that both of the other mechanisms may play major roles.

Mercury also tends to be higher in fish from lakes where zooplankton are high in mercury, indicating the importance of food-chain links. In turn, the mercury concentration of zooplankton is correlated with a host of factors, including lake-water mercury concentrations, pH, and the density of zooplankton, which suggests that the structure of the food web is important.

Mercury contamination of Minnesota rivers from point sources were generally identified and controlled in the early 1970s. Mercury concentrations in fish from these rivers decreased significantly in the early 1970s, according to a study conducted by the Minnesota Department of Natural Resources (MDNR). However this study found elevated mercury concentrations in the water and sediments of the lower St. Louis River. The elevated concentrations were associated with the wastewater discharge of the Western Lake Superior Sanitary District (WLSSD) in Duluth. WLSSD incinerates sewage sludge and municipal solid waste. The elevated mercury in the discharge was mostly a result of mercury removal from the incinerator stack by wet scrubbers. WLSSD is working to reduce inputs of mercury-containing wastes to the incinerator and to develop treatment methods to remove mercury from the scrubber water.

RECOMMENDATIONS

If mercury contamination of fish is to be reduced in northern Minnesota lakes, we need to know more about atmospheric deposition, the role of water and sediment chemistry in methylation, and how the food chain works to magnify methyl-

mercury. Although it is clear that the atmosphere carries significant amounts of mercury to remote lakes, it is not clear what the sources of the transported mercury are, nor what mitigative strategies might be appropriate. It appears that mercury can be transported long distances, and we assume that mercury deposition is fairly uniform across the state, although this should be examined. Like the acid rain problem, solutions may be possible only on the national or international scale. However, in-state sources of mercury may be locally important, so they should be identified and quantified. In addition, we do not yet understand the atmospheric chemistry of mercury, and what converts mercury vapor into water-soluble forms that are taken up by precipitation.

Any reduction in emission of mercury to the atmosphere is desirable. Currently there is little information concerning mercury emissions from specific sources. Mercury emissions resulting from coal combustion should be investigated and control strategies explored. The atmospheric contribution of mercury additives to a variety of consumer and industrial products, such as latex paints, should be investigated and potential substitutes explored. The advent of solid-waste incineration introduces a new source of mercury to the atmosphere. Electrical devices that contain mercury, such as alkaline and button batteries, fluorescent bulbs, and mercury switches, should be removed from the waste stream.

The possibilities for local mitigation are dependent on gaining additional understanding of the chemistry of mercury in the environment. Mercury readily enters the food chain only after it is converted into methylmercury, a process that is poorly understood. We need the capability to differentiate and measure the different forms of mercury, including methylmercury, at very low concentrations. This study shows that mercury concentrations in lake water at only two parts per trillion (ng/L) can result in fish consumption advisories, yet most laboratories cannot measure mercury below 100 parts per trillion.

The net methylation rate of mercury may determine whether mercury becomes concentrated

at the top of the food chain, in walleye, northern pike, bass, or lake trout. In-lake mitigation of mercury depends on gaining an understanding of how methylation is affected by environmental factors such as pH, alkalinity, calcium, and dissolved organic matter. Much dissolved organic matter is derived from peatland drainage, which has been suggested as a significant source of mercury to lakes. Several studies have found that dissolved organic matter can directly methylate mercury, in addition to the better-studied bacterial methylation process.

We do not know if a given amount of methylmercury in a lake always corresponds to a given concentration in the fish at the top of the food chain. The structure of the food web may control the concentration of mercury in fish as much as the methylation rate. Other chemical factors may influence the transfer of mercury in the food chain. For instance, research in Canada and Sweden has indicated that the addition of selenium has potential for mitigation because it interferes with the biomagnification of mercury. However, investigation of this possibility should proceed cautiously, because while selenium is an essential human nutrient, it is toxic at high concentrations.

An alternative mitigation technique may be the addition of calcium carbonate, as is done when a lake is limed to mitigate acid deposition effects. Liming a lake raises pH, alkalinity, and calcium concentrations. Because mercury concentrations of fish are negatively correlated with alkalinity, one would expect that liming might reduce mercury concentrations. To find out if this expectation is valid, the mercury content of fish is being monitored as part of the Thrush Lake liming experiment in northeastern Minnesota.

All in-lake mitigation techniques have the limitation that they are short-term and benefit only specific lakes. The most desirable mitigation technique is to reduce mercury deposition by reducing mercury emissions to the atmosphere.

Finally, humans are not the only consumers at risk from the mercury content of fish. Humans can alter their food habits and limit their intake, but some

Minnesota wildlife are dependent on fish (mink, otter, loon, merganser, pelican, eagle, osprey, cormorant, heron). Mercury concentrates as it moves through the food chain, placing these fish-eating animals particularly at risk.

BACKGROUND

The problem of mercury contamination of fish in Minnesota was first investigated in 1969 following reports of fish contamination resulting from direct industrial discharges to surface waters in Sweden and Canada. Initial attention in Minnesota was focused on rivers, which received the bulk of point-source discharges. Significant mercury contamination was indeed found in the Mississippi, Red, and lower St. Louis rivers, prompting efforts to identify and reduce sources of mercury within the state. Analyses of walleye and northern pike from rivers from 1970 through 1977 by the MDNR showed a 60 percent decline in mercury concentration, from a mean of 0.94 parts per million (ppm) in 1970 to 0.38 ppm in 1977.

Researchers in Sweden, Minnesota, and elsewhere found high mercury concentrations in fish from lakes that were unaffected by point discharges. Subsequently, a debate has ensued as to whether natural or anthropogenic sources are responsible for the elevated concentration of mercury in fish in remote lakes.

The goal of this project was to determine the sources of mercury to lakes and streams in northeastern Minnesota. An understanding of the causes of mercury contamination in Minnesota is needed to safeguard human health and also the health of piscivorous (fish-eating) wildlife. Methylmercury magnifies in food chains, and piscivorous birds and mammals are particularly at risk. In some Minnesota lakes, the mercury concentration of fish is high enough to be deleterious or lethal to mink, otter, and loon.

STRUCTURE OF RESEARCH EFFORT

This study was funded by the Legislative Commission on Minnesota Resources (LCMR), and managed by Marvin Hora of the Minnesota Pollution Control Agency (MPCA). Edward Swain and Daniel Helwig of the MPCA staff assisted with field work and analyzed data maintained in STORET. George Rapp (University of Minnesota-Duluth) and Gary Glass (U.S. EPA-Duluth) directed a survey of 80 lakes for mercury concentrations in water, sediment, and zooplankton, gathered data on mercury concentrations in air and precipitation, and studied mercury loading to the St. Louis River by the Western Lake Sanitary District discharge (with John Sorensen, Kent Schmidt, and James Huber). Patrick Brezonik, Daniel Engstrom, and Thomas Henning (University of Minnesota-Twin Cities) assessed mercury accumulation in four northeastern Minnesota lakes through the stratigraphic analysis of lake sediments. Patrick Brezonik and Mark Brigham examined factors that control methylation rates in two of these lakes.

The cooperative nature of this study proved to be a fruitful approach. Particularly revealing is the comparison between atmospheric deposition rates (Sorensen et al.) and the rate of mercury accumulation in lake sediments (Henning et al.). Data produced in the survey of 80 lakes by Sorensen et al. was merged with fish data maintained in STORET by the MPCA.

SUMMARY OF RESULTS

The results of this project are described in five separate research reports (listed in *REFERENCES*). These results are summarized in this section point by point, and the source for each point is identified.

Historical Trends

- Analyses of lake sediments from four lakes (Table 1) show that mercury has increased significantly in northeastern Minnesota since settlement in the mid 1800s. The overall increase in mercury deposition

is about 240 percent (3.4X) (Henning et al., Table 4.2). Sediment stratigraphy suggests two distinct periods of increase in mercury deposition to lakes. The first increase came between 1860 and 1890, and the second between 1920 and 1950 (Henning et al., page 53).

- Some metals migrate vertically in lake sediment over time, making their current concentrations a poor record of the past. However, experiments using sediment from Dunnigan Lake in northeastern Minnesota show that the stratigraphy of mercury in sediment is a reliable record of the mercury concentration of the sediment at the time of deposition. In addition, three studies of mercury stratigraphy where point sources have been eliminated support the idea that sediment accumulation is a quantitative record of mercury loading (Henning et al., page 58).

- Comparison of mercury concentrations in recently collected fish compared to fish collected in the 1930s (preserved at Bell Museum) shows an average annual increase of 0.004 ppm per year, or about 3 percent per year. Analyses of fish performed since 1970 show an average annual increase of 0.017 ppm per year, or about 5 percent increase per year. Higher recent rates of increase are consistent with the thought that anthropogenic sources of mercury have increased in recent times (Swain and Helwig, page 10). The rate of increase in fish mercury is highest in lakes that have low alkalinity (Swain and Helwig, page 6-7).

- Mercury concentrations in fish and lake sediments from northern Minnesota have increased in concert with industrial development. These concentrations continue to increase at the present time (Henning et al. pages 47-56; Swain and Helwig, page 10).

- Mercury contamination of Minnesota rivers from point sources have generally been identified and controlled. Analyses of walleye and northern pike taken from rivers from 1970 through 1977 showed a 60 percent decline in mercury concentration, from a mean of 0.94 ppm in 1970 to 0.38 ppm in 1977

(DNR report cited in Swain and Helwig, page 3).

Atmospheric and Watershed Loading of Mercury to Four Minnesota Lakes

- Current (1987) mercury accumulation in lake sediments is fairly constant, ranging from 18 to 26 micrograms per square meter per year ($\mu\text{g}/\text{m}^2 \text{ yr}$) (Table 1 of the Executive Summary) (Henning et al., page 84).

- The magnitude of the increase in mercury accumulation since 1850 has been relatively constant, ranging from 13 to 18 $\mu\text{g}/\text{m}^2 \text{ yr}$, or 229 percent to 260 percent over pre-1850 rates (mean of 240 percent, Table 1 of the Executive Summary) (Henning et al., page 84).

- Current mercury deposition from rain and snow falling directly on the surface of these lakes is fairly constant, varying between 12 and 14 $\mu\text{g}/\text{m}^2 \text{ yr}$ (Sorensen et al., Table 1).

- Wet deposition of mercury to just the surface of these lakes can account for a high proportion of the mercury accumulating in the lakes' sediments (between 45 and 74 percent in this study). The remaining balance of the sediment mercury can be accounted for if only a small proportion (less than 20 percent) of the mercury deposited to the terrestrial watershed washes into the lake (Henning et al. page 86; Table 1 of the Executive Summary).

Sources of Mercury to Minnesota Lakes

- The primary source of mercury to northern Minnesota lakes is atmospheric deposition (Sorensen et al., page 29).

- Mercury emitted from power plants is not quickly removed from the atmosphere, and long-range transport is therefore likely (Henning et al., page 61).

- A probable source of increased loading of mercury to lakes is the combustion of coal and fuel oil, which contain variable but significant concentrations of mercury. Atmospheric transport of mercury to

Table 1. Synthesis of data from four northeastern Minnesota lakes.

There are two alternatives for Kjostad Lake because of uncertainties in the depositional area. Category "I" is a calculation of what proportion of the mercury accumulating in the Lake's sediments are deposited directly on the lake surface by wet deposition. Category "J" is a calculation of the proportion of mercury deposited by wet deposition to the catchment (terrestrial watershed) that must be transported to the lake (Henning et al. and Sorensen et al.).

	DUNNIGAN	MEANDER	THRUSH	KJOSTAD1	KJOSTAD2
A. LAKE SURFACE AREA (ha)	35	41	6.6	179	179
B. DEPOSITIONAL AREA OF SEDIMENT (ha)	32	33	5.3	96	124
C. CATCHMENT AREA (ha)	82	193	29	1180	1180
D. CATCHMENT AREA / LAKE AREA	2.3	4.7	4.4	6.6	6.6
E. MODERN Hg DEPOSITION TO LAKE SURFACE ($\mu\text{g}/\text{m}^2 \text{ yr}$, from sediment cores)	18	21	23	23	26
F. INCREASE IN SEDIMENT ACCUMULATION SINCE 1850 ($\mu\text{g}/\text{m}^2 \text{ yr}$, from sediment cores)	13	15	16	16	18
G. INCREASE IN SEDIMENT ACCUMULATION SINCE 1850 (%)	260%	250%	229%	229%	225%
H. INTERPOLATED ATMOSPHERIC WET DEPOSITION ($\mu\text{g}/\text{m}^2 \text{ yr}$) (from 1988 precipitation analyses)	13	12	14	12	12
I. ATMOSPHERIC DEPOSITION TO LAKE SURFACE (% OF SEDIMENT ACCUMULATION)					
ASSUME 10 $\mu\text{g}/\text{m}^2 \text{ yr}$ ATMOSPHERIC DEPOSITION:	56%	48%	43%	43%	38%
INTERPOLATED Hg ATMOSPHERIC DEPOSITION:	74%	57%	60%	50%	45%
ASSUME 15 $\mu\text{g}/\text{m}^2 \text{ yr}$ ATMOSPHERIC DEPOSITION:	83%	71%	65%	65%	58%
J. Hg LOADING FROM CATCHMENT TO SEDIMENT (% OF ATMOSPHERIC DEPOSITION TO CATCHMENT)					
ASSUME 10 $\mu\text{g}/\text{m}^2 \text{ yr}$ ATMOSPHERIC DEPOSITION:	34%	23%	30%	20%	24%
INTERPOLATED Hg ATMOSPHERIC DEPOSITION:	15%	16%	15%	15%	19%
ASSUME 15 $\mu\text{g}/\text{m}^2 \text{ yr}$ ATMOSPHERIC DEPOSITION:	9%	8%	12%	8%	11%

remote Minnesota lakes has probably been enhanced as a result of the increased height of power plant stacks and a switch in the primary consumption of coal from railroads to electric power production, which occurred by 1950 (Henning et al., page 63).

Improved Method of Mercury Analysis of Water

- The standard method of mercury analysis in water was improved from the EPA (1983) detection limit of 25 nanograms per liter (ng/L) to about 2 ng/L (Glass et al., page 11).

- Even with a detection limit of 2 ng/L, 40 percent of the lakes had mercury concentrations in surface water below the detection limit (Sorensen et al., page 12). The highest concentration found in lake water was 7.0 ng/L, and the mean was 2.5 ng/L.

- Mercury concentrations in rain and snow were monitored in 1988 at three Minnesota sites near Duluth, Marcell, and Ely. The average concentration was 18.7 ng/L. Concentrations at specific lakes were interpolated and average deposition rates were calculated based on average precipitation. Calculated wet-deposition rates averaged 12.7 nanograms per square meter per year ($\text{ng}/\text{m}^2 \text{ yr}$), with a range of 10.4 to 15.4 for 80 study lakes (Sorensen et al., page Table 3).

- Concentrations of mercury in air near Duluth averaged 3 nanograms per cubic meter (ng/m^3) in 1988. There is a low correlation between the concentration in the air and precipitation because only a small proportion of mercury in air is in a water-soluble form (Glass et al., page 16).

Survey of Minnesota Lakes

- Fish from lakes in watersheds rich in limestone are less likely to have high mercury concentrations than lakes in non-calcareous regions. Mercury concentrations of northern pike average 27 percent less in the calcareous region (Swain and Helwig, page 5).
- Eighty lakes were sampled and analyzed for mercury in surface water, zooplankton, and recently deposited sediment. Mercury concentrations in fish (northern pike or walleye) were available for 65 of these lakes. Information on watershed and water chemistry parameters was available for 72 of the 80 lakes (Sorensen et al., page 3).
- Atmospheric deposition of mercury to the surface of lakes is relatively uniform across northeastern Minnesota. Variation in mercury concentrations of fish among lakes is a function of relative watershed area, water chemistry, and site-specific factors controlling bioavailability (Sorensen et al., pages 22-24).
- A method was devised to normalize the mercury concentration of northern pike to a standard 55-cm (21.7 inch) length fish so that concentrations could be compared among lakes. Normalizing is necessary because fish accumulate higher concentrations of mercury as they grow longer. A method was also developed to convert normalized mercury concentrations in walleye to northern pike units, based on the high correlation in mercury concentrations between the two species (correlation coefficient $(r)=0.88$) (Sorensen et al., page 10).
- The mercury concentration of lake water is negatively correlated with the pH of the water ($r=-0.47$), alkalinity ($r=-0.35$), and calcium concentration ($r=-0.36$), and positively correlated with color ($r=0.34$) and total organic carbon concentration ($r=0.48$) (Sorensen et al., Table 4).
- The concentration of mercury in recently-deposited lake sediment is not correlated with the type of geology in the watershed, but is correlated with the

percent forest cover in the watershed (0.57), the interpolated wet atmospheric deposition of mercury to the lake ($r=0.29$) and to the lake plus its immediate watershed ($r=0.39$). The mercury concentration in sediment is correlated with the concentration in surface water ($r=0.35$) (Sorensen et al., Table 4).

- The concentration of mercury in zooplankton correlates positively to lake-water concentrations of mercury ($r=0.45$), total organic carbon ($r=0.33$), and iron ($r=0.41$), and negatively with pH ($r=-0.42$), alkalinity ($r=-0.51$), calcium concentration ($r=-0.48$). A negative correlation of zooplankton mercury concentration with zooplankton density ($r=-0.50$) suggests variable dilution of mercury within the zooplankton biomass (Sorensen et al., page 21).
- The concentration of mercury in northern pike is positively correlated with mercury concentrations in zooplankton ($r=0.60$), surface water ($r=0.42$), and to the following lake-water parameters: color ($r=0.27$), total organic carbon ($r=0.57$), aluminum concentration ($r=0.30$), and iron concentration ($r=0.42$). Lake-water parameters negatively correlated with fish mercury include: alkalinity ($r=-0.41$), pH ($r=-0.45$), and calcium concentration ($r=-0.41$) (Sorensen et al., Table 4).
- A larger set of 127 Minnesota lakes yields similar correlations between northern pike mercury concentrations and water color ($r=0.41$), aluminum ($r=0.56$), alkalinity ($r=-0.50$) and pH ($r=-0.41$) (Swain and Helwig, Table 1).
- The correlations described above are interesting and statistically significant, but no single variable accounts for a very high proportion of the variation in mercury concentrations (the square of the correlation coefficient, r , is the proportion of the variation explained by that variable). However, multiple regression models can account for 47-71 percent of the variation of mercury concentrations in northern pike, depending on the selection of variables (Sorensen et al., Table 5).

Methylation of Mercury in Lakes

- Mercury does not bioaccumulate to a significant degree unless it becomes part of an organic compound, methylmercury. Mercury undergoes methylation through both bacterial and purely chemical processes. Preliminary results from Minnesota suggest that chemical methylation is as important as bacterial methylation (Brigham and Brezonik, page 11).
- Several studies have shown that humic acids, the coloring agent in lake water, can directly methylate mercury (Brigham and Brezonik, page 2). This finding is consistent with the positive correlation between the color of lake water and mercury concentration in fish (Swain and Helwig, Table 1; Sorensen et al., Table 4).
- Methylation rates in a lake with colored water (Kjostad Lake) were found to be about twice that of a clear-water lake (Dunnigan) under laboratory conditions (Brigham and Brezonik, pages 7-8).

Mercury Contamination of the St. Louis River Estuary

- The highest concentration of mercury in the St. Louis River estuary is associated with the wastewater discharge of the Western Lake Superior Sanitary District (WLSSD). WLSSD collects industrial and municipal wastewater and, in an unusual combination, incinerates sludge and municipal solid waste (Glass et al., page 17).
- The highest mercury concentration (about 15,000 ng/L) within the WLSSD plant is in the scrubber water resulting from cleaning the incinerator stack emissions (Glass et al., Table 4).
- Material in the solid waste that contribute to the mercury load includes some plastics and discarded electrical devices, including batteries (Glass et al., page 19, Table 5).

- The wet-scrubbing process increases the mercury concentration in the WLSSD discharge by 130 percent compared to the mercury concentration in the incoming wastewater. In contrast, conventional wastewater treatment plants lose about 85 percent of the mercury in the incoming wastewater to the sludge (Glass et al., page 17).
- The WLSSD discharge increases the mercury concentration of St. Louis River water from a background of 4 ng/L to about 365 ng/L near the discharge (Glass et al., Table 3). The U.S. EPA ambient water quality criterion for mercury is 12 ng Hg/L.
- Sediment concentrations of mercury adjacent to the WLSSD discharge range between 1000 and 5000 ng/g dry weight. The sediments upstream generally range between 50 and 200 ng/g (Glass et al., Table 3).
- Research is underway by WLSSD staff to reduce the inputs of mercury-containing wastes and to remove mercury from the incinerator scrubber water (Glass et al., page 23).

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OVERVIEW OF THE CASS COUNTY WATER PLAN FOR THE
JANUARY 24, 1990 BOARD MEETING

INTRODUCTION

Development of the Cass County water plan was initiated by resolution of the County Board of Commissioners (Board) on October 6, 1987. The Task Force appointed by the Board to prepare the plan included fourteen members. John Sumption (Manager of Cass SWCD) and Paul Fairbanks (County Solid Waste Officer) chaired the data collection and planning phases respectively. Klaers, Powers and Associates, a Duluth consulting firm, was hired to write the plan. Molly MacGregor, Mississippi Headwaters Board (MHB) Administrator, was regional project manager for the 8 member counties. The task force met 21 times between January 1988 and June 1989 to prepare the plan.

COUNTY DESCRIPTION

Cass County is located in north-central Minnesota in the heart of the state's famous lake country. Cass County is very well endowed with water resources. Walker, the County Seat, (pop. 970) is located on the southwest corner of Leech Lake (110,000 acres). The Mississippi River and Lake Winnibigoshish (70,000 acres) form most of the County's northern boundary. 70 miles to the south, the Crow Wing River forms the County's south boundary. Other major surface water features in the County include Ten Mile Lake, Woman Lake, Boy Lake, and parts of Cass and Gull Lakes. Six rivers drain the County; all empty into the Mississippi River. The County has 517 lakes. Cass County has historically been dependent on agriculture and forestry activities. Although the County currently is the leading beef cattle producer in the state, future agricultural activities are expected to continue to decline. Table 19 indicates that in 1989 farm properties paid 5.5% of the net taxes in the County while seasonal recreational properties paid 58.3%. Forestry activities are expected to continue to expand. The Task Force expects the major future impacts to the County's water resource to result from the continued development of shoreland areas.

County groundwater supplies are seen as generally adequate in quantity with little known about groundwater quality. Since bedrock aquifers are not a dependable source of groundwater, the County depends almost entirely on its more sensitive surficial aquifers.

STAFF REVIEW

BWSR field staff has met with local water planning representatives to review draft plans on August 21, 1989 and December 18, 1989.

The Task Force has responded to preliminary agency review comments in writing. No significant comments remain unaddressed from local review. BWSR field staff will update the Board on the status of plan review at the February Board Meeting.

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OVERVIEW OF THE ZUMBRO/ROOT RIVER COUNTY COMPREHENSIVE WATER
MANAGEMENT PLAN

FOR THE JANUARY 24, 1990 BOARD MEETING

INTRODUCTION

The Zumbro Root River County Comprehensive Water Plan consists of the individual plans of the following counties:

OLMSTEAD	WINONA	DODGE
WABASHA	RICE	FILLMORE
GOODHUE	MOWER	HOUSTON

The total land area of these nine counties is approximately 5650 Square Miles of which approximately 217 Square is publicly owned. Southeastern Minnesota's original vegetation was prairie, marshes, aspen-oak land, oak openings, barrens, big woods and river bottom forest. Today very little native prairie and marsh remain however the Richard J. Dorer Memorial Hardwood Forest remains as a link to the original vegetation of the area. Rochester (the county seat of Olmstead County) is the largest city of the nine counties and is centrally located in the nine counties. Faribault (Rice County), Red Wing (Goodhue County), Wabasha (Wabasha County), Winona (Winona County), Caledonia (Houston County), Preston (Fillmore County), Austin (Mower County) and Mantorville (Dodge County) complete the list of nine county seats. The Southeast nine counties began local water planning on or about December 15, 1987 however the joint power water planning task force began its work in 1981.

PHYSICAL DESCRIPTION OF ZUMBRO/ROOT RIVER NINE COUNTIES

All nine of the Zumbro/root river counties are underlain by gently dipping sedimentary rocks which feature prominent beds of limestone and dolomite (carbonates). Three major carbonate rock units are separated by less soluble shales which may locally isolate the carbonates from surface runoff. The bedrock is normally fractured and contains cracks, crevices, channels and caves.

Karst is the geologic term for this land characterized by streams which disappear into the ground or which lose most of their flow underground, caves, springs and circular depressions called sinkholes. Sinkhole density has been estimated to be 30 per Square Mile (average) and a reported maximum of 264 per Square Mile. The groundwater system is particularly vulnerable to contamination because the near surface carbonate deposits have little or no glacial drift cover. The slope of the land varies from 0-12% on the deep loess uplands, to 2-50% on the thin loess or till uplands with a soil cover of less than 60 inches over bedrock, to steep, well drained valley walls of up to 70% slope.

The Southeast nine counties coincide approximately with the Karst area of the state. Generally land use is low density rural

development which capitalizes on access to predominantly agricultural and forested land. The primary crops in the region are corn, soybeans and hay accompanied by dairy and hog farms. Given the rural character of the region, a large portion of the population relies on private wells for drinking water. Because of the dependence on the surface carbonate aquifer as a primary water source, there is concern about the short term and long term effects that land use activity and related surface contaminants may have (are having, Chris Hughes 1-23-90) on the ground water quality. (This physical description was taken from a 1982 paper entitled "Dealing With Groundwater Protection In Southeastern Minnesota" by Linda B. Bruemmer)

Erosion and sedimentation of ditches, streams and resevoirs, insufficient ground and surface water monitoring and lack of water based recreation are seen as a few of the problems in the southeast nine counties.

STAFF REVIEW

The Southeast nine counties have planned many actions to address their problems and to preserve, restore and enhance their water resources. These actions include data base development for geologic and land use atlases. This information will then help define the most sensitive areas to ground and surface water contamination. Subsequently, the Southeast nine counties are planning development of water management areas to address existing and potential contaminant impacts on surface and groundwater. Concurrently, educational programs will be developed to help citizens to become more aware of the sensitve relationship between their urban and rural land use actions the physical sensitivity of the area and the precious ground and surface water. Inventories of virtually every conduit of groundwater contamination will occur. Regulation is also being planned. Sinkhole ordinances, soil loss limits, feedlot ordinances and fertilizer regulation are a few of the actions being planned.

Each of the Southeast nine counties has specifically detailed costs, staffing needs and time frames for implementation of their plans. Each of the counties will hire or appoint a local water planning coordinator and retain their local water planning committee to oversee implementation of the plan.

Four of the nine counties; Rice, Mower, Fillmore and Goodhue are in the 56th day of a the final 90 day review. Presently staff is reviewing final review comments and recommendations of state agencies and will be presenting a recommendation for BWSR action at the February Board meeting. The remaining 5 counties; Olmstead, Winona, Houston, Wabasha and Dodge are in the 24th day of final review and an update on these 5 counties is planned for the BWSR at the February Board meeting.

OVERVIEW OF THE BROWN COUNTY COMPREHENSIVE WATER PLAN

FOR THE JANUARY 24, 1990 BOARD MEETING

INTRODUCTION

Brown County has a total of 390,400 acres of land of which 5660 acres are publicly owned. The county's original vegetation consisted of prairie, wetlands and river bottom forest, however, today the county is primarily cultivated for agricultural use. Some of the Cities in Brown County are New Ulm(county seat), Sleepy Eye, Springfield, Cobden, Comfrey, Evan and Hanska. Brown County began local water planning on August 24th, 1987 as part of the South Central Minnesota Counties Comprehensive Water Planning Project, a 13 county joint powers board formed to write and implement local water plans.

PHYSICAL DESCRIPTION OF COUNTY

Much of Brown County is covered by a uniform blanket of glacial till(unstratified material) and glacial drift[till, outwash, glacial lake sediment and loess(windblown silt and fine sand)] of the Altamont sublobe of the Des Moines Lobe, a major glacial tongue. Along the Minnesota and Cottonwood Rivers outwash sand and gravel glacial meltwater deposits exist.

The dominant hydrologic features in the county are the Minnesota and Cottonwood Rivers. The Cottonwood River flows from southwest to northeast where its confluence with the Minnesota river occurs at New Ulm. Major problems in Brown County include the lack of geologic data, lack of information and regulation of underground storage tanks under 1100 gallons, tank sludge, agricultural and urban runoff and inadequate individual sewage treatment systems.

STAFF REVIEW

Brown County has planned many actions to address its problems and to preserve, restore and enhance its water resources. These actions include development of regulations that require minimum separation of individual sewage treatment systems(ISTS) and geologically sensitive areas, development of regulations pertaining to septage disposal, spot checks for failing ISTS, inventory and regulation of all underground storage tanks through a permit process, prohibition of tiling of water purifying wetlands, establishment of buffer strips around lakes and rivers and development of a geologic atlas. Brown County contributed towards the hiring of an extension cluster agent to help implement its education program and plans to keep the task force and coordinator position to oversee, review and guide plan implementation.

The plan is in the 55th day of final review and BWSR staff will make a recommendation for Board action at the February Board meeting.

OVERVIEW OF THE MARTIN COUNTY COMPREHENSIVE WATER PLAN

FOR THE JANUARY 24, 1990 BOARD MEETING

INTRODUCTION

Martin County has a total of 464,640 acres of land of which 17,484 acres are publicly held. The county's original vegetation consisted of prairie, wetlands and river bottom forest, however, today the county is primarily cultivated for agricultural use. Some of the Cities in Martin County are Fairmont (County seat), Northrop, Granada, Sherburn, Trimont and Ceylon. Martin County began local water planning on June 17th, 1986 as part of the South Central Minnesota Counties Comprehensive Water Planning Project, a 13 county joint powers board formed to write and implement local water plans.

PHYSICAL DESCRIPTION OF COUNTY

Much of Martin County is covered by a uniform blanket of glacial till (unstratified material) and glacial drift [till, outwash, glacial lake sediment and loess (windblown silt and fine sand)] of the Altamont sublobe of the Des Moines Lobe, a major glacial tongue. Along the Blue Earth River outwash sand and gravel glacial meltwater deposits exist.

The dominant hydrologic feature in the county are its 55 lakes, 8 of which lie in a north south chain with the northernmost lakes of George, Sisseton, Budd and Hall lying in the urban area of the City of Fairmont. Problems in the county include a lack of hydrogeologic data and well location data, soil erosion and sedimentation, solid waste and the need for education about proper farm chemical usage.

STAFF REVIEW

Martin County has planned many actions to address its problems and to preserve, restore and enhance its water resources. These actions include education programs related to farm chemical usage, development of a hydrogeologic atlas, identifying unsealed wells including injection wells, development of a demonstration plot showing the benefits of conservation tillage and development of a first of a kind composting site. Martin County contributed towards the hiring of an extension cluster agent to help implement its education program and plans to keep the task force and coordinator position to oversee, review and guide plan implementation.

The plan is in the 24th day of final review and BWSR staff will provide an update for Board members at the February Board meeting.

1991 ESTMATED EXPENDITURES *

FOR

WATER PLANNING AND IMPLEMENTATION ACTIVITIES

FOR THE STATE OF MINNESOTA

Greater Minnesota ~~Water~~ Water Planning Counties

Aitkin	(estimate)	90,600
Becker	(estimate)	50,000
Beltrami	(actual)	139,600
Benton	(planning)	10,000
Big Stone	(planning)	10,000
Blue Earth	(estimate)	60,000
Brown	(estimate)	60,000
Carlton	(estimate)	40,000
Cass	(estimate)	95,000
Chippewa	(planning)	10,000
Chisago	(planning)	10,000
Clay	(estimate)	50,000
Clearwater	(actual)	48,000
Cook	(planning)	10,000
Cottonwood	(estimate)	60,000
Crow Wing	(estimate)	90,600
Dodge	(actual)	109,000
Douglas	(actual)	98,000
Faribault	(estimate)	60,000
Fillmore	(actual)	127,785
Freeborn	(estimate)	60,000
Goodhue	(actual)	227,000
Grant	(estimate)	50,000
Houston	(actual)	122,000
Hubbard	(actual)	84,000
Isanti	(planning)	10,000
Itasca	(estimate)	90,600
Jackson	(estimate)	50,000
Kanabec	(planning)	10,000
Kandiyohi	(planning)	10,000
Kittson	(estimate)	50,000
Koochiching	(planning)	10,000
LacQuiParle	(planning)	10,000
Lake	(planning)	10,000
Lake of the Woods	(planning)	10,000
Lesueur	(estimate)	60,000
Lincoln	(estimate)	40,000
Lyon	(estimate)	40,000
McLeod	(planning)	10,000
Mahnomen	(estimate)	50,000
Marshall	(estimate)	50,000
Martin	(estimate)	60,000
Meeker	(planning)	10,000
Mille Lacs	(planning)	10,000
Morrison	(estimate)	90,600

* Prepared by BWSR for SPA & Amc re. levy limit issue.

Mower	(actual)	228,915
Murray	(estimate)	40,000
Nicollet	(estimate)	60,000
Nobles	(actual)	231,250
Norman	(estimate)	50,000
Olmsted	(estimate)	250,000
Otter Tail	(estimate)	50,000
Pennington	(estimate)	50,000
Pine	(planning)	10,000
Pipestone	(estimate)	40,000
Polk	(estimate)	50,000
Pope	(estimate)	50,000
Red Lake	(estimate)	50,000
Redwood	(estimate)	40,000
Renville	(planning)	10,000
Rice	(actual)	188,000
Rock	(planning)	10,000
Roseau	(estimate)	50,000
St. Louis	(planning)	10,000
Sherburne	(planning)	10,000
Sibley	(estimate)	60,000
Stearns	(estimate)	250,000
Steele	(estimate)	60,000
Stevens	(estimate)	50,000
Swift	(planning)	10,000
Todd	(planning)	10,000
Traverse	(estimate)	50,000
Wabasha	(actual)	106,000
Wadena	(planning)	10,000
Waseca	(actual)	95,000
Watsonwan	(estimate)	60,000
Wilkin	(estimate)	50,000
Winona	(actual)	31,000
Wright	(estimate)	95,000
Yellow Medicine	(estimate)	40,000

		\$4,957,950

Seven Metropolitan Counties

Anoka	(planning)	130,000
Carver	(planning)	130,000
Dakota	(estimate)	200,000
Hennepin	(estimate)	200,000
Ramsey	(estimate)	200,000
Scott	(planning)	60,000
Washington	(estimate)	200,000

		\$1,120,000

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TOTAL	\$6,077,950
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January 23, 1990

Local Water Resources Protection and Management Program

PLAN DEVELOPMENT GRANT

Purpose: To share county costs of developing a Ch.110B or 473.8785(metro groundwater) plan.

Grant Details: Non-competitive matching grants are available to Counties in the amount of \$15300 for 110B and \$15600 for 473.8785 plans. Counties which received LCMR funding for 110B planning are ineligible.

Matching Requirements: Local matching funds may be cash or in-kind but not more than 50 percent may be federal or state funds.

Grant Duration: Grant funds must be spent within two years.

Grant Requirements(chronologically):

- a resolution to plan in accordance with appropriate statutes and rules
- a grant agreement including a resolution acknowledging the agreement and a budget detailing proposed expenses
- a work plan for the grant period
- an annual progress report
- a final report

IMPLEMENTATION BASE GRANT

Purpose: To share county costs of implementing Ch. 110B, metro groundwater, metro water management(509), or watershed district overall(112.46) plans. Fundable activities include, but are not limited to, supporting the activities of a water plan coordinator and local water planning task force.

Grant Details: Non-competitive matching grants are available to counties with one(or more) of the above indicated approved comprehensive local water plans. Grants are limited to a maximum of \$20000.

Matching Requirements: Same as above

Grant Duration: Funds must be spent within one year

Grant Requirements(chronologically):

- a grant agreement including a resolution acknowledging the agreement
- a work plan
- a budget
- a statement describing the relationship of the grant request to priority implementation items in the comprehensive local water plan(s)
- an identification of the amount, type, and source of the local share, including federal and state contributions, if applicable
- a final report

IMPLEMENTATION CHALLENGE GRANT

Purpose: Same as base grant except fundable activities include, but are not limited to, funding priority implementation items in an approved comprehensive local water plan such as monitoring programs, resource assessments, or acquisition of geographic information systems.

Grant Details: Same as base grant except there is no maximum grant.

Matching Requirements: Same as above

Grant Duration: Funds must be spent within two years. One year extensions are possible.

Grant Requirements(chronologically):
Same as base grant

January 9, 1990

**DRAFT RULES RELATING TO
LOCAL WATER RESOURCES PROTECTION AND MANAGEMENT**

0000.0100	Purpose
0000.0110	Definitions
0000.0120	Available Assistance
0000.0130	Eligibility Criteria
0000.0140	Notice of Grant Availability
0000.0150	Grant Application
0000.0160	Rejection of Grant Applications
0000.0170	Ranking of Applications
0000.0180	Allocation of Funding
0000.0190	Selection of Grantees
0000.0200	Grant Conditions
0000.0210	Grant Contract
0000.0220	Grant Payments
0000.0230	Grant Cancellation

DRAFT RULES RELATING TO LOCAL WATER RESOURCES PROTECTION AND MANAGEMENT

0000.0100 PURPOSE

This chapter provides for the administration of the state local water resources protection and management grant program. Parts 0000.0100 to 0000.0230 implement this program by establishing the substantive criteria and procedural conditions under which the board may award state matching grants for the development and implementation of a comprehensive local water plan.

0000.0110 DEFINITIONS

Subpart 1. Scope. The definitions in this part and in Minnesota Statutes, section 103B.3363 apply to parts 0000.0100 to 0000.0230. If terms defined in this part conflict with the definitions in Minnesota Statutes, chapters 110B, 112, and 473 and the rules adopted under those chapters, the definitions in this part govern.

Subp. 1. Board. "Board" means the board of water and soil resources.

Subp. 2 Comprehensive Local Water Plan. "Comprehensive Local Water plan" or "plan" means a county water plan authorized under section 110B.04, a watershed management plan required under section 473.878, a watershed management plan required under section 112.46, or a county groundwater plan authorized under section 473.8785.

Subp. 3 Local Share. "Local Share" means the contributions of a local unit of government to the eligible cost of a program including the value of cash expenditures and in-kind contributions of labor, equipment, material and real property used for and expended on eligible program activities.

Subp. 4 **Local Unit of Government.** "Local Unit of Government" means a statutory or home rule charter city, town, county, or soil and water conservation district, watershed district, an organization formed for the joint exercise of powers under section 471.59, a local health board, or other special purpose district or authority with local jurisdiction in water and related land resources management.

Subp. 5 **Official Controls.** "Official Controls" means ordinances and regulations that control the physical development of the whole or part of a local government unit, protect public health, or that implement the general objectives of the local government unit.

Subp. 6 **Program.** "Program" means a water-related program.

Subp. 7 **Related Land Quality.** "Related Land Quality" which may be also known as "related land resources" means land affected by present or projected management practices that have significant effects on the quantity and quality, or use of groundwater or surface water.

0000.0120 AVAILABLE ASSISTANCE

Subpart 1. **Grants.** The board may award grants to counties only to carry out water resource protection and management programs identified as priorities in comprehensive local water plans. Grants may be used to employ persons and to obtain and use information necessary to: (1) Develop section 110B.04 or section 473.8785 plans that have not received funding for water resources planning as provided for in Laws 1987, Chapter 404, section 30, subdivision 5, clause (a). Plan development grants shall not exceed a maximum of \$15,300 for 110B.04 plans and \$15,600 for 473.8785 plans.

(2) Implement comprehensive local water plans. Plan implementation grants consist of two types: base grants and challenge grants. (a) Base grants are non-competitive and are available to any

county with an approved comprehensive local water plan. The purpose of base grants include, but are not limited to, supporting the activities of a water plan coordinator and the local water planning task force. Base grants shall not exceed \$20,000 per year. (b) Challenge grants are competitive and are available to any county with an approved comprehensive local water plan. The purpose of challenge grants include, but are not limited to, funding priority actions such as monitoring programs, resource assessments, or acquisition of geographic information systems.

Subp. 2 **Local Match**. All grants must be matched in their entirety with a local share. Of that local share, no more than 50 percent can be federal or state funds.

Subp. 3. **Priority**. All grants must be awarded, within the limits of available appropriations, to those applicants having the highest priority.

Subp. 4. **Technical Assistance**. The board may provide technical assistance to counties who are considering application in order to ensure timely, accurate, and comprehensive applications. Technical assistance must be given to counties that receive grants, within the limits of available resources.

0000.0130 ELIGIBILITY CRITERIA

Subpart 1. **Eligible Applicants**. Only counties are eligible to apply for grants. A county must coordinate and submit requests on behalf of other units of government within its jurisdiction.

Subp. 2. **Eligible Costs**. Program costs are eligible for state matching grants if the costs are reasonable and necessary for employing persons and obtaining and using information for local government activities that protect or manage water and related land resources. These activities include planning, zoning and official controls.

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Subp. 3. ~~Ineligible Costs.~~ Ineligible costs include any costs that are not related to the activities in subpart 2. In addition, the following costs are ineligible whether or not they relate to the activities in subpart 2:

- A. Expenditures or in-kind contributions incurred prior to the grant award;
- B. Building and utility construction;
- C. Mining activities;
- D. Highway and road construction; and
- E. Activities that violate local, state, and federal statutes, rules and regulations.

0000.0140 NOTICE OF GRANT AVAILABILITY

Subpart 1. **Notice.** The board will publish in the State Register a notice that applications for plan development grants and plan implementation grants will be accepted whenever the board determines that funds are available to award such grants. The notice will contain a deadline for application submittal, which must be no less than 90 days from the date of publication.

Subp. 2. **Notification.** The board shall notify all counties of grant application periods. Any other local governmental body that wishes to be notified shall contact the board by writing to the executive director.

Whenever the board publishes notice in the State Register, the board shall mail notice of the grant application period to those local governmental bodies who have requested to be notified.

Subp. 3. **Grant application periods.** The board may establish a grant application period from time to time but there must be at least one application period each fiscal year if funds are available.

0000.0150 GRANT APPLICATION

Subpart 1. **General requirements.** The grant application shall be submitted by a county. A county must coordinate and submit requests on behalf of other units of government within its jurisdiction. A grant application must be submitted in a timely fashion to be considered. The grant application must be submitted in a format provided by the board and must contain the information required by this part.

Subp. 2. **Plan development grant.** Any county submitting an application for a plan development grant must submit the following information:

- A. A resolution committing the county to develop a local water plan in accordance with Minnesota Statutes 110B and Minnesota Rules Ch. 9300;
- B. A resolution by the county authorizing signing of the grant contract and other related documents; and
- C. A budget detailing expenses associated with developing a local water plan.

Subp. 3. **Plan implementation grant.** Any county submitting an application for a plan implementation base and/or challenge grant must submit the following information:

- A. A resolution by the county authorizing the signing of the grant contract and other related documents;
- B. A detailed work plan and schedule for program implementation during the grant period;
- C. A detailed budget for the grant period including the identification of the amount requested in the grant;
- D. A statement describing the relationship of the grant request to priority implementation items in the comprehensive local water plan; and

E. A list identifying the amount, type, and source of the local share, including federal and state contributions, if applicable.

0000.0160 REJECTION OF GRANT APPLICATION

Subpart 1. **Grounds.** An application for a plan development grant or a plan implementation grant shall be rejected by the board for the following reasons:

- A. An ineligible applicant;
- B. Ineligible costs;
- C. A late submittal; or
- D. Failure to comply with any requirement of statute or rule.

Subp. 2. **Procedure.** The board shall review each grant application within 30 days after the deadline for application submittal. The board shall notify each rejected grant applicant of the rejection of its application and the reasons for the rejection.

Subp. 3. **Effect of rejection.** A grant applicant whose application is rejected must reapply in a subsequent application period in order to be considered for a grant.

0000.0170 RANKING OF APPLICATIONS

Subpart 1. **Process of ranking.** Upon completion of the review of the grant applications for acceptability, the board shall proceed to: (a) fund all acceptable plan development and base grant requests as provided in part 0000.0120, subparts 1 and 2; and (b) rank in order of priority all acceptable challenge grant applications. Each challenge grant request for which an acceptable grant application has been submitted must be awarded the number of priority points the request is entitled to under subparts 3 and 4. The requests with the highest number of priority points will

2 be given the highest priority. All requests will be given a ranking depending on the number of
3 points awarded.

4 Subp. 2. **Review team.** Prior to ranking applications, the board shall establish a review
5 team to evaluate requests. The review team, chaired by the board, shall consist of the following
6 agencies or organizations: Association of Minnesota Counties, Minnesota
7 Departments of Agriculture, Health, Natural Resources, League of Minnesota Cities, Minnesota
8 Association of Conservation District Employees, Minnesota Association of County Planning and
9 Zoning Administrators, Minnesota Association of Soil and Water Conservation Districts, Minnesota
10 Association of Townships, Minnesota Association of Watershed Districts, Metropolitan Council,
11 Minnesota Extension Service, Minnesota Geological Survey, Minnesota Pollution Control Agency,
12 State Planning Agency and others as the board may determine.

13 Subp. 3. **Priority points for challenge grant applications.** The following criteria must be
14 used to determine the number of priority points to be awarded in the evaluation of each challenge
15 grant application. The board shall award each request between zero and ten points under each
16 of the following criteria, depending on how well the application satisfies the criterion. The
17 number of points under each criterion must be added together to determine the application's total
18 point value. This total number must be used to determine the application's overall ranking and
19 priority. The criteria are as follows:

- 20 A. The extent to which the request employs methods which provide a technically and
21 economically feasible means to protect and manage water and related land resources;
22 B. The extent to which the request is consistent with priorities described in the applicant's
23 comprehensive local water plan;

- C. The extent to which the request is consistent with state water quality management plans;
- D. The extent to which the request demonstrates a high potential for success based on community support and involvement as well as participation, coordination and cooperation of federal, state and local agencies and units of government;
- E. The extent to which the request supports efforts of local units of government to adopt, administer, and enforce official controls to protect and manage water and related land resources;
- F. The extent to which the request expresses long-term commitment to effective water protection and management;
- G. The extent to which the request complements efforts of federal, state, and local units of government; and
- H. The collective priority placed on each request by the review team. The review team shall assign priority points based on criteria A. through G.

Subp. 4. **Other considerations.** In assigning points, the board and review team must consider the regional variations that exist in program needs and priorities. Further, the uniqueness or ability of existing state delegated or mandated programs to successfully protect or manage water and related land resources must also be considered.

0000.0180 ALLOCATION OF FUNDING

Subpart 1. **Grant fund allocation.** Within 60 days of the close of an application period, the board shall determine how much of the remaining funds will be made available for plan

2 development, base grant, and challenge grant awards. In deciding how much money to make
3 available for new grant awards, the board shall consider the necessity to have money available
4 for subsequent grant periods, the necessity to have money available for anticipated grant
5 amendments in the next year, and other factors relating to the ability to ensure that money will
6 be available for upcoming projects.

7 Subp. 2. **Development; base; challenge grant split.** Within 60 days of the close of an
8 application period, the board shall determine how much of the funds available for new grants in
9 that application period will be available for plan development, base, and challenge grants. In
10 determining the allocation of funds between plan development, base, and challenge grants, the
11 board shall give priority to development of Ch. 110B.04 and Ch. 473.8785 plans.

12 If the money intended for plan development or base or challenge grants, or both, is not
13 awarded during a grant period, the board may reallocate the funds to the other kind of grant or
14 to a subsequent grant period.

15 **0000.0190 SELECTION OF GRANTEES**

16 Subpart 1. **Ranking.** The board shall complete its ranking of all applications for challenge
17 grants for which an acceptable grant application has been submitted within 60 days of the close
18 of the application period.

19 Subp. 2. **Projects funded.** The board shall select those applicants that will be awarded
20 grant funds by awarding grants to the highest priority challenge grant requests within the limits
21 of available funds established under 0000.0180 subpart 2. An application that receives less than
22 40 points will not be considered for award of grant funds.

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2 Subp. 3. **Board decision.** All decisions of the board in ranking applications and awarding
3 grants must be made at a regular or special board meeting.

4 Subp. 4. **Timing.** The board shall make its decision on fund allocation, application ranking,
5 and requests to which grants will be awarded within 60 days of the close of the application
6 period.

7 Subp. 5. **Reapplication.** A grant applicant whose application is not awarded grant funds
8 must reapply in a subsequent application period to be reconsidered for a grant.

9 0000.0200 GRANT CONDITIONS

10 Subpart 1. **Amount.** A grant that is made must be for the amount requested by the
11 applicant, up to a maximum in accordance with part 0000.0120 subparts 1 and 2.

12 Subp. 2. **Grant period.** The grant period for a plan development grant will be for a period
13 of two years. The grant period for a base grant will be for a period of one year. The grant period
14 for a challenge grant will be for a period of two years and may be extended an additional one
15 year with board approval.

16 Subp. 3. **Grant contract.** The county must enter into a contract with the board before a
17 grant will be awarded. The contract must include the provisions established in Part 0000.0210.

18 Subp. 4. **Records.** The county, or delegated local unit of government, shall maintain all
19 records relating to the receipt and expenditure of grant funds for a period of six years from the
20 date of termination of the grant contract.

21 Subp. 5. **Audit.** The county must agree that the books, records, documents and accounting
22 procedures and practices of the county, relevant to this program may be examined at any time
23 by the board or board's designee.

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Subp. 6. **Annual progress report.** The county shall submit an annual progress report to the board by January 1 of each year the grant is in effect. The report must include the following information:

- A. A discussion of work progress relative to the application and schedule, and difficulties encountered meeting the schedule during the year;
- B. A discussion of the program results appropriate to the work conducted during the year; and
- C. A report of expenditures in the year and those anticipated during the upcoming year.

Subp. 7. **Eligible costs.** No grant funds shall be used to reimburse the county for costs incurred prior to or after the end of the contract period.

0000.0210 GRANT CONTRACT

Subpart 1. **Contents.** The board and the county shall enter into a grant contract. The grant contract must:

- A. Establish the term and conditions of the grant;
- B. Provide that the county may contract with others, including appropriate local units of government under the terms and conditions specified by the board, to complete the work specified in the contract;
- C. Provide that the cost overruns are the sole responsibility of the county;
- D. Require that a county is responsible for ensuring that state funds are properly expended even if the work specified in the grant contract is performed by a local unit of government acting on behalf of the county;

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E. Require that that county submit periodic progress reports and a final report to the board in a format prescribed by the board; and

F. Incorporate terms and conditions required by federal or state statutes, rules and regulations.

Subp. 2. **Amendments.** A grant contract may be amended upon agreement of the board and the county.

Subp. 3. **Contract period.** Grant contracts for plan development shall be for a period of two years. Grant contracts for base grants will be for a period of one year. Grant contracts for challenge grants will be for a period of two years. The board may allow one year extensions for challenge grant contracts.

0000.0220 GRANT PAYMENTS

Subpart 1. **Payment.** The board shall transfer to the county the total amount of the grant promptly after the grant contract is executed as to encumbrance by the Commissioner of Finance.

Subpart 2. **Unencumbered funds.** Any grant funds unencumbered or becoming unencumbered after the end of the contract period shall be returned to the board within one month of that date.

0000.0230 GRANT CANCELLATION

Subpart 1. **Board action.** The board may rescind a grant if the program is not being completed or implemented in accordance with the terms and conditions of the grant, including time schedules.

Subp. 2. **Agency action.** At the request of a state agency commissioner, the board shall rescind the portion of a grant used to support a program not in compliance.

January 23, 1990

0000.0140	(page 4)	BWSR establishes a list of local governments to be notified of grant announcements
0000.0140	(page 4)	[90 days] BWSR announces application period
0000.0150	(page 5)	County submits application
0000.0160	(page 6)	[30 days] BWSR review applications for completeness; rejection letters sent
0000.0180	(page 8)	[60 days] After application period closes, BWSR determines funding split between types of grants
0000.0170	(pages 6-7)	BWSR ranks applications
0000.0190	(pages 9-10)	BWSR selects grantees

Total time from beginning of application period to notification of grantees:

90		
30	}	180 days
60		

Overview of the Lower Rum River Watershed Management Plan for the January 24, 1990 Board Meeting

Introduction

The Lower Rum River Water Management Organization (LRRWMO) is a joint powers commission made up of representatives from the cities of Andover, Anoka, Coon Rapids, and Ramsey. The LRRWMO is located in the southeastern part of Anoka County and is adjacent to the Mississippi River. The LRRWMO encompasses a land area of approximately ~~28.3~~⁵⁶ square miles.

Watershed Description

The LRRWMO is covered primarily by glacial drift deposited by the Grantsburg Sublobe of the Des Moines Lobe during the last period of glaciation in the Twin Cities. The Grantsburg Sublobe deposited a silty till that was reworked by glacial meltwater over much of the watershed into sand plain, sandy lacustrine, and valley train deposits. These glacial deposits, along with older, buried glacial deposits, range from 100 to 250 feet in thickness and are underlain by bedrock.

The LRRWMO is part of the Anoka Sand Plain physiographic region. The topography of the region is gently rolling to flat. The soils are generally uniform fine sands on the high grounds and organic materials in the low areas.

The sand plain has a naturally occurring high water table. There are many shallow lakes and wetlands in the watershed where the water table is at or near the surface.

The Mississippi River and the Rum River dominate the hydrologic system of the lower Rum River Watershed. The Mississippi forms the south border and the Rum River bisects the WMO in a north-south directions. The existence of the rivers in the watershed results in large areas being directly tributary to these rivers. Eight subwatersheds have been identified in the LRRWMO. There are many lakes, ponds, and low areas in the LRRWMO and the landuse ranges from open to urbanized.

The following major water management problems are identified in the plan:

- high water tables in the sandplain areas.
- maintenance of open channels for stormwater conveyance.
- water quality degradation from urban runoff.

Staff Review

BWSR staff is in the first stages of review. We are waiting for agency comments. BWSR is also aware that the LRRWMO is actively meeting and discussing additions to their plan. Discussions on these additions have to some degree been generated by the Metropolitan Water Management Task Force Report.

January 24, 1990

BWSR LCMR PROPOSALS, 92-93 BIENNIUM

Red River Valley Wind Erosion Control Pilot Project

- * windbreak maintenance
- * information and education clearinghouse
- * technical and financial assistance

Cannon River Watershed Protection Project

- * coordinated effort
- * accelerate implementation of CLWPs
- * "watershed pride" approach

Education/TV Spots

- * video footage of issues near and dear to the BWSR mission
- * also cover aspects of the RIM program

RIM

- * landscape study
- * easements

Education/Board Game

- * save the wetland

ECONOMIC REPORT

Economic Report ER90-6

November 1990

Minnesota's RIM Reserve: Easement Summary and Payment Procedures

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MINNESOTA'S RIM RESERVE: EASEMENT SUMMARY AND
PAYMENT PROCEDURES

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Minnesota's RIM Reserve: Easement Summary and
Payment Procedures

Steven J. Taff and S. Todd Lee*

Report Overview

Initiated in the 1986 Minnesota Legislature to stimulate investment in the state's fish, wildlife, water, soil and other natural resources, the RIM (Reinvest in Minnesota) Reserve was intended to reduce some undesirable consequences of farming. Roughly half of the State's total RIM expenditures are channeled into the Reserve, administered by the state Board of Water and Soil Resources and local Soil and Water Conservation Districts (SWCD); the remainder goes to habitat development projects administered by the State Department of Natural Resources.

Under the Reserve, the state buys cropping and grazing rights to land that, if cropped, is believed to cause unacceptable public damages from erosion or that, if not cropped, can increase desirable public benefits such as wildlife habitat and water quality. Since 1986, the state has spent some \$19 million to acquire limited ownership rights in and to establish conservation measures on over 34 thousand acres of Minnesota cropland.

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The essence of the Reserve is straightforward: the state buys limited term or perpetual easements on previously cropped farmland. Limited term easements were first set at ten years (paralleling federal Conservation Reserve Program contracts), but were extended to 20 years for 1987 and succeeding sign-up periods. Both limited term and perpetual easements were originally intended to be used on "marginal agricultural lands" (MAL). Essentially, these are parcels with soils that lie at the lower end of the joint distribution of soil productivity and resistance to productivity losses from erosion, measures that can be calculated for all Minnesota soils (Larson et al., 1988). Subsequent legislation expanded the set of easement types to include the restoration of previously drained wetlands, "living snowfences" (windbreaks of trees planted along highways), pastured hillsides, riparian lands, and sensitive groundwater areas, among others.

Participating landowners must establish and maintain permanent cover or other conservation practices as prescribed by a conservation plan developed for each easement. In exchange, landowners receive a lump-sum payment, plus appropriate cost-sharing for selected practices.

In this report we examine the characteristics of the land that had been enrolled in the Reserve as of May 1, 1990 (Part A) and how this program has been administered, particularly with respect to easement payments (Part B). Local property tax implications of RIM Reserve enrollment are examined in a companion document (Lee and Taff, 1990). In neither report do we attempt a monetary valuation of the public benefits that are said to result from RIM program investments.

PART A: RIM RESERVE ENROLLMENT DATA

The Data Set

Extensive use is made of two data sets: the RIM contract files and USDA Soil Conservation Service soils interpretation records. The former lists for each easement the year of purchase, the location (township) the number of acres, the conservation practice cost and source, the easement type, and all soil mapping units (by type and acreage) on the parcel. The mapping unit information permits a link with the SCS soils interpretation data to generate many of the tables presented here. Details are available from the authors.

The RIM easement characteristics reported in this section are not based upon a complete enumeration. Of the 1,382 easements completed (as of May 1, 1990), 780 can be linked to soils data, although some of the data are not complete. (For the remaining easements, the soils information had not yet been recorded by program staff, or the counties in which the easement is located do not have a completed soil survey.) These 780 easements account for 16,871 acres, roughly half of the total enrolled acreage. However, the characteristics of the enumerated set appear to be similar enough to the whole set to warrant confidence about any conclusions drawn from data reported here. Table 1 shows this comparison. Newer easement types such as sensitive groundwater areas are underrepresented in the enumerated set, because most 1989 contracts were not fully entered at the time of the analysis.

Table 1: Comparison of Complete RIM Easement Data Set and Soils Characteristics Data Set

<u>Easement Type</u>	<u>Percent of Total Set</u>			
	<u>Number of Easements</u>		<u>Easement Acreage</u>	
	<u>Full Set</u>	<u>Soils Set</u>	<u>Full Set</u>	<u>Soils Set</u>
Limited Term				
MAL-10	53	67	54	67
MAL-20	11	8	9	7
Hillsides	<1	-	<1	-
Riparian	<1	-	<1	-
Groundwater	1	-	<1	-
Perpetual				
MAL	24	21	24	21
Wetlands-History	6	4	8	5
Wetlands-No History	<1	-	<1	-
Hillsides	1	-	2	-
Riparian	2	-	2	-
Groundwater	<1	-	<1	-
Snowfence	1	<1	<1	<1

Note: See Chart 1 for Easement Type key.

Chart 1: RIM Reserve Easement Types

<u>Short Title</u>	<u>Full Title (onset date)</u>
Limited Term:	
MAL - 10	Marginal Agricultural Land - 10 year term (1986 only)
MAL - 20	Marginal Agricultural Land - 20 year term (1987 - present)
Hillside	Pastured Hillside - 20 year term (1989 - present)
Riparian	Riparian Land - 20 year term (1989 to present)
Groundwater	Sensitive Groundwater Area - 20 year term (1989 to present)
Perpetual	
MAL	Marginal Agricultural Land - (1986 - present)
Wetland - History	Restored Wetland with Cropping History - (1987 - present)
Wetland - No History	Restored Wetland with No Cropping History - (1989 - present)
Hillside	Pastured Hillside - (1989 - present)
Riparian	Riparian Land - (1989 - present)
Groundwater	Sensitive Groundwater Area - (1989 - present)
Snowfence	Living Snowfence (Highway Windbreak) - (1987 - present)

Easement Purchases

The nearly 1,400 RIM easements purchased to date are widely scattered across the state (Table 2). Eighty-four SWCDs report easements, and no district has more than 62 (Renville). The district (also Renville) with the largest aggregate acreage has only 1,474 acres. Easement payments are similarly widely dispersed: only one district received over \$1 million to date.

Tables 3 through 5 show statewide totals arrayed by sale year and easement type. RIM easements might be one of twelve types: either of limited or perpetual duration and either eligible as marginal agricultural land, previously-drained (but restorable) wetlands, riparian lands, pastured hillsides, sensitive groundwater areas, or living snowfence (Chart 1). The bulk of the RIM easements was acquired in the first program year, mostly for a limited duration (10 years). This imbalance is large part attributable to the diminishing budget resources appropriated to the RIM Reserve since that first program year (Table 7). At the same time as perpetual easements have become increasingly emphasized (at the specific urging of the Legislature), program attention has shifted away from marginal agricultural lands toward drained wetlands and, very recently, also toward riparian land and sensitive groundwater areas. None of these eligible land types are necessarily "marginal" in the sense used in the original legislation.

Table 6 shows the statewide average per-acre payments. The reader is cautioned that these average figures, particularly for the easement types with little sales activity to date, can be significantly influenced by the payment levels associated with the geographic areas in which these few easements happen to be located.

Table 2: RIM Reserve Easement Summary by SWCD: 1986- May 1, 1989

<u>SWCD</u>	<u>Number of Easements</u>	<u>Easement Acres</u>	<u>Total Payments (dollars)</u>
Aitkin	9	274	35,559
Anoka	1	22	5,510
Becker	16	420	110,402
Beltrami	13	199	23,753
Benton	24	598	151,523
Big Stone	9	215	78,449
Blue Earth	13	176	112,033
Brown	22	421	310,246
Carver	17	302	224,469
Cass	1	20	2,495
Chippewa	9	163	96,473
Chisago	24	356	94,259
Clay	26	1,036	419,524
Clearwater	6	386	43,217
Cook	1	6	701
Cottonwood	33	685	475,141
Dakota	16	362	173,457
Dodge	4	67	33,408
Douglas	25	492	167,189
East Ottertail	40	1,236	371,413
East Polk	30	1,086	297,626
East Agassiz (Norman)	20	701	231,523
Faribault	18	518	455,004
Fillmore	24	403	186,433
Freeborn	23	331	218,637
Goodhue	44	643	312,346
Grant	6	216	143,587
Hennepin	2	21	9,015
Hubbard	4	55	6,980
Isanti	41	557	143,541
Itasca	1	26	3,149
Jackson	16	250	171,730
Kanabec	3	56	14,480
Kandiyohi	33	679	358,182
Kittson	12	480	116,253
Lac Qui Parle	9	186	81,398
Lake of the Woods	5	93	11,575
Le Sueur	19	359	189,056
Lincoln	11	247	100,572
Lyon	10	214	103,375
Mahnomen	3	57	15,480
Marshall	14	565	147,481
Marshall Beltrami	5	133	27,572
Martin	23	463	310,600
McLeod	31	492	313,982

(continued)

Table 2: RIM Reserve Easement Summary by SWCD: 1986- May 1, 1989

<u>SWCD</u>	<u>Number of Easements</u>	<u>Easement Acres</u>	<u>Total Payments (dollars)</u>
Meeker	29	811	413,863
Mille Lacs	14	164	47,993
Morrison	42	854	209,112
Mower	10	182	106,505
Murray	16	351	189,616
Nicollet	8	124	74,791
Nobles	3	67	44,450
North St. Louis	2	44	5,412
Olmsted	13	227	104,045
Pennington	7	210	56,253
Pine	1	67	8,241
Pipestone	4	54	22,287
Pope	25	762	299,112
Red Lake	8	330	88,950
Redwood	29	787	665,286
Renville	62	1,474	1,033,948
Rice	23	330	179,059
Rock	3	26	11,345
Root River (Houston)	19	471	204,496
Roseau	13	524	137,628
Scott	35	678	429,801
Sherburne	23	610	154,330
Sibley	39	518	357,875
Stearns	32	607	188,137
Steele	12	244	132,187
Stevens	22	530	276,041
Swift	21	577	289,023
Todd	12	372	97,280
Traverse	5	135	70,746
West Ottertail	1	25	11,592
Wabasha	27	562	242,257
Wadena	21	435	51,834
Waseca	5	102	90,688
Washington	2	53	15,652
Watsonwan	11	122	62,558
Wilkin	7	221	97,605
Winona	18	178	81,586
Wright	33	594	301,099
Yellow Medicine	<u>9</u>	<u>303</u>	<u>185,506</u>
STATE TOTAL	1,382	30,985	13,938,000

Table 3: Number of RIM Reserve Easements by Easement Type by Year:
State: 1986 - May 1, 1989

<u>Easement Type</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
Limited Term					
MAL-10	737	.	.	.	737
MAL-20	.	58	90	8	156
Hillside	.	.	.	5	5
Riparian	.	.	.	2	2
Groundwater	<u>.</u>	<u>.</u>	<u>.</u>	<u>7</u>	<u>7</u>
	737	58	90	22	907
Perpetual					
MAL	88	107	101	38	334
Wetland-History	.	33	33	23	89
Wetland-No History	.	.	.	5	5
Hillside	.	.	.	13	13
Riparian	.	.	.	23	23
Groundwater	.	.	.	3	3
Snowfence	<u>.</u>	<u>4</u>	<u>3</u>	<u>1</u>	<u>8</u>
	<u>88</u>	<u>144</u>	<u>137</u>	<u>106</u>	<u>475</u>
TOTAL	825	202	227	128	1,382

Note: See Chart 1 for Easement type key.

Table 4: RIM Reserve Easement Acreage by Easement Type by Year:
State: 1986 - May 1, 1989

<u>Easement Type</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
Limited Term					
MAL-10	16,712	.	.	.	16,712
MAL-20	.	955	1,612	86	2,653
Hillside	.	.	.	125	125
Riparian	.	.	.	21	21
Groundwater	<u>.</u>	<u>.</u>	<u>.</u>	<u>129</u>	<u>129</u>
	16,712	955	1,612	361	19,640
Perpetual					
MAL	2,024	2,578	1,974	798	7,374
Wetland-History	.	913	874	845	2,632
Wetland-No History	.	.	.	189	189
Hillside	.	.	.	477	477
Riparian	.	.	.	491	491
Groundwater	.	.	.	110	110
Snowfence	<u>.</u>	<u>42</u>	<u>23</u>	<u>7</u>	<u>72</u>
	2,024	3,533	2,871	2,917	11,345
TOTAL	18,736	4,488	4,483	3,278	30,985

Note: See Chart 1 for Easement type key.

Table 5: RIM Reserve Easement Payments by Easement Type by Year:
State: 1986 - May 1, 1989 (thousand dollars)

<u>Easement Type</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
Limited Term					
MAL-10	5,648	.	.	.	5,648
MAL-20	.	297	711	29	1,037
Hillside	.	.	.	38	38
Riparian	.	.	.	10	10
Groundwater	<u>.</u>	<u>.</u>	<u>.</u>	<u>43</u>	<u>43</u>
	5,648	297	711	120	6,776
Perpetual					
MAL	1,404	1,588	1,295	502	4,789
Wetland-History	.	549	641	528	1,718
Wetland-No History	.	.	.	110	110
Hillside	.	.	.	166	166
Riparian	.	.	.	298	298
Groundwater	.	.	.	50	50
Snowfence	<u>.</u>	<u>13</u>	<u>13</u>	<u>5</u>	<u>31</u>
	1,404	2,150	1,949	1,659	7,162
TOTAL	\$7,052	\$2,447	\$2,660	\$1,779	\$13,938

Note: See Chart 1 for Easement type key.

Table 6: Average RIM Reserve Easement Payments by Easement Type by Year:
State: 1986 - May 1, 1989 (dollars per acre)

<u>Easement Type</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
Limited Term					
MAL-10	338	.	.	.	338
MAL-20	.	311	441	334	391
Hillside	.	.	.	308	308
Riparian	.	.	.	479	479
Groundwater	<u>.</u>	<u>.</u>	<u>.</u>	<u>333</u>	<u>333</u>
	338	311	441	332	345
Perpetual					
MAL	694	616	656	629	649
Wetland-History	.	601	733	624	653
Wetland-No History	.	.	.	581	581
Hillside	.	.	.	348	348
Riparian	.	.	.	606	606
Groundwater	.	.	.	459	459
Snowfence	<u>.</u>	<u>301</u>	<u>563</u>	<u>736</u>	<u>426</u>
	694	609	679	569	631
TOTAL	\$376	\$545	\$593	\$543	\$450

Note: See Chart 1 for Easement type key.

Table 7: RIM Reserve Funding: 1986-1989

<u>Year</u>	<u>Funding (Thousand Dollars)</u>	
	<u>Easements (1)</u>	<u>Administration (2)</u>
1986	9,400	600
1987	4,500	750
1988	4,500	750
1989	1,500	750
1990	<u>750</u>	<u>750</u>
	\$20,650	\$3,600

- (1) Includes easement payments, practice cost sharing, and RIM Reserve coordinator's salary.
- (2) Pass-through payments to SWCDs for RIM Reserve program administration. State-level administrative costs covered by non-earmarked BWSR allocations.

For reference, Tables A1-A3 (located in the Appendix) report without comment the number of easements, easement acreage, and easement payments, respectively, by easement type for each SWCD in which an easement has been acquired. Table A4 reports easement acreage by conservation practice by SWCD.

Cover Practices

A given RIM Reserve parcel might contain up to a dozen specific conservation practices. In Table 10 we show the easement and acreage figures for conservation practices at the state level. (Comparable SWCD-level data is in Table A4.) By far the most prevalent practice is introduced grasses, followed at some distance by lands already in vegetative cover and by native grass establishment. This reflects the preponderance of RIM easements on marginal ag lands and the relatively low expense (to the land owner) of satisfying easement cover requirements by introducing non-native grasses.

Table 9 shows the distribution of such practices per parcel. Even though most easements have only one or two associated practices, caution must nonetheless be exercised in interpreting aggregate data on practices, to avoid double counting. It is valid, however, to use this data as a structure count (so many wildlife food plots or diversions, for example) or as an aggregate area (so many acres of permanent nature grasses, for example).

In these charts we follow the RIM Reserve program managers' custom of treating donated land as a cover practice, although of course it is not strictly so. Unlike the CRP, which brings in non-eligible lands for payment if it comprises less than one third of an otherwise eligible field, the RIM Reserve accepts non-eligible land only if it is donated by the landowner or

another party. Examples are woodland within the boundaries of a marginal ag land parcel or uncropped upland within a restored wetland parcel. For reporting purposes, total easement acres includes donated lands. Most of the 424 acres of donated land in the total Reserve is associated with perpetual easements, especially marginal ag land, restored wetlands, and riparian lands (Table 10).

Parcel records list previous cropping history on a field basis. However, a RIM parcel might be made up of all or parts of one or several fields. Therefore, we cannot compile a cropping history for each parcel from existing data. We cannot answer questions such as, How much corn (or wheat or alfalfa) land did the RIM Reserve remove from production?

Land Attributes

Linking together the easement data set with soil interpretation records permits us to characterize the "quality" of the various lands under RIM easements. Easement records are disaggregated to the field level, and each field has associated with it a predominant soil mapping unit (which may only be a general soil complex, in which case the first soil in the complex, is assumed to be dominant.) Soil data is available only for those contracts signed prior to 1989; consequently, only marginal agricultural land, wetland, and living snowfence easement types are considered in the tables that follow. Because up to half of a MAL easement may consist of land not eligible in and of itself, the impact of RIM reserve expenditures on the targeted environmental goal (habitat, erosion, water quality) may be muted to the extent that the included non-eligible land does not provide such services. However, other RIM Reserve guidelines seek to minimize this potential. For example, every acre of restored wetland can have associated

Table 8: Conservation Practices on RIM Reserve Easements: State:
1986- May 1, 1989

<u>Practice</u>	<u>Number of Easements Practice with Practice</u>	<u>Easement Acres with Practice</u>
Donated Land	64	424
Introduced Grasses	949	16,273
Already in Trees	19	327
Living Snowfence	8	40
Shallow Water	5	8
Native Grasses	358	5,484
Trees/Shrubs	423	2,585
Field Windbreak	72	141
Diversion	12	1
Grass Waterway	4	2
Restored Wetland	109	1,079
Already in Cover	503	7,185
Wildlife Food Plot	108	212
Temporary Cover	64	682

Note: Many easements incorporate more than one practice. "Temporary Cover" is used for transition into one or more of the permanent practices listed above.

Table 10: Distribution of Donated Land by RIM Reserve Easement Type:
State: 1986 - May 1, 1989

<u>Easement Type</u>	<u>Number of Easements with Donated Land</u>
Limited Term	
MAL-10	3
MAL-20	3
Hillsides	-
Riparian	-
Groundwater	-
Permanent	
MAL	22
Wetland-History	18
Wetland-No History	-
Hillsides	-
Riparian	15
Groundwater	1
Snowfence	2

Note: See Chart 1 for Easement Type key.

with it four acres of adjoining upland, for the express purpose of providing additional high quality habitat.

Under the widely-used SCS land capability classification system (see Appendix B for details), roughly half of the RIM easement soils fall under classes I, II, or III (Table 11). While most land in this range has varying degrees of difficulty associated with cultivation, none is deemed "unsuitable" for crop production, given appropriate crop selection, tillage regimes, and conservation practices. Much of this land probably entered the Reserve as parts of fields the dominant part of which were eligible marginal agricultural lands. Table 12 shows that perpetual MAL easements do show a little more emphasis toward more unproductive land, as measured here. None of this should be surprising. The RIM Reserve uses its own set of criteria to judge eligibility for the various easement types. Only the MAL criterion is even remotely consistent with the SCS classification used here for characterization purposes.

The remaining tables categorize RIM easements by various soil factors. Most of the parcels are on slopes averaging less than 10% (Table 13). The commonly-reported soil T-factor, which is an estimate of the maximum annual erosion (measured in tons per acre per year) that a soil can "tolerate" without reducing productivity, is reported in Table 14. The majority of RIM easement soils are in the 5-ton category, regardless of easement type. Because soils with low (1 or 2 tons per acre per year) T-Factors are the most sensitive to erosion loss, they are usually not cropped and are generally, as a result, not often eligible for the RIM Reserve in the first place. (The exception is the pastured hillsides category.)

Table 11: RIM Reserve Easement Acres by Land Capability Class and Sub Class: State: 1986-88

<u>Class</u>	<u>Easement Acres in Class</u>
I	150
IIc	10
IIe	1,316
IIs	349
IIw	1,903
IIIe	2,218
IIIs	1,527
IIIw	1,920
IVe	1,332
IVs	1,979
IVw	795
Vw	297
VIe	492
VIs	148
VIw	394
VIIe	147
VIIIs	38
VIIw	3
VIIIw	9
Total	15,026

Note: Data presented for land characterization purposes only. RIM eligibility is based on criteria other than Land Capability Class. No data for 1989 easements.

Table 12: RIM Reserve Easement Acres by Land Capability Major Class and Easement Type: State 1986-88

<u>Major Class</u>	<u>MAL/ 10 yr</u>	<u>MAL/ 20 yr</u>	<u>MAL/ Perp.</u>	<u>Wetland/ History</u>	<u>Living Snowfence</u>	<u>Total</u>
I	90	11	37	11	3	150
II	1,931	264	1,018	356	9	3,579
III	3,757	472	1,131	305	2	5,665
IV	3,345	178	581	5	0	4,105
V	85	31	142	39	0	297
VI	783	99	153	0	0	1,035
VII	143	3	39	0	0	185
VIII	0	0	9	0	0	9
	10,133	1,055	3,108	716	14	15,026

Note: See Chart 1 for Easement Type key. Data presented for land characterization purposes only. RIM eligibility is based on criteria other than Land Capability Class. No data for 1989 easements.

Table 13: Distribution of RIM Reserve Easement Acreage by High Slope Range:
State: 1986-88

High Slope Range	Easement Type					Total
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Living Snowfence	
1-5	4,890	620	2,059	598	10	8,177
6-10	2,402	214	391	99	2	3,108
11-15	1,743	178	475	25	2	2,423
16-20	1,006	49	141	5	0	1,201
21-25	197	22	44	0	0	263
26+	<u>221</u>	<u>13</u>	<u>38</u>	<u>0</u>	<u>0</u>	<u>272</u>
	10,459	1,096	3,148	727	14	15,442

Note: See Chart 1 for Easement Type key. High Slope is the greater of the endpoints of the reported slope range. Data presented for land characterization purposes only. RIM eligibility is based on criteria other than High Slope Range. No data for 1989 easements.

Table 14: Distribution of RIM Reserve Easement Acreage by T-Factor:
State: 1986-88

<u>T-Factor</u>	<u>Easement Type</u>					<u>Total</u>
	<u>MAL/ 10 yr</u>	<u>MAL/ 20 yr</u>	<u>MAL/ Perp.</u>	<u>Wetland/ History</u>	<u>Living Snowfence</u>	
1	6	0	0	0	0	6
2	132	0	16	0	0	148
3	1,678	145	311	1	0	2,135
4	1,725	140	298	31	0	2,195
5	<u>6,918</u>	<u>812</u>	<u>2,521</u>	<u>695</u>	<u>14</u>	<u>10,959</u>
	10,459	1,097	3,148	726	14	15,443

Note: See Chart 1 for Easement Type key. Data presented for land characterization purposes only. RIM eligibility is based on criteria other than T-factor. No data for 1989 easements.

PART B. RIM RESERVE PAYMENT PROCEDURES

Rights Acquired

The set of rights acquired under any RIM easement varies somewhat by easement type and enrollment period. ("Property rights," in the context used here, includes liabilities and obligations as well as entitlements.) Some of the transferred rights are explicit in the easement contract, while others are implicit or are spelled out only in other legal forms. The rights transferred to the state are more than simply those to plant and harvest crops. One way to characterize them is to think of them as use rights, access rights, management rights, or entitlements. Some are transferred to the state as buyer; others clearly remain with the landowner.

a) Use rights. The principal rights acquired by the State under a RIM easement are those to grow annual crops, to cultivate the soil, to hay or graze the parcel, to apply agricultural chemicals (other than those authorized in the management plan), to snowmobile, to build structures (including wells and irrigation equipment), to harvest timber (unless approved in the management plan) or to otherwise damage the vegetative cover. The landowner retains the right to control access, to hunt, to charge a fee for use by others, and to subsurface mineral rights. (If mineral rights have been previously severed, the landowner must obtain a quitclaim or a non-mining consent contract prior to selling the RIM easement.) Starting in 1990, Minnesota law requires that all abandoned wells must be sealed by the owner prior to these easement being acquired by the state.

b) Management rights. Most land management discretion remains with the landowner, although it is severely limited by the transfer of use rights, of course. The landowner faces the added responsibility of managing the RIM parcel according to the official easement conservation plan. Significantly, in the case of restored wetlands easements, the State assumes management authority.

c) Access rights. While the landowner retains the right to post RIM land against trespass, the State acquires the right to enter the property for easement monitoring purposes and restored wetland management. As with non-RIM land, the owner can sell or lease access rights for recreational activities such as hunting.

d) Entitlements/Taxes. The state picks up the seller's right to break out (for cropping) new land on associated properties (see below), and the owner retains the right (obligation) to pay property taxes and other assessments (see below) and the right to lease or sell the property (with easement attached). The conveyance does provide the seller with certain protection against subsequent zoning changes, liability assignments, and utility right-of-way assessments.

RIM easements have transferred slightly different packages of rights over the years. For example, 1986 easements were silent with respect to property tax payments. Reflecting legislative concern over possible non-payment, easements since 1987 make property tax delinquency a violation of the contract. Another change over time has been the sodbusting requirement. Earlier easements forbade sodbusting on any land owned by the easement seller, at any time thenceforth. Subsequent legislative

action confined the sodbusting restriction to land owned by the seller at the time of the transaction.

A fundamental right that is not explicitly transferred is the "right" to pollute. More specifically, Minnesota farmland owners are largely immune from off-site damages attributable to cropping practices. For example, public roadside ditch cleanup costs are usually not assigned to landowners whose eroding fields contributed the sediment. For example, one of the purposes of public purchase of RIM MAL easements is to reduce erosion from cropped land. What is actually purchased thereby is the right to farm on erosive soils; what is implicitly purchased is the right to pollute.

Theoretical Price Determination

How much should the state pay for a RIM easement? The upper bound, presumably, is the level of public benefit achieved by removing the parcel from cropping. This benefit is generally assumed by analysts and program managers to be higher than any foreseeable acquisition costs. This assumption is made more valid, but not necessarily proven, to the extent that purchases are targeted to those parcels that are felt to provide the highest benefits.

The lower bound of the easement price continuum is the landowner's "reservation price," the price below which a sale will not be made and above which a sale will be made. The reservation price captures the landowner's opportunity costs, discount rates, and risk preferences, along with other price determinants. However, landowners cannot be expected to know their reservation prices with precision, and public agencies generally cannot elicit this price in advance of a payment offer. (See

concluding section on bidding mechanisms.) A common practice among economic analysts is to treat this private reservation price as the social opportunity cost as well. This entails an assumption that markets are free and that prices reflect underlying preferences, not market distortions.

By definition, any sale above the owner's reservation prices leaves the owner better off than before, and any sale below the public benefit price leaves the public better off. The closer the easement payment is to the lower bound, therefore, the more cost-effective is the acquisition program from the government's point of view. Landowners, of course, would prefer the reverse. The higher the easement price, the more money the owner obtains for relinquishing the same set of rights.

Since in practice the administering agency knows neither the public benefit nor the private reservation price, how should it formulate an easement offer price? That has been the problem confronting RIM program managers over the years. Unlike most goods where prices are established through market transactions, there is no conventional market for the package of rights that RIM acquires. There are, however, several similar rights packages for which there does exist a market. The prices of these packages might be used as proxies for the unknown price of the RIM easement rights.

1) Cropland rental rate. In Minnesota most rental arrangements are for one year (or in some cases two or three years), with payment either in cash or a share of the harvested crop. Any entitlements--notably the acreage base which provides eligibility for federal crop subsidies--are usually transferred over to the renter. (If they are not, the rental rate

is considerably lower.) Average tillable land rent data are surveyed each year by the Minnesota Extension Service, in cooperation with the State Department of Revenue and the State Planning Agency. The data are appropriately disaggregated to the county level at best, and even then with considerable caution.

2) Land market value. As was discussed above, the bulk of the traditional rights in land are transferred to the state when a RIM easement is purchased. Therefore, we would expect the price of full fee-title to the land not to be that much higher than the price of the easement. Full fee-title estimated market values are published each year at the township level by the Minnesota Department of Revenue. The estimates cover agricultural land without structures and, since 1989, have been guided by a valuation schedule distributed by the Department. This schedule is linked to calculated crop equivalency ratings (CER), which themselves are based on broad soil class groupings. We will discuss these links later in this report.

3) CRP rental rate. The RIM Reserve was originally set up to take advantage of the CRP's promised bidding system, by which landowners would compete to enter land into the federal reserve. In the process, a price for marginal land cropping rights would be "revealed" to RIM program managers. As it turned out, however, the CRP became essentially a flat payment scheme, with the price immediately settling at the previously determined maximum acceptable rental rate (MARR) for each multi-county bidding pool. These MARRS are widely known for each county in Minnesota--especially by local landowners.

The ideal price series for pegging RIM payments would be widely known, well accepted, geographically disaggregated, and matched to the rights actually acquired under RIM and the owner's reservation price. None of the three price series discussed above--cash rents, estimated market values, or CRP MARRs--meets all four criteria. Cash rents aren't systematically collected at a local level, although the rights acquired are akin to RIM rights. Market values meet the first two tests and partially meet the third (townships are still fairly large for price targeting purposes). Fee-title prices are obviously in excess of those acquired by RIM. The CRP matches most closely the rights--but not the terms--of RIM, but the rates are invariant within their multi-county bidding pool.

The best price series from the public's point of view would be information about each landowner's reservation prices, thus enabling the administering agency to pay just enough to acquire the necessary rights. Short of such a list, RIM payments are increasingly linked to estimated market values. These and other payment issues are discussed below.

Payment Procedures

RIM Reserve payments are typically made in a lump sum at the beginning of the easement, although they can be stretched into four equal annual payments, if the enrollee chooses, for tax purposes. This contrasts with the federal CRP, Water Bank, and most ASCS ACP (Agricultural Conservation Practices) programs, all of which make equal annual payments.

The initial reason for the lump sum procedure was said to be the pressing need of some farmers for immediate payments to alleviate cash

flow problems. The payment method has the incidental benefit of being less expensive to administer, at least with respect to payments. It also helps confirm that the RIM easement is an actual transfer of property and not--particularly for limited term easements--a long term "lease."

Up-front payments are not without their drawbacks. There was initial concern that some participating landowners, having received their payments, would cease paying local property taxes on the parcels, even to the point of allowing the property to become tax delinquent. (If a RIM parcel does go delinquent, its ownership reverts to the state, not the RIM Reserve program.) In a subsequent legislative session, non-payment of property taxes was made a violation of the terms of the easement. Since that time, RIM Reserve administrators have received no reports of property tax nonpayment.

A second possible problem with one-time payments is the loss of leverage over contract compliance. For example, most RIM contracts call for the landowner to perform certain management activities (e.g, weed control, thinning, etc.) at periodic intervals. Non-compliance is an easement violation, subject to enforcement by the state's attorney general's office. The threat of withholding an annual payment such as that under the CRP is not possible under the RIM Reserve because all payments are up-front.

A final possible disadvantage is that landowners don't seem to understand it. As discussed below, potential RIM enrollees are said to sometimes simply divide the RIM offer by the number of years in the contract, comparing this to local rents or to prevailing annual CRP payments. This misperception places the RIM offer, which is based on a

Table 15: Limited-Term RIM Easement Payment Offers: By SWCD:
1986 Sign-up

<u>SWCD</u>	<u>Offers (dollars per acre)</u>
Aitkin	126
Anoka	246
Becker	273
Beltrami	112
Benton	266
Big Stone	332
Blue Earth	524
Brown	489
Carlton	123
Carver	418
Cass	126
Chippewa	440
Chisago	269
Clay	328
Clearwater	126
Cook	123
Cottonwood	523
Crow Wing	121
Dakota	488
Dodge	483
Douglas	303
East Agassiz (Norman)	333
East Ottertail	265
East Polk	269
Faribault	533
Fillmore	487
Freeborn	517
Goodhue	473
Grant	344
Hennepin	303
Hubbard	126
Isanti	260
Itasca	123
Jackson	523
Kanabec	244
Kandiyohi	420
Kittson	272
Koochiching	123
Lac Qui Parle	430
Lake	123
Lake of the Woods	125
Le Sueur	518
Lincoln	423
Lyon	432
Mahnomen	273
Marshall	265

(continued)

Table 15: Limited-Term RIM Easement Payment Offers: By SWCD:
1986 Sign-up (Continued)

<u>SWCD</u>	<u>Offers (dollars per acre)</u>
Marshall-Beltrami (Beltrami)	112
Marshall-Beltrami (Marshall)	265
Martin	532
McLeod	407
Meeker	418
Mille Lacs	273
Morrison	246
Mower	503
Murray	428
Nicollet	507
Nobles	415
North St. Louis	123
Olmsted	476
Pennington	268
Pine	123
Pipestone	389
Pope	305
Ramsey	303
Red Lake	264
Redwood	524
Renville	526
Rice	506
Rock	427
Root River (Houston)	477
Roseau	264
Scott	398
Sherburne	253
Sibley	502
South St. Louis	123
Stearns	304
Steele	514
Stevens	345
Swift	329
Todd	270
Traverse	305
Wabasha	492
Wadena	123
Waseca	520
Washington	297
Watonwan	504
West Ottertail	324
West Polk	330
Wilkin	341
Winona	470
Wright	301
Yellow Medicine	432

Source: Minnesota Board of Water and Soil Resources, "RIM
Reserve Comments #23". Nov. 6, 1986

economists, they decided upon 7%, a rate that was somewhat below the prevailing cost of money for state bond-raising and slightly above the prevailing rate of return for small private investments. The official RIM discount rate has remained at 7% since that time.

The RIM administrators prepared a list of official offers for each soil and water conservation district (SWCD), the Reserve's local administering agency. Counties with no CRP bids were assigned the average bid in the multi-county pool to which they were assigned for CRP bidding purposes. The 90% bid figure was then multiplied by 7.02358 (the present value of 1.00 annually at 7% for 10 years) and rounded off to the nearest dollar to obtain the final RIM payment offer for each SWCD (Table 15). (Minnesota SWCDs correspond in most cases to county boundaries. Exceptions are the three split counties noted above and the Marshall-Beltrami district, which consists of adjoining portions of those two counties.)

For the 1986 program year, perpetual easements were paid at a flat 70% of the 1985 township estimated market value for tillable land. (In several instances, the 10-year payment, based on the CRP, was higher than this perpetual payment.) The 30% reduction from full value was felt to reflect both the fact that RIM parcels were less productive (by targeting objectives) than the average parcel and the fact that the state was buying only some of the available property rights. Payment rates at these levels were calculated by the Minnesota Department of Revenue and provided to RIM program managers.

In the next legislative session, significant changes in program administration were authorized. The limited term easement term went from

ten to twenty years (because average state bond pay-offs take about 17 years), and perpetual easements were "strongly encouraged." The perpetual easement payment was set at the lower of 90% of the 1986 township EMV or the present value of the township average weighted annual cash rent.

(Cash rent estimates are available only at the county level. For RIM program purposes, these county rents were weighted by the ratio of each township's average tillable EMV to the county average tillable EMV.) These figures were set by administrative rule, not by legislation. (For comparison, the state Water Bank program pays at a rate of 50% of EMV.)

The 20-year limited term payments for 1987 were set at 65% of the perpetual payment. Apparently, the 20-year payment was to be the same proportion of the perpetual payment as is the proportion of the two (presumably uniform and continuous) streams of public benefits. However, the 65% of perpetual payment arrangement cannot be grounded directly in such present value ratios. At 7%, the ratio of the two benefit streams is 0.74, not 0.65. It appears that the ratio was further multiplied by the 90% figure: $.90 * .74 = .67$, or 65% rounded down a bit. Strictly speaking, then, the 65% proportion for limited term easements should be applied to the property's full value, not the price of the easement, if the underlying rationale is to be followed. At present, the perpetual payment is 90% of EMV, and the limited term payment is therefore 58.5% of EMV. The shift from 1986 to 1987 in SWCD average RIM offers are shown in Table 16 for illustration. Actual offers, of course, were at the township level.

These payment arrangements remained in place for 1988 and subsequent easements, with a few exceptions. Restored wetlands with no cropping

Table 16: SWCD Average RIM Payment Rates and Estimated Market Values: 1986 and 1987-89 Signups

SWCD	1986		1987-1989	
	10-year payment	Average EMV	20-year payment	Average EMV
Aitkin	126	217	121	207
Anoka	246	483	299	511
Becker	273	359	190	324
Beltrami	112	203	104	178
Benton	266	496	236	404
Big Stone	332	548	242	414
Blue Earth	524	965	428	731
Brown	489	1,158	486	830
Carlton	123	206	118	202
Carver	418	953	483	826
Cass	126	178	97	166
Chippewa	440	879	351	601
Chisago	269	474	250	427
Clay	328	606	320	547
Clearwater	126	211	111	189
Cook	123	322	186	318
Cottonwood	523	990	377	644
Crow Wing	121	230	138	236
Dakota	488	735	367	627
Dodge	483	886	355	608
Douglas	303	451	232	396
East Agassiz (Norman)	333	557	289	494
East Ottertail	265	339	184	315
East Polk	269	575	283	484
Faribault	533	1,135	464	794
Fillmore	485	527	197	338
Freeborn	517	908	316	540
Goodhue	473	767	381	650
Grant	344	724	314	536
Hennepin	303	1,056	1,601	1,028
Hubbard	126	218	122	208
Isanti	260	378	211	360
Itasca	123	251	125	213
Jackson	523	1,017	417	713
Kanabec	244	286	151	258
Kandiyohi	420	773	331	567
Kittson	272	388	190	325
Koochiching	123	130	68	117
Lac Qui Parle	430	663	263	449
Lake	123	127	73	125
Lake of the Woods	125	158	94	160
Le Sueur	518	851	366	626
Lincoln	423	428	188	322
Lyon	432	641	292	499
McLeod	407	887	374	640

(continued)

Table 16: SWCD Average RIM Payment Rates and Estimated Market Values:
1986 and 1987-89 Signups

SWCD	1986		1987-1989	
	10-year payment	Average EMV	20-year payment	Average EMV
Mahnomen	273	375	188	321
Marshall	265	405	189	323
Marshall Beltrami (Beltrami)	112	203	104	178
Marshall Beltrami (Marshall)	265	405	189	323
Martin	532	1,157	478	816
Meeker	418	795	342	584
Mille Lacs	276	342	190	325
Morrison	246	294	161	276
Mower	503	786	306	523
Murray	428	706	314	537
Nicollet	507	1,047	458	784
Nobles	415	746	324	553
North St. Louis	123	143	81	138
Olmsted	476	709	307	525
Pennington	268	322	136	233
Pine	123	232	136	232
Pipestone	389	537	228	390
Pope	305	478	229	392
Ramsey	303	1,863	1,235	2,112
Red Lake	264	346	159	272
Redwood	524	1,044	410	700
Renville	526	1,056	418	715
Rice	506	804	373	638
Rock	427	720	305	522
Root River (Houston)	477	446	190	324
Roseau	264	249	113	193
Scott	398	1,039	483	826
Sherburne	253	409	243	416
Sibley	502	970	412	703
South St. Louis	123	143	81	138
Stearns	304	529	255	436
Steele	514	894	399	683
Stevens	345	721	319	545
Swift	329	643	268	457
Todd	270	318	155	264
Traverse	305	736	325	555
Wabasha	492	635	273	466
Wadena	123	207	121	207
Waseca	520	1,026	393	672
Washington	297	761	494	844
Watsonwan	504	1,036	451	771
West Ottertail	324	339	184	315
West Polk	330	575	283	484
Wilkin	341	697	367	628
Winona	470	577	239	408
Wright	301	788	429	733
Yellow Medicine	432	737	298	510

history which is a perpetual easement, are paid at the 58.5% EMV rate. Perpetual pastured hillside easements are paid at 58.5% EMV, and 20-year pastured hillside easements are paid at 65% of that figure.

In 1988 and 1989, the EMV and rent figures were again based solely upon 1986 data. Program administrators felt that the more current EMV data provided by newer assessment reports did not fit actual market conditions. Land values were perceived to be going up, even though assessment data, with their built-in lags, still showed land prices going down. Consequently, proffered RIM prices were the same for the 1987, both 1988, and the 1989 rounds. No adjustment was made for inflation.

Statewide township EMV the data do not provide strong support for this argument, however. Figure 1 shows that 714 townships increased in average estimated market values between 1986 and 1987, and a great many others remained unchanged. (RIM payments are based upon the previous year's assessments, so this is the relevant period for the 1987-1988 RIM offers.) If the newer data had been used, easements located in townships that had gone up in EMV would have been "overpaid" because the sale was consummated at the lower, previous price. Easements in townships that had gone down in EMV might not have been sold at all under the new, lower price.

Interestingly, of those 353 townships in which RIM easements were actually purchased between 1987 and 1989, all but a handful were among those that had experienced a drop in market values between 1986 and 1987 sign-ups (Figure 2). If the newer rates had been used, the easements in those townships would have been offered a lower payment. Whether or not owners would have responded as they did to the frozen 1986 EMV rates is not known. Also, the newer EMV values might have elicited new participation from townships in which EMVs went up between 1986 and 1987.

Figure 1: Distribution of Changes in Township Average Estimated Market Value: 1986-1987: State

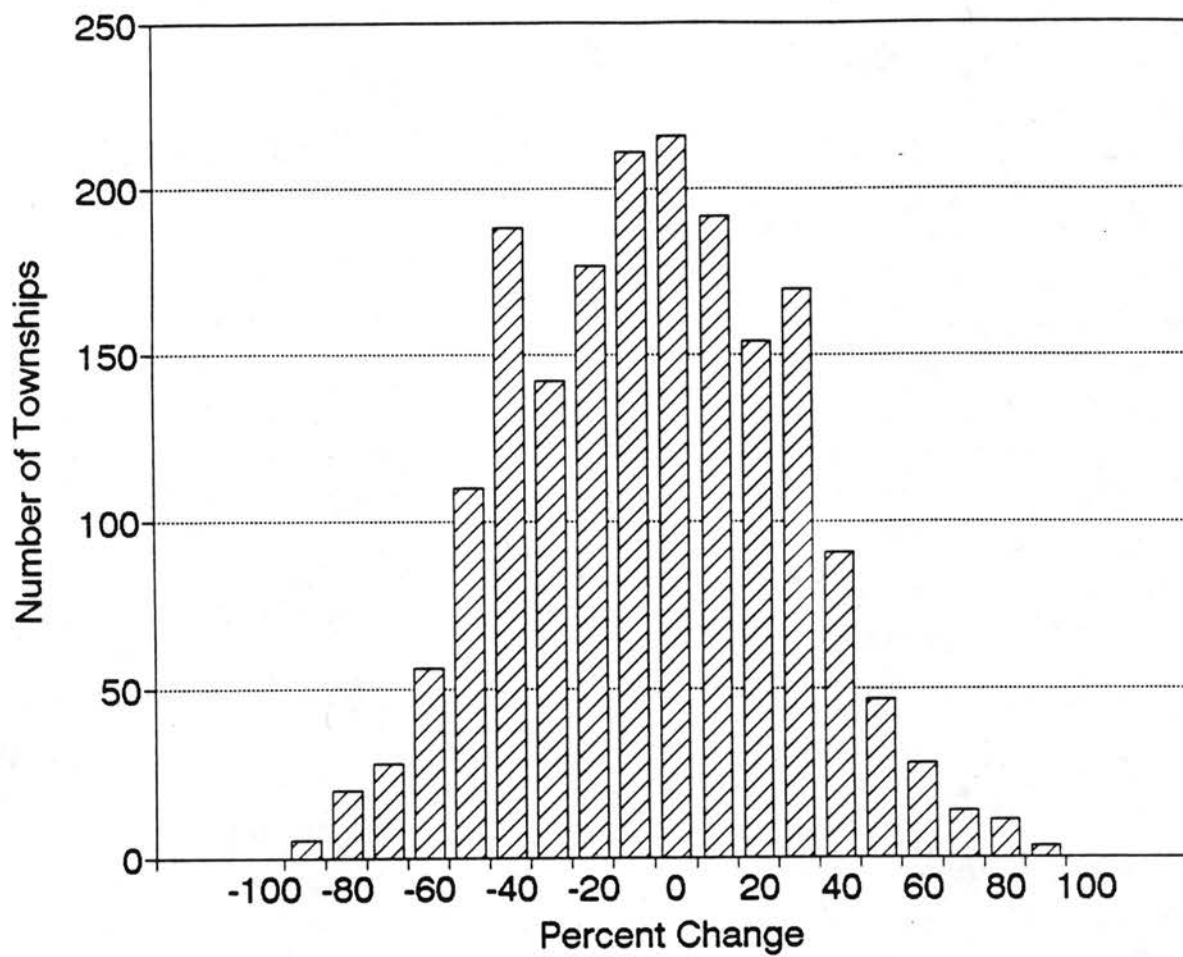
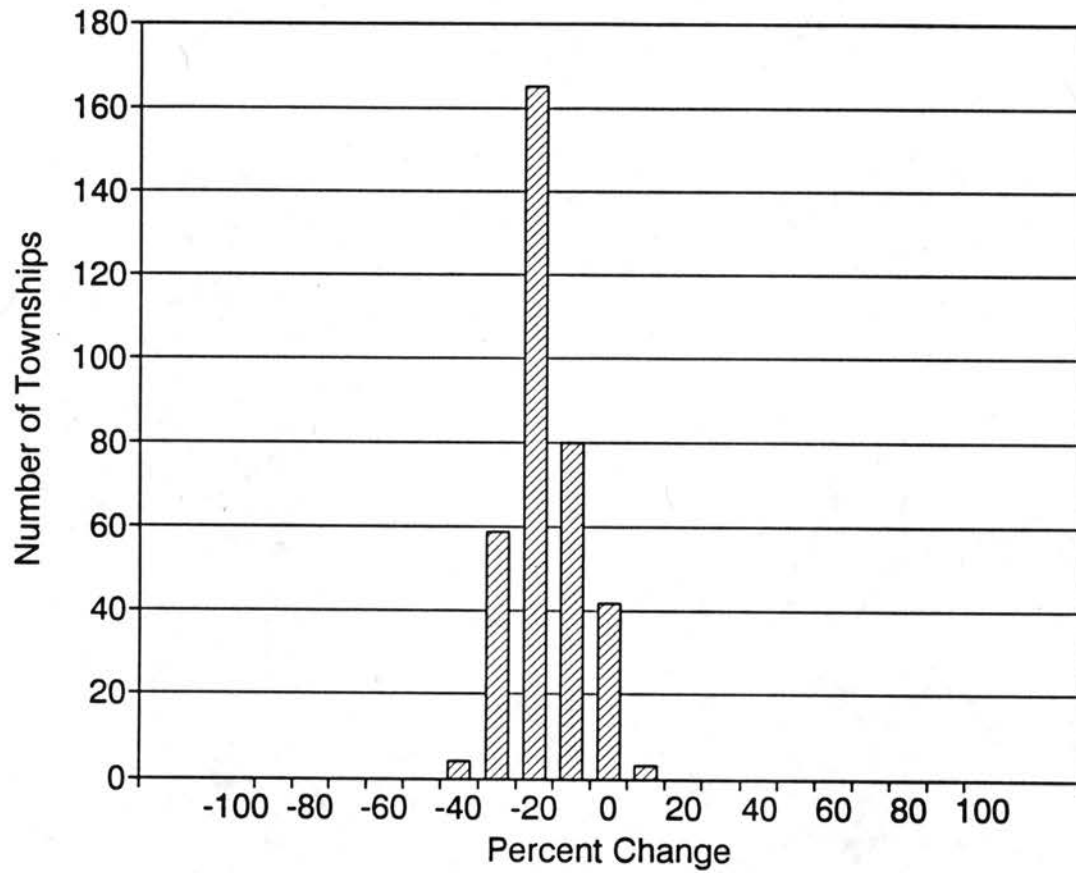


Figure 2: Distribution of Changes in Estimated Market Value: 1986-1987:
Townships with 1987-1989 RIM Easements



Reduction in Limited Term Easements

There was a significant shift in RIM payment rates and enrollment distribution following the 1986 sign-up. Payments were thenceforth severed from CRP rental rates, and overall sign-up dropped precipitously, with more interest shown in perpetual easements. Several reasons might explain this drop.

a) The duration of the limited term easement was increased to twenty years. This presumably dampened the interest of potential sellers who found the new term too long. These either shifted to the permanent easement option or opted out entirely. No available data either confirms or refutes this contention.

b) The Legislature allocated much less overall RIM financial support to 1987 and succeeding sign-ups and directed that permanent easements be stressed by local program managers. Combined, these actions greatly reduced the amount of money available for limited-term easements.

c) With the heavy participation by Minnesota farmers in the CRP and in the 1986 RIM sign-up, there was inevitably a reduction in the amount of crop land even eligible for RIM, let alone owned by an interested farmer.

d) The shift in payment bases from CRP to market or rent values dramatically reduced RIM limited-term payment offers in many localities from the 1986 round, as Table 20 showed. Where the payment dropped, interest in RIM may to have dropped as well.

Practice Payments

The RIM Reserve permits other agencies and organizations to participate in cost-sharing for conservation practices. Table 17 shows that such outside assistance is highest (in dollar terms) in the restoration of wetlands and in planting of trees and shrubs. Overall, the

RIM program pays 83.8% of the establishment costs, and the landowner puts in another 8%. Most of the outside funding came from the Minnesota Department of Natural Resources (Table 18).

To generate Table 17, data set structure required that the RIM share be calculated as the residual of estimated total costs minus the amount paid by the landowner and by other parties. (For those easements on which estimated costs do not exceed the reported payment limit for RIM, simple aggregations greatly overstate RIM contributions.) The results are not exactly precise because in some few cases, the reported payments by other parties exceeded the estimated costs. In those instances, the relative shares are calculated on the basis of non-RIM contributions, and the RIM share is set to zero.

CRP Competition

In the eyes of many landowners the CRP and RIM Reserve are said to compete with each other. Assume that a particular parcel is eligible for either program. If CRP entry is selected, for whatever reason, then there is a smaller pool of RIM eligible land remaining. If this tightening of potential RIM supply reduces RIM entry then the competition can be considered "effective." Why might the CRP be selected? Presumably landowners decide that they're better off with the ten annual federal payments than with the one-time state payment. To what extent is this the case?

Because RIM and CRP are paid on different bases, a common monetary measure must be found so that the two payment schemes can be compared. One could calculate either the annual rental equivalent of the one-time RIM payment or find the present value of the annual CRP rents. We employ the first procedure in what follows. (Any such direct comparison risks the

Table 17: Cost Sharing for RIM Easement Conservation Practices:
State: 1986 - May 1, 1989

<u>Practice</u>	<u>Total Cost (dollars)</u>	<u>Established Payments (Percent)</u>		
		<u>Landowner</u>	<u>RIM</u>	<u>Others</u>
Donated	100	100.0	--	--
Introduced Grasses	1,280,625	4.4	95.2	0.4
Already Est. Trees/Shrubs	75	--	100.0	--
Living Snowfence	14,249	1.6	89.9	8.5
Shallow Water	4,100	17.7	9.7	72.6
Native Grasses	504,147	6.5	89.3	4.2
Trees/Shrubs	547,576	13.6	76.7	9.7
Field Windbreak	42,838	19.1	56.7	24.2
Diversion	2,375	--	42.9	57.1
Grass Waterway	4,160	27.6	8.2	64.2
Wetland Restoration	271,484	4.0	50.6	45.4
Already Est. Cover	108,478	20.5	79.5	--
Wildlife Food Plot	21,079	64.7	--	35.3
Temporary Cover	<u>17,763</u>	<u>16.0</u>	<u>82.0</u>	<u>2.0</u>
	\$2,819,049	8.0	83.8	8.2

Table 18: Sources of Non-RIM Establishment Cost Shares: All Practices:
State: 1986 - May 1, 1989

<u>Source</u>	<u>Payments (Dollars)</u>
USDA Agricultural Conservation and Stabilization Service	48,398
Dept. of Natural Resources	225,908
Minnesota Waterfowl Association	5,580
Pheasants Forever	33,406
U.S. Fish and Wildlife Service	16,000
Others	<u>14,183</u>
	\$229,760

implication that the rights acquired under the two programs are equivalent. This is clearly not the case in actuality; the CRP and the RIM Reserve are increasingly different programs, both with respect to program goals and to the property rights acquired. It is also evident that a one-time up-front payment is more certain than is the contractual promise of a stream of future annual payments.)

Either comparison technique requires the use of some discount rate. The higher the discount rate chosen for analysis, the higher will be the revealed RIM annual equivalent and the lower will be the present value of the annual CRP rent. The appropriate rate for RIM is clearly spelled out in regulations (7%), but no rate is self-evident for the CRP.

One way to portray the financial choice facing landowners with parcels eligible for both programs is to calculate an "annuity equivalent" of the lump-sum RIM payment. We want to find an annuity (an annual payment) that, if continually invested at i percent each year, will provide the same amount of money at the end of the n -year contract period as would the lump-sum RIM payment, if invested at the same i percent for the duration of the contract. (This is formally equivalent to comparing the present value of an annuity to the initial RIM payment.)

Table 19 shows the annuity equivalents of each SWCD's average 1987-88 RIM payment offers for perpetual easements (at 7%) in comparison to CRP maximum acceptable rental rates for the same enrollment periods. (Actual CRP payments averaged slightly less than the county MARRs (Taff, 1990). Landowners' personal discount rates of course may differ from the 7% used here.) Nearly all districts show a higher MARR than RIM annuity equivalent. The strongly urban Ramsey and Hennepin districts are notable

Table 19: SWCD Average Estimated Market Values, CRP Maximum Acceptable Rental Rates, and RIM Perpetual Easement Annuity Equivalents: 1988

<u>SWCD</u>	<u>Ave. EMV</u>	<u>CRP MARR</u>	<u>Annuity Equivalent</u>
Aitkin	201.66	20.00	17.14
Anoka	521.53	45.00	44.32
Becker	292.30	45.00	24.84
Beltrami	161.88	20.00	13.76
Benton	404.42	45.00	34.37
Big Stone	373.88	55.00	31.77
Blue Earth	731.92	85.00	62.20
Brown	745.09	85.00	63.32
Carlton	201.45	20.00	17.12
Carver	830.21	70.00	70.56
Cass	155.73	20.00	13.23
Chippewa	564.81	70.00	48.00
Chisago	434.03	45.00	36.89
Clay	492.39	55.00	41.85
Clearwater	171.50	20.00	14.58
Cook	309.14	20.00	26.27
Cottonwood	638.67	85.00	54.28
Crow Wing	235.37	20.00	20.00
Dakota	627.44	80.00	53.32
Dodge	608.83	85.00	51.74
Douglas	365.98	50.00	31.10
East Agassiz (Norman)	447.36	55.00	38.02
East Ottertail	296.25	45.00	25.18
East Polk	450.26	45.00	38.27
Faribault	793.74	85.00	67.46
Fillmore	339.62	80.00	28.86
Freeborn	576.25	85.00	48.97
Goodhue	620.95	80.00	52.77
Grant	479.67	55.00	40.77
Hennepin	1,036.31	50.00	88.07
Hubbard	206.38	20.00	17.54
Isanti	345.96	45.00	29.40
Itasca	209.76	20.00	17.83
Jackson	713.05	85.00	60.60
Kanabec	244.19	45.00	20.75
Kandiyohi	537.28	70.00	45.66
Kittson	339.12	44.00	28.82
Koochiching	117.18	20.00	9.96
Lac Qui Parle	436.52	70.00	37.10
Lake	129.55	20.00	11.01
Lake of the Woods	150.63	20.00	12.80
Le Sueur	625.54	85.00	53.16
Lincoln	321.68	70.00	27.34
Lyon	509.79	70.00	43.32
Mahnomen	290.65	45.00	24.70
Marshall	318.16	44.00	27.04

(continued)

Table 19: SWCD Average Estimated Market Values, CRP Maximum Acceptable Rental Rates, and RIM Perpetual Easement Annuity Equivalents: 1988

<u>SWCD</u>	<u>Ave. EMV</u>	<u>CRP MARR</u>	<u>Annuity Equivalent</u>
Marshall Beltrami (Beltrami)	161.88	20.00	13.76
Marshall Beltrami (Marshall)	318.16	44.00	27.04
Martin	816.03	85.00	69.35
McLeod	585.23	70.00	49.74
Meeker	528.00	70.00	44.87
Mille Lacs	304.10	45.00	25.84
Morrison	258.98	45.00	22.01
Mower	526.59	85.00	44.75
Murray	519.44	70.00	44.15
Nicollet	722.75	85.00	61.42
Nobles	553.30	70.00	47.02
North St. Louis	133.68	20.00	11.36
Olmsted	512.43	80.00	43.55
Pennington	205.35	44.00	17.45
Pine	210.13	20.00	17.86
Pipestone	390.21	70.00	33.16
Pope	347.49	50.00	29.53
Ramsey	2,045.10	50.00	173.80
Red Lake	223.17	44.00	18.97
Redwood	700.15	85.00	59.50
Renville	681.00	85.00	57.88
Rice	638.48	85.00	54.26
Rock	524.58	70.00	44.58
Root River (Houston)	303.07	80.00	25.76
Roseau	193.39	44.00	16.44
Scott	846.54	70.00	71.94
Sherburne	422.01	45.00	35.86
Sibley	625.72	85.00	53.18
South St. Louis	133.68	20.00	11.36
Stearns	408.64	50.00	34.73
Steele	669.99	85.00	56.94
Stevens	493.16	55.00	41.91
Swift	434.75	55.00	36.95
Todd	251.06	45.00	21.34
Traverse	505.67	55.00	42.97
Wabasha	378.23	80.00	32.14
Wadena	180.53	20.00	15.34
Waseca	777.32	85.00	66.06
Washington	877.82	50.00	74.60
Watsonwan	771.06	85.00	65.53
West Ottertail	296.25	55.00	25.18
West Polk	450.26	55.00	38.27
Wilkin	566.35	55.00	48.13
Winona	407.60	80.00	34.64
Wright	656.90	50.00	55.83
Yellow Medicine	509.37	70.00	43.29

exceptions. The RIM Reserve, measured this way, clearly cannot compete on price with the CRP.

Another way to characterize inter-program competition is the way in which CRP affects people's perceptions of the going rate for land retirement. It was the original intent of RIM Reserve program designers not to try to compete with the then-new CRP. Rather, initial RIM payment rates were set so that if a landowner had a choice between the two programs (by virtue of equally eligible land), and if the decision was to be made strictly on the basis of price, then the owner would choose to enter the federal program. In that way, scarce state dollars would be husbanded. The downside to this line of reasoning is now apparent. By essentially fixing annual CRP rental rates at the maximum acceptable rental rate and by its large presence in most counties, the CRP has established a new market value: the annual rental rate for retiring marginal land from crop production for a specified period. If the RIM Reserve is thought to pay substantially less than this amount, then landowners might decide not to enter the Reserve, even if they weren't eligible for the CRP, because they feel that RIM offers weren't up to the market rate.

Alternative Mechanisms

Lacking a ready market for cropping rights on agricultural land, program administrators have sought proxies to the unknown reservation price at which land owners would be willing to sell RIM easements. To date, three procedures have been employed: a fixed proportion of federal Conservation Reserve Program enrollment "bids", capitalized local cash rental rates, and varying proportions of local average estimated agricultural land values. What is sought is a payment scheme that

accomplishes public purposes at the lowest possible outlay, including administration expenditures.

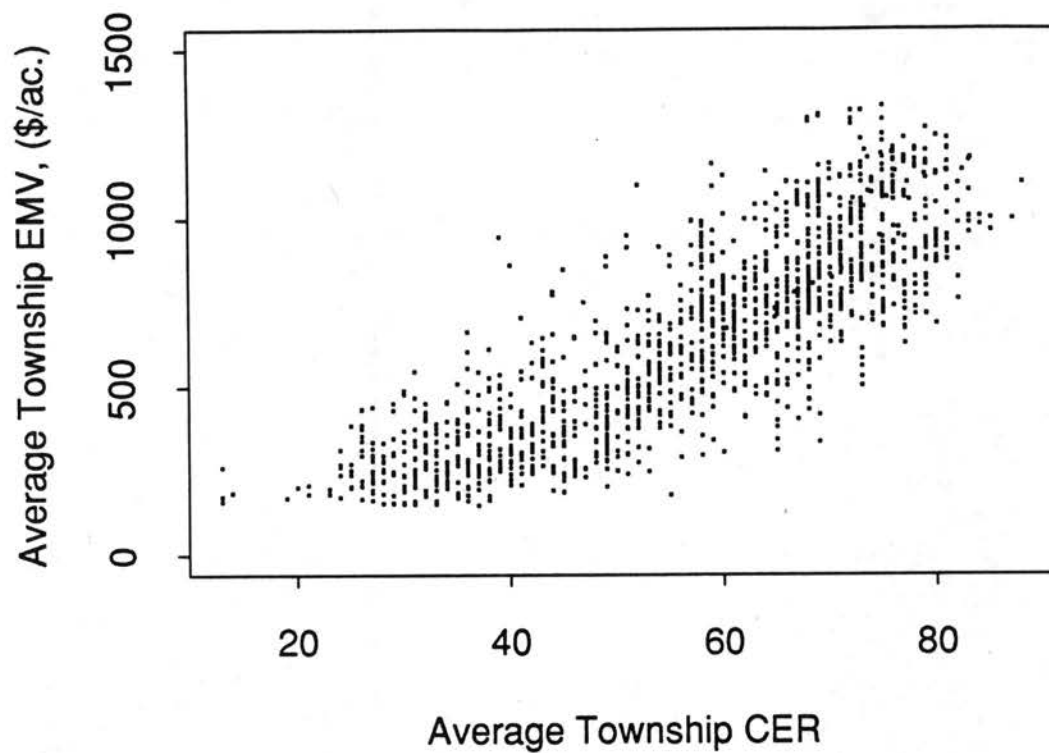
Increasingly, RIM payments are based on average local land values as determined at the township level by county assessors for property tax purposes. Is this mechanism consistent with the need for RIM to pay for a specified set of property rights on a varying set of land parcels?

Two determinations are necessary, in no particular order, if neither bidding nor direct appraisal (discussed below) is to be used. The first is the proportion of fee-simple parcel value reflected in the set of rights acquired. Program administrators have set 90% as the proper ratio for most perpetual RIM easements and 65% of that 90%, for most limited term (twenty year) easements.

The second is the determination of the full value of the parcel itself. RIM program administrators have largely settled upon the average estimated market value of all tillable land in the township for this figure. The EMV value series has the advantage of being widely accepted and widely available. It is likely a high-side estimate of the monetary value of RIM-eligible lands, since they are generally thought to be "marginal" (erosive, wet, low in productivity, or hilly) in some sense. However, many drained wetlands, sensitive groundwater areas, or riparian lands are in no sense marginal with respect to productivity.

The estimated market values used as the basis for RIM payments reflect land productivity as measured by crop equivalent ratings (CERs). (See Rust, 1984). Figure 3 plots each of 1,401 townships' 1987 EMVs by their calculated CERs (Smith, 1990). The linear fit is reasonably close, ($R^2 = .705$). Basing RIM payments on EMVs, therefore, is tantamount to basing them upon productivity. However, given the current township-level payment

Figure 3: Scatterplot of Average Cropland Estimated Market Values and Average Crop Equivalence Ratings by Township: State: 1987



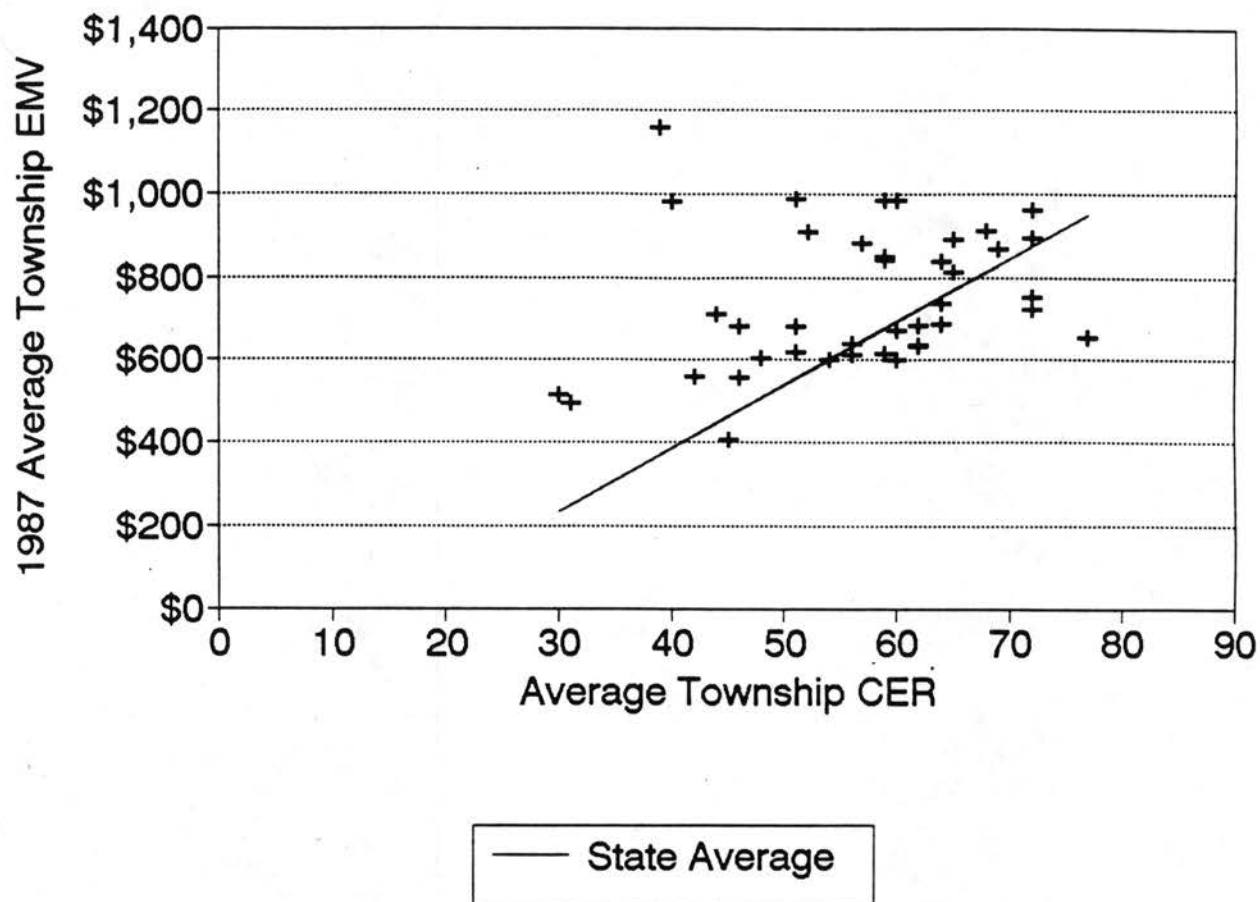
series employed, less productive lands receive the same payment as do more productive lands within the same township. (The public environmental benefit achieved by retiring any particular parcel is presumably independent of the agricultural productivity of the parcel.)

Productivity indices can be expected to be less tied to market values in areas subject to substantial non-agricultural development pressure. For example, Figure 4 shows the EMV/CER relationship in the seven-county Twin Cities metropolitan area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties). The linear relationship is far less direct ($R^2=0.07$) than it was for the state as a whole. In these areas, an EMV-based RIM will generally "overpay" for easements compared to values based strictly upon productivity. (Overpayment in this sense is suggested by points above the state average line, which itself is the best linear predictor of the relationship shown in Fig. 3).

If RIM payments could more closely approximate landowner reservation prices, program cost effectiveness would of course be enhanced. "Overpayments" would be avoided, and the resulting savings could go toward additional enrollments. This is easier said than done.

Three mechanisms might achieve a better matching. The first is direct appraisal. RIM program managers could first decide which parcels in a locality would--if retired--provide maximum public benefits. Each such parcel could be professionally appraised for the appropriate RIM easement offer price. Alternatively, RIM parcels could be screened from a pool of interested owners, and the selected parcels could then be appraised. In either case, landowners might or might not agree to the appraised price.

Figure 4: Scatterplot of Average Cropland Estimated Market Values and Average Crop Equivalent Ratings by Township: Seven Metro Counties



The current procedure has the advantage that parcel landowners know the offered price before they submit their names, so the likelihood of their entry once selected is presumably high. Appraisal schemes might result in lower easement acquisition payments, but they may have associated with them considerable administrative expenses. Direct appraisal systems used in other state programs consistently show a 12-18 month processing delay.

A second possible way to better match RIM payments to landowner reservation prices is through competitive bidding. In theory at least, a well-constructed bidding mechanism would provide the incentive for landowners to bid nearer their true reservation price. RIM program managers could then take the lowest bids (for otherwise equally desirable parcels) or could select the most desirable parcels, secure in the knowledge that the bid price would be the most cost-effective from the government's point of view. Unfortunately, practical bidding schemes for such purposes have yet to be developed, although they are under examination at the University of Minnesota's Department of Agricultural and Applied Economics. Schemes proposed to date suffer from exposure to strategic behavior, administrative complexity, or sheer impracticality.

A third mechanism might be to pay a fixed percentage of each farm's or even each parcel's estimated market value. These figures are collected annually by county assessors and would presumably better match "real" property values than do the presently-used township averages. The procedure would not be without its problems, however. Many assessors report only their whole-farm estimated values, not their field-by-field figures. Too, landowners would face the interesting incentive to seek a

higher assessment for their property, at least in the year prior to easement sale.

In our judgement, if surrogate cropping rights values are to be used, lower administrative costs and "truer" market values favor use of EMVs over other productivity indicators, including cash rent. (This is what program administrators have done, starting in 1990.) If the state had paid only on an EMV basis from 1987 through 1989, it would have had to pay \$36,000 more for the 20 year easements and \$548,000 more for the perpetual easements than was actually spent on the mixed rent\SMV system (Table 20). This "overpayment" might be thought of as the "cost" of switching earlier to an all-EMV payment section. These calculations assume that all entrants who entered under on a rent-based payment would also have entered under a higher EMV-based figure, and vice versa. Also assumed is that the hypothetical schemes would pay on the basis of 1986 rents or values, as was actually the case.

Section Summary

In this section we examined the RIM payment experience to date and showed the increasing emphasis on EMVs as proxies for unknown cropping rights prices. Our study did not determine whether or not these payments, as made, exceeded sellers' reservation prices. This can be determined only by establishing a market for rights such as those acquired by the State under a RIM easement or by setting up a conceptually sound and administratively practical bidding system. The administrative costs of switching to such systems may outweigh the cost-effectiveness gains thereby achieved.

Table 20: Actual, Hypothetical EMV-Based, and Hypothetical Rent-Based
Total RIM Payments: State 1987-1989.

	Easement <u>Acres</u>	<u>Payments (\$000)</u>		
		<u>Actual</u>	<u>EMV-Based</u>	<u>Rent-Based</u>
Limited-Term	2,928	1,128	1,164	1,410
Perpetual	9,321	5,758	6,306	7,708

Any proposal to make the current RIM payment determination and parcel selection process more cost-effective must be carefully examined to determine the costs and benefits of moving to a new system. In many cases, the costs of acquiring the necessary information may outweigh the advantages of more carefully matching public expenditures and public benefits.

Given the RIM Reserve program's present modest funding level, the most straightforward and publicly acceptable price determination mechanism is probably the present system of offers based on pre-established proportions of current published township average estimated market values.

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Appendix A:

Summaries of Easement Data by SWCD

Table A1: Number of RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part A
(Percent of all Contracts in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Aitkin	6 66.67	1 11.11	2 22.22	0 0.00	0 0.00	0 0.00
Anoka	1 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Becker	13 81.25	1 6.25	1 6.25	0 0.00	1 6.25	0 0.00
Beltrami	6 46.15	3 23.08	4 30.77	0 0.00	0 0.00	0 0.00
Benton	18 75.00	1 4.17	2 8.33	1 4.17	0 0.00	0 0.00
Big Stone	2 22.22	3 33.33	3 33.33	1 11.11	0 0.00	0 0.00
Blue Earth	9 69.23	1 7.69	3 23.08	0 0.00	0 0.00	0 0.00
Brown	8 36.36	3 13.64	8 36.36	1 4.55	0 0.00	0 0.00
Carver	4 23.53	2 11.76	10 58.82	1 5.88	0 0.00	0 0.00
Cass	0 0.00	1 100.00	0 0.00	0 0.00	0 0.00	0 0.00
Chippewa	6 66.67	0 0.00	2 22.22	1 11.11	0 0.00	0 0.00
Chisago	23 95.83	1 4.17	0 0.00	0 0.00	0 0.00	0 0.00
Clay	12 46.15	3 11.54	11 42.31	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A1: Number of RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part A
(Percent of all Contracts in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Clearwater	2 33.33	4 66.67	0 0.00	0 0.00	0 0.00	0 0.00
Cottonwood	4 12.12	7 21.21	13 39.39	1 3.03	0 0.00	0 0.00
Dakota	13 81.25	3 18.75	0 0.00	0 0.00	0 0.00	0 0.00
Dodge	3 75.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Douglas	11 44.00	4 16.00	3 12.00	7 28.00	0 0.00	0 0.00
E. Agassi (Norman)	12 60.00	1 5.00	5 25.00	1 5.00	0 0.00	0 0.00
East Ottertail	35 87.50	1 2.50	3 7.50	1 2.50	0 0.00	0 0.00
East Polk	27 90.00	3 10.00	0 0.00	0 0.00	0 0.00	0 0.00
Faribault	0 0.00	1 5.56	8 44.44	8 44.44	0 0.00	0 0.00
Fillmore	22 91.67	0 0.00	2 8.33	0 0.00	0 0.00	0 0.00
Freeborn	14 60.87	2 8.70	4 17.39	3 13.04	0 0.00	0 0.00
Goodhue	24 82.93	12 7.32	5 9.76	0 0.00	0 0.00	0 0.00
Itasca	1 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Jackson	9 56.25	0 0.00	2 12.50	4 25.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A1: Number of RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part A
(Percent of all Contracts in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Kanabec	2 66.67	0 0.00	1 33.33	0 0.00	0 0.00	0 0.00
Kandiyohi	21 63.64	1 3.03	3 9.09	8 24.24	0 0.00	0 0.00
Lake of the Woods	5 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Le Sueur	11 57.89	7 36.84	1 5.26	0 0.00	0 0.00	0 0.00
Lincoln	7 63.64	0 0.00	2 18.18	2 18.18	0 0.00	0 0.00
Lyon	3 30.00	0 0.00	5 50.00	1 10.00	0 0.00	0 0.00
Mahnomen	3 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Marshall	12 85.71	0 0.00	2 14.29	0 0.00	0 0.00	0 0.00
Marshall Beltrami	3 60.00	1 20.00	1 20.00	0 0.00	0 0.00	0 0.00
Martin	8 34.78	7 30.43	5 21.74	1 4.35	0 0.00	0 0.00
McLeod	9 29.03	6 19.35	11 35.48	5 16.13	0 0.00	0 0.00
Meeker	14 48.28	1 3.45	9 31.03	2 6.90	2 6.90	0 0.00
Mille Lacs	6 42.86	4 28.57	4 28.57	0 0.00	0 0.00	0 0.00
Morrison	21 50.00	1 2.38	11 26.19	2 4.76	1 2.38	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A1: Number of RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part A
(Percent of all Contracts in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Mower	2 20.00	2 20.00	2 20.00	0 0.00	0 0.00	1 10.00
Murray	6 37.50	0 0.00	5 31.25	4 25.00	0 0.00	0 0.00
Nicollet	5 62.50	2 25.00	1 12.50	0 0.00	0 0.00	0 0.00
Nobles	2 66.67	0 0.00	1 33.33	0 0.00	0 0.00	0 0.00
North St. Louis	2 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Olmsted	10 76.92	0 0.00	2 15.38	0 0.00	0 0.00	0 0.00
Pennington	7 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Pine	1 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Pipestone	0 0.00	0 0.00	2 50.00	1 25.00	0 0.00	0 0.00
Pope	8 32.00	3 12.00	10 40.00	3 12.00	0 0.00	0 0.00
Red Lake	5 62.50	1 12.50	1 12.50	1 12.50	0 0.00	0 0.00
Redwood	0 0.00	0 0.00	21 72.41	5 17.24	0 0.00	0 0.00
Renville	4 6.45	19 30.65	25 40.32	6 9.68	1 1.61	0 0.00
Rice	16 69.57	2 8.70	2 8.70	3 13.04	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A1: Number of RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part A
(Percent of all Contracts in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Rock	1 33.33	2 66.67	0 0.00	0 0.00	0 0.00	0 0.00
Root River (Houston)	16 84.21	2 10.53	0 0.00	0 0.00	0 0.00	0 0.00
Roseau	12 92.31	0 0.00	1 7.69	0 0.00	0 0.00	0 0.00
Scott	13 37.14	2 5.71	20 57.14	0 0.00	0 0.00	0 0.00
Sherburne	23 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Sibley	7 17.95	7 17.95	20 51.28	5 12.82	0 0.00	0 0.00
Stearns	30 93.75	1 3.12	1 3.12	0 0.00	0 0.00	0 0.00
Steele	7 58.33	2 16.67	3 25.00	0 0.00	0 0.00	0 0.00
Stevens	2 9.09	0 0.00	14 63.64	2 9.09	0 0.00	1 4.55
Swift	6 28.57	1 4.76	12 57.14	1 4.76	0 0.00	0 0.00
Todd	10 83.33	1 8.33	1 8.33	0 0.00	0 0.00	0 0.00
Traverse	1 20.00	0 0.00	2 40.00	2 40.00	0 0.00	0 0.00
West Ottertail	0 0.00	0 0.00	1 100.00	0 0.00	0 0.00	0 0.00
Wabasha	18 66.67	0 0.00	4 14.81	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A1: Number of RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part A
(Percent of all Contracts in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Wadena	10 47.62	11 52.38	0 0.00	0 0.00	0 0.00	0 0.00
Waseca	0 0.00	1 20.00	3 60.00	0 0.00	0 0.00	0 0.00
Washington	2 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Watonwan	10 90.91	1 9.09	0 0.00	0 0.00	0 0.00	0 0.00
Wilkin	5 71.43	0 0.00	2 28.57	0 0.00	0 0.00	0 0.00
Winona	16 88.89	2 11.11	0 0.00	0 0.00	0 0.00	0 0.00
Wright	15 45.45	3 9.09	11 33.33	2 6.06	0 0.00	0 0.00
Yellow Medicine	1 11.11	0 0.00	6 66.67	2 22.22	0 0.00	0 0.00
STATE TOTAL	737	156	334	89	5	2

(continued)

Table A1: Number or RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Aitkin	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9
Anoka	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1
Becker	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	16
Beltrami	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	13
Benton	0 0.00	2 8.33	0 0.00	0 0.00	0 0.00	0 0.00	24
Big Stone	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9
Blue Earth	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	13
Brown	2 9.09	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	22
Carver	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	17
Cass	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1
Chippewa	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9
Chisago	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	24
Clay	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	26
Clearwater	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	6

Note: See Chart 1 Type Key

(continued)

Table A1: Number or RIM Reserve Easements by SWCD by Easement Type:
1986-May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Cook	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1
Cottonwood	1 3.03	0 0.00	1 3.03	0 0.00	3 9.09	3 9.09	33
Dakota	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	16
Dodge	1 25.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	4
Douglas	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	25
E. Agassiz (Norman)	1 5.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	20
East Ottertail	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	40
East Polk	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	30
Faribault	0 0.00	1 5.56	0 0.00	0 0.00	0 0.00	0 0.00	18
Fillmore	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	24
Freeborn	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	23
Goodhue	0 0.00	1 2.27	0 0.00	1 2.27	1 2.27	0 0.00	44
Grant	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	6
Hennepin	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2

Note: See Chart 1 Type Key

(continued)

Table A1: Number or RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1,1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Hubbard	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	4
Isanti	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	41
Itasca	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1
Jackson	0 0.00	0 0.00	0 0.00	1 6.25	0 0.00	0 0.00	16
Kanabec	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	3
Kandiyohi	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	33
Kittson	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	12
Lac Qui Parle	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9
Lake of the Woods	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	5
Le Sueur	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	19
Lincoln	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	11
Lyon	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 10.00	10
Mahnomen	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	3
Marshall	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	14

Note: See Chart 1 Type Key

(continued)

Table A1: Number or RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Marshall Beltrami	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	5
Martin	1 4.35	1 4.35	0 0.00	0 0.00	0 0.00	0 0.00	23
McLeod	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	31
Meeker	1 3.45	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	29
Mille Lacs	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	14
Morrison	0 0.00	2 4.76	0 0.00	0 0.00	1 2.38	3 7.14	42
Mower	3 30.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	10
Murray	0 0.00	0 0.00	0 0.00	0 0.00	1 6.25	0 0.00	16
Nicollet	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	8
Nobles	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	3
North St. Louis	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2
Olmsted	0 0.00	0 0.00	0 0.00	1 7.69	0 0.00	0 0.00	13
Pennington	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	7
Pine	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1

Note: See Chart 1 Type Key

(continued)

Table A1: Number or RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Pipestone	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 25.00	4
Pope	1 4.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	25
Red Lake	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	8
Redwood	3 10.34	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	29
Renville	7 11.29	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	62
Rice	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	23
Rock	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	3
Root River (Houston)	0 0.00	0 0.00	0 0.00	0 0.00	1 5.26	0 0.00	19
Roseau	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	13
Scott	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	35
Sherburne	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	23
Sibley	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	39
Stearns	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	32
Steele	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	12

Note: See Chart 1 Type Key

(continued)

Table A1: Number or RIM Reserve Easements by SWCD by Easement Type:
1986 - May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Stevens	1 4.55	0 0.00	1 4.55	1 4.55	0 0.00	0 0.00	22
Swift	1 4.76	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	21
Todd	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	12
Traverse	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	5
West Ottertail	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1
Wabasha	0 0.00	0 0.00	0 0.00	0 0.00	5 18.52	0 0.00	27
Wadena	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	21
Waseca	0 0.00	0 0.00	0 0.00	1 20.00	0 0.00	0 0.00	5
Washington	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2
Watsonwan	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	11
Wilkin	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	7
Winona	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	18
Wright	0 0.00	0 0.00	1 3.03	0 0.00	1 3.03	0 0.00	33
Yellow Medicine	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9
STATE TOTAL	23	7	3	5	13	8	1,382

Table A2: RIM Reserve Easement Acreage by SWCD by Easement Type: 1986 - May 1, 1989: Part A (Percent of All RIM Acreage in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Aitkin	197.6 72.01	20.4 7.43	56.4 20.55	0 0.00	0 0.00	0 0.00
Anoka	22.4 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Becker	365.8 87.07	15.6 3.71	24.1 5.74	0 0.00	14.6 3.48	0 0.00
Beltrami	96 48.24	38.8 19.50	64.2 32.26	0 0.00	0 0.00	0 0.00
Benton	438.1 73.25	43 7.19	18.9 3.16	65 10.87	0 0.00	0 0.00
Big Stone	62 28.82	80.9 37.61	37.6 17.48	34.6 16.09	0 0.00	0 0.00
Blue Earth	123.6 70.43	14.3 8.15	37.6 21.42	0 0.00	0 0.00	0 0.00
Brown	118.1 28.05	61.4 14.58	141.9 33.71	19.1 4.54	0 0.00	0 0.00
Carver	72.6 24.08	32.6 10.81	190.2 63.08	6.1 2.02	0 0.00	0 0.00
Cass	0 0.00	20 100.00	0 0.00	0 0.00	0 0.00	0 0.00
Chippewa	74.8 45.83	0 0.00	19.7 12.07	68.7 42.10	0 0.00	0 0.00
Chisago	336.1 94.38	20 5.62	0 0.00	0 0.00	0 0.00	0 0.00
Clay	447.2 43.15	18.5 1.79	570.6 55.06	0 0.00	0 0.00	0 0.00
Clearwater	226.4 58.61	159.9 41.39	0 0.00	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Reserve Easement Acreage by SWCD by Easement Type: 1986 - May 1,
1989: Part A (Percent of All RIM Acreage in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Cook	5.7 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Cottonwood	101.8 14.86	169.6 24.76	267.2 39.01	41.6 6.07	0 0.00	0 0.00
Dakota	322.9 89.22	39 10.78	0 0.00	0 0.00	0 0.00	0 0.00
Dodge	51.7 77.28	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Douglas	206.3 41.97	55 11.19	87 17.70	143.2 29.14	0 0.00	0 0.00
E. Agassiz (Norman)	451 64.31	70.6 10.07	132.6 18.91	42 5.99	0 0.00	0 0.00
East Ottertail	1068.8 86.45	22.6 1.83	114.4 9.25	30.5 2.47	0 0.00	0 0.00
East Polk	975.9 89.89	109.7 10.11	0 0.00	0 0.00	0 0.00	0 0.00
Faribault	0 0.00	41 7.92	201.8 38.98	248 47.90	0 0.00	0 0.00
Fillmore	391.7 97.20	0 0.00	11.3 2.80	0 0.00	0 0.00	0 0.00
Freeborn	217.6 65.78	10.5 3.17	72.3 21.86	30.4 9.19	0 0.00	0 0.00
Goodhue	412.2 64.09	137.9 21.44	57.8 8.99	0 0.00	0 0.00	0 0.00
Grant	0 0.00	0 0.00	196.4 90.76	20 9.24	0 0.00	0 0.00
Hennepin	0 0.00	20.7 100.00	0 0.00	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Reserve Easement Acreage by SWCD by Easement Type: 1986 - May 1, 1989: Part A (Percent of All RIM Acreage in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Hubbard	55.4 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Isanti	504 90.57	35.1 6.31	17.4 3.13	0 0.00	0 0.00	0 0.00
Itasca	25.6 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Jackson	96.2 38.51	0 0.00	16.7 6.69	105.4 42.19	0 0.00	0 0.00
Kanabec	44 79.28	0 0.00	11.5 20.72	0 0.00	0 0.00	0 0.00
Kandiyohi	445.3 65.62	23.7 3.49	37.7 5.56	171.9 25.33	0 0.00	0 0.00
Kittson	342.2 71.26	0 0.00	138 28.74	0 0.00	0 0.00	0 0.00
Lac Qui Parle	148.1 79.50	0 0.00	38.2 20.50	0 0.00	0 0.00	0 0.00
Lake of the Woods	92.6 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Le Sueur	248.1 69.11	91.9 25.60	19 5.29	0 0.00	0 0.00	0 0.00
Lincoln	148.7 60.18	0 0.00	52.4 21.21	46 18.62	0 0.00	0 0.00
Lyon	78.7 36.84	0 0.00	89.4 41.85	27.1 12.69	0 0.00	0 0.00
Mahnomen	56.7 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Marshall	511.7 90.57	0 0.00	53.3 9.43	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Reserve Easement Acreage by SWCD by Easement Type: 1986 - May 1, 1989: Part A (Percent of All RIM Acreage in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Marshall Beltrami	101.3 75.99	14.8 11.10	17.2 12.90	0 0.00	0 0.00	0 0.00
Martin	171.2 37.02	114 24.65	103.9 22.46	45.6 9.86	0 0.00	0 0.00
McLeod	106.2 21.60	76.3 15.52	140.2 28.51	169 34.37	0 0.00	0 0.00
Meeker	459.6 56.71	5 0.62	175.3 21.63	69 8.51	86 10.61	0 0.00
Mille Lacs	56.2 34.25	34.1 20.78	73.8 44.97	0 0.00	0 0.00	0 0.00
Morrison	462.8 54.20	12.9 1.51	129.2 15.13	59.4 6.96	51 5.97	0 0.00
Mower	36.7 20.16	48.2 26.48	41.3 22.69	0 0.00	0 0.00	6.2 3.41
Murray	109.2 31.13	0 0.00	115.6 32.95	72 20.52	0 0.00	0 0.00
Nicollet	85.2 68.71	8.6 6.94	30.2 24.35	0 0.00	0 0.00	0 0.00
Nobles	28 41.79	0 0.00	39 58.21	0 0.00	0 0.00	0 0.00
North St. Louis	44 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Olmsted	195 85.90	0 0.00	7.3 3.22	0 0.00	0 0.00	0 0.00
Pennington	209.9 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Pine	67 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Reserve Easement Acreage by SWCD by Easement Type: 1986 - May 1, 1989: Part A (Percent of All RIM Acreage in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Pipestone	0 0.00	0 0.00	35.3 65.74	9 16.76	0 0.00	0 0.00
Pope	125.4 16.46	64.4 8.45	425.5 55.85	132.7 17.42	0 0.00	0 0.00
Red Lake	197.9 60.04	6.5 1.97	5.2 1.58	120 36.41	0 0.00	0 0.00
Redwood	0 0.00	0 0.00	541.8 68.81	160.8 20.42	0 0.00	0 0.00
Renville	87.8 5.96	408.4 27.71	512.9 34.80	261.8 17.76	37.2 2.52	0 0.00
Rice	202.6 61.41	36.9 11.19	46 13.94	44.4 13.46	0 0.00	0 0.00
Rock	8 31.37	17.5 68.63	0 0.00	0 0.00	0 0.00	0 0.00
Root River (Houston)	402.5 85.46	12.5 2.65	0 0.00	0 0.00	0 0.00	0 0.00
Roseau	489.5 93.51	0 0.00	34 6.49	0 0.00	0 0.00	0 0.00
Scott	238.6 35.18	21.7 3.20	418 61.62	0 0.00	0 0.00	0 0.00
Sherburne	610 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Sibley	76.4 14.76	68.9 13.31	274.2 52.99	98 18.94	0 0.00	0 0.00
Stearns	583 96.08	6.2 1.02	17.6 2.90	0 0.00	0 0.00	0 0.00
Steele	155.5 63.65	19.1 7.82	69.7 28.53	0 0.00	0 0.00	0 0.00

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Reserve Easement Acreage by SWCD by Easement Type: 1986 - May 1, 1989: Part A (Percent of All RIM Acreage in SWCD on Second Line)

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Stevens	31.3 5.91	0 0.00	280.6 52.95	66 12.46	0 0.00	15 2.83
Swift	170.1 29.46	8.6 1.49	366 63.40	12 2.08	0 0.00	0 0.00
Todd	334.8 90.10	27.8 7.48	9 2.42	0 0.00	0 0.00	0 0.00
Traverse	50.6 37.40	0 0.00	26.6 19.66	58.1 42.94	0 0.00	0 0.00
West Ottertail	0 0.00	0 0.00	25 100.00	0 0.00	0 0.00	0 0.00
Wabasha	289.7 51.58	0 0.00	38 6.77	0 0.00	0 0.00	0 0.00
Wadena	249.7 57.35	185.7 42.65	0 0.00	0 0.00	0 0.00	0 0.00
Waseca	0 0.00	21 20.61	71.6 70.26	0 0.00	0 0.00	0 0.00
Washington	52.7 100.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Watonwan	115.4 94.44	6.8 5.56	0 0.00	0 0.00	0 0.00	0 0.00
Wilkin	117 52.94	0 0.00	104 47.06	0 0.00	0 0.00	0 0.00
Winona	162.9 91.47	15.2 8.53	0 0.00	0 0.00	0 0.00	0 0.00
Wright	228.5 38.47	59.1 9.95	247.3 41.64	46 7.75	0 0.00	0 0.00
Yellow Medicine	16 5.29	0 0.00	177.4 58.63	109.2 36.09	0 0.00	0 0.00
STATE TOTAL	16,712	2,653	7,374	2,632	184	21

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Easement Acreage by SWCD and by Easement Type: 1986 -
May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Aitkin	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	274.4
Anoka	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	22.4
Becker	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	420.1
Beltrami	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	199
Benton	0 0.00	33.1 5.53	0 0.00	0 0.00	0 0.00	0 0.00	598.1
Big Stone	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	215.1
Blue Earth	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	175.5
Brown	80.5 19.12	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	421
Carver	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	301.5
Cass	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	20
Chippewa	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	163.2
Chisago	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	356.1
Clay	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1036.3
Clearwater	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	386.3

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Easement Acreage by SWCD and by Easement Type: 1986 -
May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Cook	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	5.7
Cottonwood	3.9 0.57	0 0.00	24.9 3.64	0 0.00	64.3 9.39	11.6 1.69	684.9
Dakota	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	361.9
Dodge	15.2 22.72	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	66.9
Douglas	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	491.5
East Ottertail	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1236.3
East Polk	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1085.6
Faribault	0 0.00	26.9 5.20	0 0.00	0 0.00	0 0.00	0 0.00	517.7
Fillmore	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	403
Freeborn	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	330.8
Goodhue	0 0.00	7.9 1.23	0 0.00	17.4 2.71	10 1.55	0 0.00	643.2
Grant	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	216.4
Hennepin	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	20.7
Hubbard	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	55.4

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Easement Acreage by SWCD and by Easement Type: 1986 -
May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Isanti	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	556.5
Itasca	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	25.6
Jackson	0 0.00	0 0.00	0 0.00	31.5 12.61	0 0.00	0 0.00	249.8
Kanabec	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	55.5
Kandiyohi	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	678.6
Kittson	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	480.2
Lac Qui Parle	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	186.3
Lake of the Woods	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	92.6
Le Sueur	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	359
Lincoln	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	247.1
Lyon	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	18.4 8.61	213.6
Mahnomen	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	56.7
Marshall	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	565
Marshall Beltrami	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	133.3

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Easement Acreage by SWCD and by Easement Type: 1986 -
May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Martin	21.5 4.65	6.3 1.36	0 0.00	0 0.00	0 0.00	0 0.00	462.5
McLeod	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	491.7
Meeker	15.6 1.92	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	810.5
Mille Lacs	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	164.1
Morrison	0 0.00	54.5 6.38	0 0.00	0 0.00	51 5.97	33.1 3.88	853.9
Mower	49.6 27.25	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	182
Murray	0 0.00	0 0.00	0 0.00	0 0.00	54 15.39	0 0.00	350.8
Nicollet	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	124
Nobles	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	67
Norman	5.1 0.73	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	701.3
North St. Louis	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	44
Olmsted	0 0.00	0 0.00	0 0.00	24.7 10.88	0 0.00	0 0.00	227
Pennington	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	209.9
Pine	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	67

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Easement Acreage by SWCD and by Easement Type: 1986 -
May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Pipestone	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9.4 17.50	53.7
Pope	13.8 1.81	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	761.8
Red Lake	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	329.6
Redwood	84.8 10.77	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	787.4
Renville	165.8 11.25	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1473.9
Rice	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	329.9
Rock	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	25.5
Root River (Houston)	0 0.00	0 0.00	0 0.00	0 0.00	56 11.89	0 0.00	471
Roseau	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	523.5
Scott	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	678.3
Sherburne	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	610
Sibley	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	517.5
Stearns	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	606.8
Steele	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	244.3

Note: See Chart 1 Type Key

(continued)

Table A2: RIM Easement Acreage by SWCD and by Easement Type: 1986 -
May 1, 1989: Part B

SWCD	Easement Type						Total
	Riparian/ Perp.	Ground water/ 20 yr	Ground water/ Perp.	Hillside/ 20 yr	Hillside/ Perp.	Snow- fence	
Stevens	15 2.83	0 0.00	80 15.10	42 7.93	0 0.00	0 0.00	529.9
Swift	20.6 3.57	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	577.3
Todd	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	371.6
Traverse	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	135.3
West Ottertail	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	25
Wabasha	0 0.00	0 0.00	0 0.00	0 0.00	233.9 41.65	0 0.00	561.6
Wadena	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	435.4
Waseca	0 0.00	0 0.00	0 0.00	9.3 9.13	0 0.00	0 0.00	101.9
Washington	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	52.7
Watonwan	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	122.2
Wilkin	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	221
Winona	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	178.1
Wright	0 0.00	0 0.00	4.8 0.81	0 0.00	8.2 1.38	0 0.00	593.9
Yellow Medicine	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	302.6
Total	491	129	110	125	477	72	30,986

Note: See Chart 1 Type Key

Table A3: RIM Reserve Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989: Part A

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Aitkin	24898	1543.3	9117.8	0	0	0
Anoka	5510.4	0	0	0	0	0
Becker	99863	2255	5896.3	0	2387.3	0
Beltrami	10761	4069	8922.7	0	0	0
Benton	118646	10277	5623.6	11197	0	0
Big Stone	20584	27926	18813	11126	0	0
Blue Earth	64766	8463.2	38804	0	0	0
Brown	55306	37123	136430	22016	0	0
Carver	30347	18193	171008	4921.4	0	0
Cass	0	2494.6	0	0	0	0
Chippewa	32912	0	12893	50669	0	0
Chisago	90411	3848.4	0	0	0	0
Clay	146682	4299.6	268543	0	0	0
Clearwater	22415	20802	0	0	0	0
Cook	701.1	0	0	0	0	0
Cottonwood	47802	94850	244717	16525	0	0
Dakota	157575	15882	0	0	0	0
Dodge	24971	0	0	0	0	0
Douglas	62509	15805	36025	52851	0	0
E. Agassiz (Norman)	149217	12676	52783	14470	0	0
East Ottertail	299959	3523.6	48584	19347	0	0

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Reserve Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989: Part A

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
East Polk	278987	18639	0	0	0	0
Faribault	0	26503	187007	224106	0	0
Fillmore	180858	0	5575.1	0	0	0
Freeborn	112498	5394.1	75306	25438	0	0
Goodhue	194970	62355	42349	0	0	0
Grant	0	0	129265	14322	0	0
Hennepin	0	9014.8	0	0	0	0
Hubbard	6980.4	0	0	0	0	0
Isanti	131040	7390.7	5110.4	0	0	0
Itasca	3148.8	0	0	0	0	0
Jackson	50313	0	14954	94521	0	0
Kanabec	10736	0	3743.6	0	0	0
Kandiyohi	187026	7931.4	27100	136124	0	0
Kittson	93078	0	23175	0	0	0
Lac Qui Parle	63683	0	17715	0	0	0
Lake of the Woods	11575	0	0	0	0	0
Le Sueur	128516	45544	14996	0	0	0
Lincoln	62900	0	18297	19375	0	0
Lyon	33998	0	50087	10836	0	0
Mahnomen	15479	0	0	0	0	0
Marshall	135601	0	11880	0	0	0

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Reserve Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989: Part A

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Marshall Beltrami	24274	927.81	2370.2	0	0	0
Martin	88844	77579	98736	24412	0	0
McLeod	43223	38977	104256	127526	0	0
Meeker	192113	1642.3	106986	39337	65654	0
Mille Lacs	15372	9260.6	23361	0	0	0
Morrison	113849	2908.6	32287	16534	11958	0
Mower	18460	23652	28675	0	0	3401.3
Murray	46738	0	81713	38304	0	0
Nicollet	43196	5124.5	26470	0	0	0
Nobles	11620	0	32830	0	0	0
North St. Louis	5412	0	0	0	0	0
Olmsted	92820	0	4686.5	0	0	0
Pennington	56253	0	0	0	0	0
Pine	8241	0	0	0	0	0
Pipestone	0	0	15463	3337.7	0	0
Pope	38247	16578	189831	51957	0	0
Red Lake	51718	1109.2	1863.7	34260	0	0
Redwood	0	0	480431	122215	0	0
Renville	46183	227880	428682	220922	29616	0
Rice	102516	13840	30742	31962	0	0
Rock	3416	7929.3	0	0	0	0

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Reserve Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989: Part A

SWCD	Easement Type					
	MAL/ 10 yr	MAL/ 20 yr	MAL/ Perp.	Wetland/ History	Wetland/ No Hist.	Riparian/ 20 yr
Root River (Houston)	191992	2798.1	0	0	0	0
Roseau	129228	0	8400.2	0	0	0
Scott	94963	13828	321010	0	0	0
Sherburne	154330	0	0	0	0	0
Sibley	38353	36045	203036	80441	0	0
Stearns	177232	2409.8	8495.2	0	0	0
Steele	79927	9560.3	42699	0	0	0
Stevens	10799	0	174563	36150	0	6750.5
Swift	55963	3158.6	210823	8568.7	0	0
Todd	90396	4569.5	2314.4	0	0	0
Traverse	15433	0	16819	38494	0	0
West Ottertail	0	0	11592	0	0	0
Wabasha	142532	0	20911	0	0	0
Wadena	30713	21121	0	0	0	0
Waseca	0	12666	74468	0	0	0
Washington	15652	0	0	0	0	0
Watonwan	58162	4395.9	0	0	0	0
Wilkin	39897	0	57708	0	0	0
Winona	76563	5023	0	0	0	0
Wright	68779	27281	160043	38364	0	0
Yellow Medicine	6912	0	101364	77230	0	0
STATE TOTAL	5,647,543	1,037,068	4,788,350	1,717,857	109,615	10,152

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989:
Part B

SWCD	Easement Type						Total
	Riparian Perm.	Ground water/ 20 yr	Ground water Perm.	Hillside 20 yr	Hillside Perm	Snow- fence	
Aitkin	0	0	0	0	0	0	35559
Anoka	0	0	0	0	0	0	5510.4
Becker	0	0	0	0	0	0	110402
Beltrami	0	0	0	0	0	0	23753
Benton	0	5779.6	0	0	0	0	151523
Big Stone	0	0	0	0	0	0	78449
Blue Earth	0	0	0	0	0	0	112033
Brown	59370	0	0	0	0	0	310246
Carver	0	0	0	0	0	0	224469
Cass	0	0	0	0	0	0	2494.6
Chippewa	0	0	0	0	0	0	96473
Chisago	0	0	0	0	0	0	94259
Clay	0	0	0	0	0	0	419524
Clearwater	0	0	0	0	0	0	43217
Cook	0	0	0	0	0	0	701.1
Cottonwood	3491.9	0	22154	0	35951	9650	475141
Dakota	0	0	0	0	0	0	173457
Dodge	8437	0	0	0	0	0	33408
Douglas	0	0	0	0	0	0	167189
E. Agassiz (Norman)	2377.6	0	0	0	0	0	231523
East Ottertail	0	0	0	0	0	0	371413

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989:
Part B

SWCD	Easement Type						Total
	Riparian Perm.	Ground water/ 20 yr	Ground water Perm.	Hillside 20 yr	Hillside Perm	Snow- fence	
East Polk	0	0	0	0	0	0	297626
Faribault	0	17388	0	0	0	0	455004
Fillmore	0	0	0	0	0	0	186433
Freeborn	0	0	0	0	0	0	218637
Goodhue	0	2912.5	0	4979.3	4780.3	0	312346
Grant	0	0	0	0	0	0	143587
Hennepin	0	0	0	0	0	0	9014.8
Hubbard	0	0	0	0	0	0	6980.4
Isanti	0	0	0	0	0	0	143541
Itasca	0	0	0	0	0	0	3148.8
Jackson	0	0	0	11942	0	0	171730
Kanabec	0	0	0	0	0	0	14480
Kandiyohi	0	0	0	0	0	0	358182
Kittson	0	0	0	0	0	0	116253
Lac Qui Parle	0	0	0	0	0	0	81398
Lake of the Woods	0	0	0	0	0	0	11575
Le Sueur	0	0	0	0	0	0	189056
Lincoln	0	0	0	0	0	0	100572
Lyon	0	0	0	0	0	8453.1	103375
Mahnomen	0	0	0	0	0	0	15479
Marshall	0	0	0	0	0	0	147481

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989
Part B

SWCD	Easement Type						Total
	Riparian Perm.	Ground water/ 20 yr	Ground water Perm.	Hillside 20 yr	Hillside Perm	Snow- fence	
Marshall Beltrami	0	0	0	0	0	0	27572
Martin	16717	4312.2	0	0	0	0	310600
McLeod	0	0	0	0	0	0	313982
Meeker	8130.3	0	0	0	0	0	413863
Mille Lacs	0	0	0	0	0	0	47993
Morrison	0	12417	0	0	9860.8	9296.8	209112
Mower	32315	0	0	0	0	0	106505
Murray	0	0	0	0	22861	0	189616
Nicollet	0	0	0	0	0	0	74791
Nobles	0	0	0	0	0	0	44450
North St. Louis	0	0	0	0	0	0	5412
Olmsted	0	0	0	6538.6	0	0	104045
Pennington	0	0	0	0	0	0	56253
Pine	0	0	0	0	0	0	8241
Pipestone	0	0	0	0	0	3486	22287
Pope	2499.1	0	0	0	0	0	299112
Red Lake	0	0	0	0	0	0	88950
Redwood	62640	0	0	0	0	0	665286
Renville	80666	0	0	0	0	0	1033948
Rice	0	0	0	0	0	0	179059
Rock	0	0	0	0	0	0	11345

Note: See Chart 1 Type Key

(continued)

Table A3: RIM Easement Payments by SWCD by Easement Type: 1986 - May 1, 1989
Part B

SWCD	Easement Type						Total
	Riparian Perm.	Ground water/ 20 yr	Ground water Perm.	Hillside 20 yr	Hillside Perm	Snow- fence	
Root River (Houston)	0	0	0	0	9705.4	0	204496
Roseau	0	0	0	0	0	0	137628
Scott	0	0	0	0	0	0	429801
Sherburne	0	0	0	0	0	0	154330
Sibley	0	0	0	0	0	0	357875
Stearns	0	0	0	0	0	0	188137
Steele	0	0	0	0	0	0	132187
Stevens	10514	0	25800	11464	0	0	276041
Swift	10510	0	0	0	0	0	289023
Todd	0	0	0	0	0	0	97280
Traverse	0	0	0	0	0	0	70746
West Ottertail	0	0	0	0	0	0	11592
Wabasha	0	0	0	0	78813	0	242257
Wadena	0	0	0	0	0	0	51834
Waseca	0	0	0	3553.2	0	0	90688
Washington	0	0	0	0	0	0	15652
Watsonwan	0	0	0	0	0	0	62558
Wilkin	0	0	0	0	0	0	97605
Winona	0	0	0	0	0	0	81586
Wright	0	0	2422.5	0	4210.5	0	301099
Yellow Medicine	0	0	0	0	0	0	185506
STATE TOTAL	297669	42809.9	50376.9	38476.9	166183	30885.9	13,936,987

Note: See Chart 1 Type Key

Table A4: RIM Reserve Easement Acreage by Conservation Practice by SWCD: 1986 - May 1, 1989: Part A

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Aitkin	0	4.8	0	0	0	0	6
Anoka	0	14.5	0	0	0	0	7.9
Becker	0	265.4	0	0	0	0	112.1
Beltrami	0	178.2	0	0	0	0	51.9
Benton	23.9	380.1	0	0	0	65.6	44.1
Big Stone	3.4	147.6	0	0	0	0	7.5
Blue Earth	0	64.3	0	0	0	104.8	4.8
Brown	24.6	130.8	0	0	0	239.9	10.4
Carver	0	198.9	0	0	0	32.7	31.3
Cass	0	0	0	0	0	0	12
Chippewa	11.4	43.6	0.7	0	0	38.4	8.8
Chisago	0	220.5	0	0	0	78.1	7
Clay	0.3	425.5	5	0	0.2	168.4	32.6
Clearwater	0	4.1	16.7	0	0	21.9	15.4
Cook	0	5.7	0	0	0	0	0
Cottonwood	6	245.5	0	3	0	152.1	64.3
Dakota	0	150.9	0	0	0	171.6	15
Dodge	5.2	40.7	0	0	0	0	3.1
Douglas	0	240.4	0	0	0	107.9	108.6
E. Agassiz (Norman)	0	322.7	0	0	0	78.7	181.1
East Ottertail	0	720.6	0	0	0	103.9	32.9

(Continued)

Table A4: RIM Reserve Easement Acreage by Conservation Practice by SWCD: 1986 - May 1, 1989: Part A

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
East Polk	0	825	0	0	0	0	0
Faribault	35.8	78.1	0	0	0	308.5	46.5
Fillmore	0	172.1	0	0	0	0	53
Freeborn	0	167	0	0	0	112.6	41.1
Goodhue	0	354	0	0	0	38.7	76.1
Grant	0	15	0	0	0	130.3	0
Hennepin	0	1.9	0	0	0	15.3	4.5
Hubbard	0	38.4	0	0	0	0	9.8
Isanti	0	513.4	0	0	0	43.9	62.4
Itasca	0	11	0	0	0	0	14.6
Jackson	0	186.9	0	0	0	10	2
Kanabec	0	0	0	0	0	0	16.5
Kandiyohi	5.6	304.9	0	0	0	132.7	1
Kittson	0	288.7	0	0	0	20.6	3
Lac Qui Parle	0	88.2	0	0	0	15	1
Lake of the Woods	0	11	0	0	0	0	2.6
Le Sueur	0	122.5	0	0	0	28.4	6.5
Lincoln	0	120.1	0	0	0	44.5	28.4
Lyon	2.6	105.2	0	6	0	17.6	18.9
Mahnomen	0	49.5	0	0	0	0	0
Marshall	0	470.1	0	0	0	0	0
Marshall Beltrami	0	101.7	0	0	0	0	0

(continued)

Table A4: RIM Reserve Easement Acreage by Conservation Practice by SWCD: 1986 - May 1, 1989: Part A

SWCD	Practice						
	Donated	Intro-duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Martin	35.1	299.3	3.9	0	0	77.4	8
McLeod	8.3	161.6	0	0	0	223.4	34
Meeker	2.3	308.3	0	0	0	454.3	8.6
Mille Lacs	0	139.9	0	0	0	0	90.9
Morrison	1	522.8	6.2	26.1	0	40	76.7
Mower	0	131.8	0	0	0	34.4	27.6
Murray	2.9	256.6	0	0	0	0	0
Nicollet	1.5	96.9	0	0	0	4.6	31.5
Nobles	0	19.4	0	0	0	0	3.2
North St. Louis	0	9	0	0	0	0	9
Olmsted	0	180.7	0	0	0	0	44.3
Pennington	0	196.9	0	0	0	0	0
Pine	0	0	0	0	0	0	11.4
Pipestone	0	9.3	0	4.5	0	19.1	24
Pope	35.7	634.3	0	0	0	0	196.3
Red Lake	0	97.4	0	0	0	0	0
Redwood	11.8	494.9	0	0	0	220.6	21.8
Renville	107.2	446.1	0	0	0	697.1	15.7
Rice	0	118.9	0	0	4	103.7	23
Rock	0	8	0	0	0	0	11
Root River (Houston)	0	59.2	68.5	0	0	30.1	51.1
Roseau	0	490	0	0	0	0	34

(continued)

Table A4: RIM Reserve Easement Acreage by Conservation Practice by SWCD: 1986 - May 1, 1989: Part A

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Scott	2.1	372.9	1	0	0	185.5	57.7
Sherburne	0	511.8	0	0	0	15	0
Sibley	0	250.6	0	0	0	196.9	71.1
Stearns	0	460.2	0	0	0	24.5	49.9
Steele	0	32	0	0	1.5	155	13.5
Stevens	49.8	272.3	0	0	0	9	26.3
Swift	5.8	219.3	0	0	0	308.4	24.1
Todd	0	170.6	0	0	0	121.2	75.4
Traverse	0	110.5	0	0	0	0	4.3
West Ottertail	0	20	0	0	0	0	5
Wabasha	0	135.3	206.1	0	0	0	101.1
Wadena	0	181.8	8	0	0	102.4	89.9
Waseca	0	92.6	0	0	0	0	10
Washington	0	32.4	0	0	0	0	0
Watsonwan	0	72.3	0	0	0	11.3	0.3
Wilkin	0	167	0	0	0	34	1
Winona	0	58.2	0	0	0	4	63.8
Wright	18.8	435.8	10.8	0	0	33.7	110.3
Yellow Medicine	22.7	166.9	0	0	2	96	14.4
STATE TOTAL	423.8	16273.3	326.9	39.6	7.7	5483.7	2584.9

(Continued)

Table A4: RIM Easement Acreage by Conservation Practice by SWCD: 1986-May 1, 1989:
Part B

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Aitkin	0	0	0	0	269.6	0	0
Anoka	0	0	0	0	0	0	0
Becker	0	0	0	13	125.1	0	0
Beltrami	2	0	0	1.5	0	19.5	0
Benton	8	0	0	43	147.2	3.3	0
Big Stone	2.4	0	0	7	48.6	8.5	7
Blue Earth	2.5	0	0	15.2	4.4	2	0
Brown	0	0	0	6.7	0	9	5
Carver	0	0	0	7.2	29.7	2.6	0
Cass	0	0	0	0	20	0	0
Chippewa	0	0	0	58	3	0	58
Chisago	1.1	0	0	0	57.5	0	0
Clay	5.5	0	0	2	309.7	7	2
Clearwater	0	0	0	0	349	4	0
Cook	0	0	0	0	0	0	0
Cottonwood	15	0	0	39.6	279.3	2	14
Dakota	0	0	0	14.9	34.4	2	
Dodge	0	0	0	0	18.2	0.7	0
Douglas	0	0	0	50.8	113.7	3.3	0
E. Agassiz (Norman)	0	0	0	26.1	264.5	10	0
East Ottertail	19.7	0	0	17.5	310.9	7	18
East Polk	0.4	0	0	0	248.9	11.3	0

(continued)

Table A4: RIM Easement Acreage by Conservation Practice by SWCD: 1986-May 1, 1989:
Part B

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Fillmore	0	0	0	0	230.9	0	0
Freeborn	0.6	0	0	10.9	45	0.5	12.7
Goodhue	0	0	0	0	240.5	2.5	7.5
Grant	5	0	0	10	59.1	2	10
Hennepin	0	0	0	0	3.5	0	0
Hubbard	0	0	0	0	17	0	0
Isanti	0	0	0	0	43.7	0	0
Itasca	0	0	0	0	0	0	0
Jackson	0	0	0	71.4	52.9	0	0
Kanabec	0	0	0	0	50.5	0	0
Kandiyohi	0	0	0	51	194.7	1	20.9
Kittson	0	0	0	0	170.9	0	0
Lac Qui Parle	5.4	0	0	0	60.1	0	0
Lake of the Woods	0	0	0	0	81.6	0	0
Le Sueur	0	0	0	0	208.1	0	0
Lincoln	3	0	0	56.5	44.8	0	9.7
Lyon	0	0	0	7	76.4	1	16.8
Mahnomen	1	0	0	0	7.2	0	0
Marshall	0	0	0	0	94.9	0	0
Marshall Beltrami	0	0	0	0	31.6	0	0
Martin	3.4	0	0	2.2	43.4	7.6	8.1
McLeod	17.3	0	0	46.5	60.7	13.6	100.9

(continued)

Table A4: RIM Easement Acreage by Conservation Practice by SWCD: 1986-May 1, 1989:
Part B

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Mille Lacs	0	0	0	0	17.7	0	0
Morrison	2.3	0	0	104.3	231.3	5	2.3
Mower	0	0	0	0	15.8	0	0
Murray	0	0	0	18.8	84.8	0.5	43.8
Nicollet	0	0	0	0	0	0	0
North St. Louis	0	0	0	0	35	0	0
Olmsted	0	0	1	1	31.3	0	0
Pennington	0	0	0	0	13	0	0
Pine	0	0	0	0	67	0	0
Pipestone	0	0	0	1.7	1.6	5	4.9
Pope	0	0	0	46	25.8	5	26
Red Lake	0	0	0	0	111.2	1	0
Redwood	11.2	0	0	73.3	0	3.8	115.5
Renville	0	0	0	84.7	194.9	1.6	15
Rice	0	0.2	0.4	3	99.7	1.5	5.5
Rock	0	0	0	0	17.5	0	8
Root River (Houston)	0	0	0	0	320.8	1	0
Roseau	0	0	0	0	33.5	0	0
Scott	0	0	0.2	4.3	92.4	0.5	22.2
Sherburne	3.2	0	0	0	60.7	7.2	0
Sibley	1.3	0	0	37.2	44.9	14.5	10.6
Stearns	2.7	0	0	0	111.3	6	0

(continued)

Table A4: RIM Easement Acreage by Conservation Practice by SWCD: 1986-May 1, 1989:
Part B:

SWCD	Practice						
	Donated	Intro- duced Grasses	Already in Trees	Living Snow- fence	Shallow Water	Native Grasses	Trees
Stevens	0	1	0	9.2	188.6	10.2	0
Watsonwan	1	0	0	0	38.6	0	0
Wilkin	0	0	0	0	19	1	0
Winona	0	0	0	0	115.9	0	0
Wright	0	0	0	31.7	52.1	11.4	15
Yellow Medicine	1.7	0	0	23.3	16	1	0
STATE TOTAL	140.9	1.2	1.9	1078.8	7185.4	212.2	682.3
							34442.6

Appendix B: Land Capability Classification

From USDA SCS, "Soil Survey for Dakota County, Minnesota."

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follow:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices, or both.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations

that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.