III. Completed Research Projects

"a summary of any research project completed in the preceding biennium;"

This section includes summaries of all projects completed, including research projects.

- The following documents are summaries of accomplishments for each appropriation year and short abstracts for all projects completed since the previous biennial report of January 15, 2009.
- The abstracts describe the general accomplishments of each project for completed projects.
See http://www.lccmr.leg.mn
- Research projects have been marked as such in the description.
- Full final reports are available at the LCCMR, Room 65 - State Office Building. The abstracts are current as of 12/30/10.
- Legal Citations
  - M.L. 2008, Chapter 367, Section 2
  - M.L. 2007, Chapter 20, Section 2
  - M.L. 2006, Chapter 243, Sec. 20 (completed since January 15, 2009)
  - M.L. 2005, First Special Session, Article 1, Section 9 (completed since January 15, 2009)

2008 PROJECTS

MN Laws 2008, Chapter 367, Section 2 (beginning July 1, 2008)

NOTE: For all projects, contact us to obtain the most up-to-date work programs for current projects (project updates are required twice each year) or the final reports of completed projects.

The following documents are short abstracts for projects funded during the 2008 Legislative Session. The final date of completion for these projects is listed at the end of the abstract. When available, we have provided links to a project's web site. The sites linked to this page are not created, maintained, or endorsed by the LCCMR office or the Minnesota Legislature.

Subd. 3 Land and Habitat

Subd. 4 Water Resources

Subd. 5 Natural Resource Information

Subd. 6 Environmental Education

Subd. 7 Establishment of an Emerging Issues Account

Funding Sources: (**note: all projects are TF, unless otherwise noted)
Environment and Natural Resources Trust Fund (TF)
Great Lakes Protection Account (GLPA)

Subd. 3 Land and Habitat

Back to top of page

Metro Conservation Corridors (MeCC) - Phase IV
Subd. 3a $3,150,000

Sarah Strommen
Minnesota Land Trust
2356 University Avenue West, Suite 240
St. Paul, MN 55114

Phone: (651) 647-9769
Email: sstrommen@mnland.org
Web: http://www.dnr.state.mn.us/metroconservationcorridors/index.html

OVERALL PROJECT OUTCOME AND RESULTS
During the fourth phase of the Metro Corridors project, the Metro Conservation Corridors Partners continued their work to accelerate protection and restoration of remaining high-quality natural lands in the greater Twin Cities Metropolitan Area by strategically coordinating and focusing conservation efforts within a connected and scientifically-identified network of critical lands. This corridor network stretches from the area's urban core to its rural perimeter, including portions of 16 counties.

The Partners employed a multi-faceted approach, which included accomplishments in four specific result areas:

1. Partnership and Program Coordination: Partners met quarterly to review project accomplishments and coordinate activity. With DNR support, the partners also continued efforts to develop an online database to facilitate tracking and reporting of MeCC projects over time.
2. Restore and Enhance Significant Habitat: Collectively, the partners restored 775 acres of land. Restoration of an additional 464 acres and 0.06 miles of shoreline was completed using other funds.
3. Acquire Significant Habitat: Collectively the partners protected 1,183 acres of land, including more than 4 miles of shoreline through acquisition of fee title and conservation easements and leveraged an additional 773 acres of land and more than 5 miles of shoreline using other funds.
4. Other Conservation Tools and Incentives: The Metro Greenways Program assisted three cities, two soil & water conservation districts, and one county with the development and gathering of natural resources information to identify sites for protection or restoration and/or to implement conservation measures.

Since 2003, MeCC partners have protected more than 8,000 acres and restored more than 6,500 acres. These strategic and coordinated efforts address a number of recommendations of the Statewide Conservation and Preservation Plan, including protecting priority land habitats, protecting critical shorelands of streams and lakes, restoring land, wetlands, and wetland-associated watersheds, and improving connectivity and access to outdoor recreation.

PROJECT RESULTS USE AND DISSEMINATION
As projects were completed, the individual partners were encouraged to publicize accomplishments through press releases, organization newsletters and websites. These efforts resulted in information being distributed to the public through websites, email lists, daily and weekly newspapers, newsletters, and other print materials. Additionally, once the MeCC database development is complete, the partnership plans to incorporate a public web portal, which will display accomplishments.

COMPLETE OVERALL FINAL REPORT

Abstracts and Reports of Individual Partner Projects

1.1 Overall Summary and Coordination and Administration of MeCC Partnership (DNR)
2.1 Restore/Enhance Significant Watershed Habitat (Friends of the Mississippi River)
2.2 Lower Minnesota River Watershed Restoration & Enhancement Project (Friends of Minnesota Valley)
2.3 Restore and Enhance Significant Habitat (Great River Greening)
2.4 Metro Greenways Habitat Restoration and Enhancement Grants (DNR)
2.5 Scientific and Natural Area (SNA) Restoration and Enhancement (DNR)
3.1 Critical Lands Protection Program - Fee Title & Conservation Easement Acquisition (Trust for Public Land)
3.2 Protecting Significant Habitat by Acquiring Conservation Easements (Minnesota Land Trust)

3.3 Fee Acquisition for Minnesota Valley National Wildlife Refuge (Minnesota Valley National Wildlife Refuge Trust)
3.4 Metro Greenways Habitat Acquisition (DNR)
3.5 DNR Fish and Wildlife Acquisition (DNR)
3.6 Acquisition of Significant Habitat (DNR)
4.1 Metro Greenways Community Conservation Assistance Grants (DNR)

Project completed: 06/30/2010

Back to top of page

Vermillion River Corridor Acquisition and Restoration in Dakota County
Subd. 3b $400,000

Alan Singer
Dakota County
14955 Galaxie Ave
Apple Valley, MN 55124

Phone: (952) 891-7001
Email: al.singer@co.dakota.mn.us
Fax: (952) 891-7031
Web: http://www.co.dakota.mn.us

Funds enable Dakota County to develop and begin implementation of a comprehensive and integrated water quality, wildlife habitat, and outdoor recreational corridor system plan for the 335 square mile Vermillion River watershed, located in the counties of Dakota, Scott, and Goodhue. Implementation using these funds includes fee title and conservation easement acquisition to protect approximately 125 acres and restoration efforts to enhance approximately 40 acres.

Project Publication:
Vermillion River Corridor Plan: Improving Water Quality, Habitat, and Recreation (PDF - 13.2 MB)

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Minnesota's Habitat Corridors Partnership - Phase IV
Subd. 3c $3,150,000

Joe Pavelko
Pheasants Forever, Inc
7975 Acorn Circle
Victoria, MN 55386

Phone: (612) 532-3800
Email: jpavelko@pheasantsforever.org
Web: http://www.mnhabitatcorridors.org

Overall Project Outcome and Results
During the period between July 1st, 2008 and June 30th, 2010, Minnesota's Habitat Conservation Partnership (HCP) collectively expended $3,100,005 of Environment and Natural Resources Trust Fund (ENRTF) dollars to restore, enhance, or protect 8,143 acres of habitat and 199,832 feet of shoreline and riparian areas. Additionally, HCP used these funds to leverage an additional $6,607,398 of other non-state funds to restore, enhance, or protect 8,423 acres of habitat and 23,585 feet of shoreline and riparian areas. In total, HCP expended $11,877,328 to restore, enhance or protect a total of 17,397 acres of habitat and 152,780 feet of shoreline and riparian areas within the defined HCP project areas.

Partners expended a total of $1,926,055 ($1,140,480 ENRTF; $785,575 other non-state funds) to restore/enhance a total of 9,081 acres (7,244 acres ENRTF; 1,837 other non-state funds). Work included 5,230 acres of grassland restoration/enhancement, 3,054 acres of wetland restoration/enhancement, 185 acres of woodland restoration, 27,380 feet of shoreline restoration, & 200 acres of wild rice restoration. Other accomplishments included shallow lake surveys, dam modifications, and site access/development.

Partners expended a total of $7,484,898 ($877,500 ENRTF; $6,607,398 other non-state funds) to acquire 6,951 acres (616 acres ENRTF; 6,335 acres other non-state funds) of perpetual conservation easements. Grassland/wetlands continued to be a priority for HCP partners working on easements, with 6,152 acres protected. Shoreline/riparian areas were also a

priority with almost 32,000 feet protected. In addition, 504 acres of woodland was also permanently protected.

Partners expended a total of $1,868,112 ($994,985 ENRTF; $873,127 other funds) to permanently protect 560 acres (309 acres ENRTF; 251 acres other non-state funds) in fee-title acquisition. HCP achieved 290 acres of new WMAs, 66 acres of AMAs, 124 acres of SNAs, and 80 acres of WPAs. Additionally, almost 10,000 feet of shoreline/riparian areas were protected.

For complete information, go to http://www.mnhabitatcorridors.org.

HCP Partners included: Ducks Unlimited, Fond du Lac Reservation, Friends of the Detroit Lakes Wetland Management District, Leech Lake Band of Ojibwe, MN Board of Water and Soil Resources, MN Deer Hunters Association, MN Department of Natural Resources, MN Land Trust, MN Valley National Wildlife Refuge Trust, Inc, National Wild Turkey Federation, Pheasants Forever, The Nature Conservancy, Trust for Public Land, U.S. Fish and Wildlife Service, U.S. Natural Resources Conservation Service.

Project Results Use and Dissemination The partnership acknowledges funding from the Minnesota Environment and Natural Resources Trust Fund. Accomplishment report information, mapping products, and project information can be found at http://www.mnhabitatcorridors.org. Other forms of information can be obtained by contacting Joe Pavelko, the HCP Coordinator, at (612) 532-3800.

COMPLETE OVERALL FINAL REPORT

Abstracts and Reports of Individual Partner Projects

0x Overall Summary of HCP - Phase IV
1a Project Coordination and Mapping (Pheasants Forever)
2a Hides for Habitat Restoration (Minnesota Deer Hunter Association)
2b Partners for Fish and Wildlife (U.S. Fish and Wildlife Service)
2c Living Lakes Enhancement (Ducks Unlimited)
2d Shallow Lakes Assessment and Management (DNR)
2e* Fond du Lac - Wild Rice Habitat Restoration (Fon du Lac Band of Chippewa) **[*Dollars turned back; no expenditure. No Final Report.]**
2f Habitat Enhancement on Shallow Lakes and Forested Impoundments (Leech Lake Band of Ojibwe)
2g Wildlife Areas Management (DNR)
2h Fish Habitat Restoration (DNR)
2i Set out Seedlings (National Wild Turkey Federation)
2j Lakescaping (DNR)
2k Prairie Management (DNR)
2n Campaign for Conservation (The Nature Conservancy)
2o Working Lands Partnership (Friends of the Detroit Lakes Wetland Management District)
2o Bluffland Restoration (National Wild Turkey Federation)
3a Shorelands Protection Program (Minnesota Land Trust)
3c Living Lakes Enhancements (Ducks Unlimited)
3d Wetlands Reserve Program (Ducks Unlimited and U.S. Natural Resources Conservation Service)
3e RIM Reserve (BWSR)
4a Critical Lands Conservation Initiative (Pheasants Forever)
4b Fisheries and Widlife Acquisition (DNR)
4c Critical Lands Protection Program (Trust for Public Land)
4h Habitat Acquisition for Minnesota Valley Wetland Management District of USFWS (Minnesota Valley National Wildlife Refuge Trust)
4i Habitat Acquisition - Professional Services (DNR)

Project due to be completed: 6/30/2010
Overall Work Program(For work programs of individual partner projects, click links directly above)

Back to top of page

Preserving the Avon Hills Landscape
Subd. 3d $337,000

Thomas Kroll
Saint Johns Arboretum and University
Box 3000
Collegeville, MN 56321

Phone: (320) 363-3163
Email: tkroll@csbsju.edu
Fax: (320) 363-3202
Web: http://www.csbsju.edu/arboretum/avonhills

Saint John's Arboretum and University and the Minnesota Land Trust will work with local landowners, non-profit organizations, and local units of government to develop plans and implement land protection measures, including ordinances and conservation easements, that will benefit the Avon Hills landscape area (approximately 80 square miles in Stearns County) of central Minnesota. Implementation using these funds includes conservation easement acquisition to permanently protect approximately 450-1,000 acres. Conservation easements will be held and monitored by the Minnesota Land Trust.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Minnesota River Valley Green Corridor Land Protection
Subd. 3e $1,000,000

Nancy Fasching
Southwest Initiative Foundation
PO Box 428
Hutchinson, MN 55350

Phone: (320) 587-4848
Email: nancyf@swifoundation.org
Fax: (320) 587-3838
Web: http://www.swifoundation.org

Overall Project Outcome and Results
The Green Corridor Legacy Program will provide Minnesotans public access to high quality game and wildlife habitat through a multi-year land acquisition plan.

The initial phase of this project included:

- Acquisition of 249.23 acres of easement free fee-title acquisition conservation lands from willing sellers. This program acquired land from willing and supportive landowners. The land is purchased and then transferred to the DNR for long-term habitat conservation, outdoor recreational access, sustainability, and monitoring. These properties include the Whispering Ridge Aquatic Management Area in Redwood County (182.87 acres), Beaver Falls Aquatic Management Area in Renville County (6.6 acres), and two additions to Fort Ridgely State Park in Renville County (29.85 acres and 30 acres).
- Development of a conservation plan guidance document that insures both the natural resources and the natural history of this corridor are restored, conserved, protected and utilized in manners that balance the ecological, cultural, socio-economic and recreational needs of today, while preserving these resources for future generations.
- Organization of a variety of stakeholders into a working partnership team committed to the vision for a Green Corridor in the Minnesota River Valley.

Project Results Use and Dissemination
Results from this project have been disseminated as follows:

- The conservation plan will be used to guide and vet proposed acquisitions by Green Corridor, Inc.
- More importantly, the plan will be used as a key decision support system by a wide variety of conservation partners and stakeholders within the project area to craft and implement a conservation and economic vision for the project area.
- The plan will be disseminated principally through the web, but is also available in limited numbers via CD and hard copy format. In the near future, once the new Tatanka Bluff Council website is fully operational, a recap of these FY08 ENRTF appropriation accomplishments will be posted on this website under the "Green Corridor" icon tab. The website will ask viewers for comments and feedback concerning the various strategies and outcomes related to this project and the Conservation Plan. The project will also served as a cornerstone for future funding requests to the LCCMR and from the Outdoor Heritage Fund.

The communications and outreach activities that have been done for the Minnesota River Valley Green Corridor Project include:

- The plan has been adopted by Green Corridor, Inc. as its conservation vision for the Middle Minnesota Valley.
- The final plan was presented to the public on May 6th, 2010 at the Tatanka Bluffs Council annual meeting at the Redwood Area Community Center in Redwood Falls MN.

- The conservation plan entitled, "Conservation in the Middle Minnesota Valley: A Blueprint and Action Plan" was produced in hard copy, CD and web format. The product will be available via the following web sites: Green Corridor, Inc. (www.tatankabluffs.com) and Great River Greening (www.greatrivergreening.org).
- Since the start of this project in the summer of 2008 numerous meetings, public forums, and media outreach activities have taken place that have illustrated the intended outcomes, accomplishments, and public benefits of this appropriation.

Project Publication:
Conservation in the Middle Minnesota Valley: A Blueprint and Action Plan (PDF - 14.6 MB)

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Scientific and Natural Area Acquisition
Subd. 3f $1,000,000

Peggy Booth
MN Department of Natural Resources (DNR)
500 Lafayette Rd, Box 25
St. Paul, MN 55155

Phone: (651) 259-5088
Email: peggy.booth@dnr.state.mn.us
Fax: (651) 296-1811
Web: http://www.dnr.state.mn.us/snas

Overall Project Outcome and Results
Environment and Natural Resources Trust Fund (ENRTF) dollars from this appropriation contributed toward the acquisition of six sites protecting a total of 673 acres (211.3 acres using ENRTF dollars; 461.7 acres using other funds) with rare features and native plant communities. These acquisitions resulted in three new Scientific and Natural Area (SNA) units within the State Outdoor Recreation System - Chimney Rock SNA (Dakota County), Clinton Falls Dwarf Trout Lily SNA (Steele County), and Lester Lake SNA (Hubbard County) - plus additions to three existing SNAs - Franconia Bluffs SNA (Chisago County), Lake Alexander Woods SNA (Morrison County), and St. Wendel Tamarack Bog SNA (Stearns County).

About the sites:

- The 77-acre new Chimney Rock SNA acquisition included a landowner donation and funding from Dakota County and the Department's rare species mitigation funds (pro-rated at 44.6 acres for this appropriation). Chimney Rock SNA is named for its unique geological feature of statewide significance and contains four rare plant species.
- The 21-acre Clinton Falls Dwarf Trout Lily SNA contains the world's largest population of the Minnesota endemic species of dwarf trout lily which straddles and is riparian to the Straight River.
- The new 440-acre Lester Lake site - jointly managed as an SNA and an Aquatic Management Area (320 acres designated as SNA and 120 acres designated as AMA) - was acquired through the Trust for Public Land with funding support from the Outdoor Heritage Fund, Kabekona Lake Association and Foundation, and Reinvest in Minnesota (pro-rated at 30.3 ENRTF acres for this appropriation). This site fully contains the undisturbed 70-acre Lester Lake, forested and sedge meadow native plant communities, and habitat for state special concern red-shouldered hawk and white adder's mouth orchid.
- Additions to existing SNAs include various native forest communities at the 35-acre Franconia Bluffs SNA, Parcel 2 (prorated at approximately 15.4 acres ENRTF), a 40-acre addition to Lake Alexander Woods SNA, and a 60-acre addition to the St. Wendel Tamarack Bog.

FINAL REPORT RECEIVED - AWAITING REVISION

Project completed: 6/30/2010

Back to top of page

State Land Acquisition Consolidation
Subd. 3g $500,000

Craig Engwall
MN Department of Natural Resources (DNR)

1201 E Hwy 3
Grand Rapids, MN 55744

Phone: (218) 999-7913
Email: craig.engwall@dnr.state.mn.us
Fax: (218) 327-4263
Web: http://www.dnr.state.mn.us

Establishment of a revolving account of funds the Department of Natural Resources (DNR) can use to consolidate state land ownership in Northern Minnesota in order to reduce forest fragmentation and enhance management efficiency. Funds in the account can finance the acquisition of lands of significant natural resource value adjacent to existing DNR forest lands; funds are replenished through the sale of isolated DNR parcels in difficult to manage areas.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

State Park and Trail Land Acquisition
Subd. 3h $1,500,000

Larry Peterson (Parks) and Stan Linnell (Trails)
MN Department of Natural Resources (DNR)
500 Lafayette Rd
St. Paul, MN 55155

Phone: Larry Peterson: (651) 259-5593; Stan Linnell: 651) 259-5626
Email: larry.peterson@state.mn.us and stan.linnell@dnr.state.mn.us
Fax: (651) 296-6532 [Parks]; (651) 297-5475 (Trails)
Web: http://www.dnr.state.mn.us

Overall Project Outcome and Results
The Trust Fund funding allowed for the following State Parks and State Trails land acquisition projects:

- Ownership of approximately 158 acres currently for sale adjacent to Monson Lake State Park. Adding this parcel will provide additional access to a high quality lake and is adjacent to state park ownership.
- Ownership of approximately 360 acres at George Crosby Manitou State Park. Acquisition of this parcel will provide protection to one of the largest and highest quality old-growth northern hardwood forest complexes in the Lake Superior Highlands.
- The DNR Parks and Trails Division made offers to acquire four parcels of land for the Mill Towns State Trail that were rejected by the landowners at the end of June 2010. An Amendment request to transfer the remaining funds to Result 5-acquisition of approximately 1.25 miles of Paul Bunyan State Trail was approved on August 17, 2010.
- The DNR Parks and Trails Division made offers to acquire one parcel in Maplewood State Park that was rejected by the landowner at the end of June 2010.
- Ownership of approximately 1.25 miles of the Paul Bunyan State Trail. The property acquired is comprised entirely of former industrial property and is located adjacent to the shoreline of Lake Bemidji. This acquisition is partially funded through LCCMR and provides for State ownership of a significant segment of the remaining authorized Paul Bunyan State Trail. The acquired trail segment is to be constructed during 2011. Additional funding through Capital Bonding (2005 and 2006) and 2009 LCCMR was also used for this project.

See attached map for locations.

All acquisitions are from willing sellers, within the statutory boundaries of state parks and for statutory authorized state trails as determined by the Commissioner.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Metropolitan Regional Park System Land Acquisition
Subd. 3i $1,500,000

Arne Stefferud
Metropolitan Council

390 N Robert St
St. Paul, MN 55101

Phone: (651) 602-1360
Email: arne.stefferud@metc.state.mn.us
Fax: (651) 602-1467
Web: http://www.metrocouncil.org

The Metropolitan Council will grant these funds to metropolitan regional park agencies, along with a required minimum 40% match of non-state funds, to acquire approximately 225 acres within approved regional park unit boundaries in the Metropolitan Regional Park System.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Local Initiative Grants - Regional Parks and Natural Areas
Subd. 3j $1,000,000

Wayne Sames
MN Department of Natural Resources (DNR)
500 Lafayette Rd.
St. Paul, MN 55155

Phone: (651) 259-5559
Email: wayne.sames@dnr.state.mn.us
Fax: (651) 296-6047
Web: http://www.dnr.state.mn.us

Co- Project Manager:
Marc Mattice
Wright County Parks
1901 Highway 25 North
Buffalo, MN 55313

Phone: (763) 682-7693
Email: marc.mattice@co.wright.mn.us
Fax: (763) 682-7313
Web: http://www.co.wright.mn.us/department/parks/

Through this program, the Department of Natural Resources (DNR) provides matching grants to local governments for acquisition of regional parkland outside the Twin Cities metropolitan area and for natural and scenic area land statewide. Specifically, these funds are to be used for a regional park grant to Wright County to begin to acquire lands for a proposed regional park on the Bertram Chain of Lakes in Wright County.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Conservation Partners/Environmental Partnerships Matching Grant Program
Subd. 3k $150,000

Wayne Sames
MN Department of Natural Resources (DNR)
500 Lafayette Rd, Box 10
St. Paul, MN 55155

Phone: (651) 259-5559
Email: wayne.sames@state.mn.us
Fax: (651) 296-6047
Web: http://www.dnr.state.mn.us/grants/habitat/env_cons_part.html

Overall Project Outcome and Results

A total of seven projects were completed for a total grant amount of $123,000. Five Conservation Partners habitat projects were completed for $87,000. The projects included reforestation and invasive species removal in Coon Rapids Dam Regional Park; improving the aquatic ecology of a 130 acre shallow lake in Kandiyohi County; restoration of 1,300 feet of Minnesota River shoreline in Mankato; a 15 acre restoration of prairie, savanna and wetland in Ramsey County; and implementation of several lake shore conservation projects in Stearns County.

Two Environmental Partnership projects were completed for $36,000. The projects involved implementation of innovative storm water management and interpretation at Square lake Regional Park and demonstration of innovative storm water management practices with environmental interpretation by the Washington County Conservation District.

Two projects originally awarded grants were withdrawn by the applicants.

Administration of the grants was completed by DNR local grants staff for a total of $10,000. A summary of the funded projects is attached.

Project Results Use and Dissemination
Grant recipients are required to submit a final report on the project to the DNR. This information is maintained in the project file and is available on request. Some projects involve the development of informational signing, brochures, booklets, etc., that are made available to the public.

FINAL REPORT

Project due to be completed: 6/30/2010

Back to top of page

County Trail System Design
Subd. 3l $175,000

Mary Vogel
University of Minnesota
151 Rapson Hall
89 Church St SE
Minneapolis, MN 55455

Phone: (612) 626-7417
Email: vogel001@umn.edu
Fax: (612) 626-7424
Web: http://ccl.design.umn.edu/

Overall Project Outcome and Results
Using a publicly engaged process involving citizens, county trail committees, local officials, and trail users, and building on the Center's previous state trail work, the Center for Changing Landscapes created designs/plans for individual county trail systems in Brown, Lyon, Redwood, and Renville Counties. While celebrating the region's and each county's environmental and cultural assets, the county-wide, community, district, and site scale plans/designs link the counties and the communities within them and connect to the existing city trails and the authorized state trails.

Project Goals:

- Create county trail plans/designs that promote recreation and environmental awareness and stewardship by addressing issues of environmental type, quality, and preservation along trail corridors and in the larger trail landscapes by preserving, enhancing, and interpreting natural and cultural landscape systems and features;
- Leverage the effectiveness of existing and planned recreational, natural, and cultural assets such as parks, trails, historic sites, conservation lands;
- Create community and county consensus around trail opportunities; and
- Create plans/designs for use to empower county trail funding from local and other sources.

Project Products:

- Community-focused and county-wide trail discussions: local input and critiques of plans/designs were given in over 25 public meetings with trail committees, citizens, and local officials;
- A printed and digital report that includes analyses of the landscape of the region and the four counties; 4 county trail system plans/designs; 49 county system routes through individual communities; 54 community trailhead locations; 19 community trailhead designs; 5 trailhead & special place designs; 5 county park trailhead designs; 4 signature element package that brand each county trail: logos, signs, kiosks, and rest areas; and a plan/design for the Chief Sleepy Eye Spur.

- Over 60 display boards of trail work for trail committee and larger public meetings
- Power point presentations for committee and public meetings

Plans are available for download at http://ccl.design.umn.edu/publications.html

Project Results Use & Dissemination

- Local media have publicized project meetings and the work. There have been newspaper articles, newsletter articles, radio interviews, and website postings.
- The plans/designs have been presented to and discussions held with county trail committees, park committees, city councils, and county boards.
- Plans/designs for Chief Sleepy Eye Spur were presented to the Minnesota Senate's Capitol Investment Committee and the House's Capitol Investment Finance Division.
- The work has been adopted including in the newly updated Southwestern Trail Plan and Lyon County's trail plan in its comprehensive plan.
- Plans are being made for a public meeting in September that will roll out all of the work in the four counties and set the stage for cooperation among the counties and for the development of a coordinated implementation strategy.
- Project results distributed to each county in both printed and digital form for their use and posted on LCCMR's and the Center for Changing Landscape's websites.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Accelerated Prairie Management, Survey, Acquisition and Evaluation
Subd. 3m $1,250,000

Carmen Converse
MN Department of Natural Resources (DNR)
500 Lafayette Rd, Box 25
St. Paul, MN 55155

Phone: (651) 259-5083
Email: carmen.converse@dnr.state.mn.us
Fax: 651) 296-1811
Web: http://dnr.state.mn.us/eco

Overall Project Outcome and Results (includes Use and Dissemination)
Minnesota's native prairie covered about 18 million acres at the time of the public land surveys (1847-1908); currently less than one percent remains. This multi-faceted prairie project was designed to increase conservation of native prairie and provide tools for long-term management and assessment of this rare resource. Project results addressed:

1. Rapid assessment of remaining native prairie;
2. Completion of the Minnesota County Biological Survey (MCBS) in six prairie counties;
3. Increased technical assistance to private prairie landowners;
4. Acceleration of management of public and private prairie lands;
5. Establishment of a baseline dataset for long-term status trend monitoring and analysis;
6. Acquisition of prairie bank easements.

Results:
1) Rapid Assessment: The effectiveness of a computerized procedure to detect changes in mapped prairies was explored in this result. Detailed feature extraction, segmentation, and change analysis procedures using the SPRING software was completed for 1,521 prairie/savanna sites identified by the MCBS prior to 1994. The total area assessed included 65,444 acres of prairie/savanna habitat in 32 counties and over 192,000 acres of surrounding "buffer" area. Statewide, the prairie habitat examined had a 4% change affecting 2,332 acres from 1991 to 2008. Prairie habitat outside of protected areas had significantly higher amounts of prairie loss or woody vegetation encroachment. A separate report, Accelerated prairie management, survey, acquisition and evaluation result 1: Rapid assessment of remaining native prairie was completed.

2) MCBS completed surveys in six counties. Less than 1,700 acres of prairie in these counties was recorded as compared to approximately 2,053,300 acres recorded in the late 1800's. The rarity of prairie species is largely due to prairie habitat loss and fragmentation. Rare plant populations were recorded at 281 new locations, including new distributional data on species such as Wild quinine and Valerian. Vegetation samples (relevés) were collected at 26 locations. A State Wildlife Grant for concurrent animal surveys resulted in 70 new records. Sites of high biodiversity significance such as the 15 acre Dexter Prairie were identified for protection as natural areas.

3) Technical assistance: DNR prairie specialists provided consultation regarding management and protection strategies for native prairies at eight public events and individually to 63 private landowners. Forty prairie stewardship plans were delivered to landowners.

4) Management: The Scientific and Natural Area program (SNA) prairie management activities resulted in 545 acres of woody plant removal, 2085 acres of prescribed burning, 2162 acres of exotic species treatments, and 84.5 acres of prairie reconstruction.

5) Status Trend Monitoring: A total of 683 vegetation transects, 42 relevés, and 1596 bird point counts were completed at 38 sites containing high quality prairie providing a baseline dataset for future proposed long-term monitoring and analysis on at least 35 sites. A separate report, Accelerated prairie management, survey, acquisition and evaluation result 5: Prairie monitoring and evaluation was completed.

6) Protection: SNA protected high quality prairies in Big Stone, Pipestone, Goodhue, and Fillmore counties through acquisition of five Native Prairie Bank conservation easements (totaling 476.2 acres) that provide habitat for species such as Greater Prairie Chicken, Chestnut-collared Longspur, Prairie bush clover and Plains wild indigo.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Prairie Ecosystem Restoration
Subd. 3n $80,000

Rich Perrine
Martin Soil and Water Conservation District
923 N State St, Ste 170
Fairmont, MN 56031

Phone: (507) 235-6680
Email: richard.perrine@mn.nacdnet.net
Fax: (507) 235-8171
Web: http://www.martinswcd.net

Overall Project Outcome and Results
This project's focus was to collect seed and plant materials from 50 species of local ecotype native plants from 50 vulnerable prairie remnants and then re-seed or plant them on 1,000 acres or more of protected easements. By increasing the plant diversity in our native prairies we aimed to improve their natural functions and provide a better habitat for our insects, birds, and mammals. Additionally, the seeds collected are being used as foundation seed and their origination followed according to MN Crop Improvement Association's (MCIA) "Yellow Tag" program.

Letters were received from 31 landowners and 18 County Townships giving us permission to conduct native plant inventories and then collect seed and plant materials. MCIA was contracted to perform site inspections, identification, and verification of native species in order for the seeds collected to maintain their "Yellow Tag" eligibility. We received an overwhelming response for us to plant on 1589 acres. Many properties had several areas in which we planted seed or seedling plugs which we successfully grew.

In June 2009 four interns were hired and put to work learning plant and seed identification and seed stratification requirements. Daily tasks included identifying prairie remnants or sites with local ecotype native species, planting trays, using GPS to mark species locations on large sites, placing no mow signs in selected ditches, shelling and cataloguing seed types and amounts collected. Seeds were collected from 104 different species of which 34 species could be considered at-risk for further decline.

Projects Results Use and Dissemination
Articles were published in Martin SWCD's Conservation Update and several radio spots were aired discussing this project to update county residents on our progress. We also set up information booths at various community events and we always had photographs and talked about what we were doing with the project.

FINAL REPORT RECEIVED - AWAITING REVISION

Project completed: 6/30/2010

Back to top of page

Best Practices for Native Prairie Management
Subd. 3o $45,000

Michelle Snider
Minnesota Recreation and Park Association
200 Charles Street NE
Fridley, MN 55432

Phone: (763) 571-1305 x100
Email: snider@mnrecpark.org
Fax: (763) 571-5204
Web: http://www.mnrpa.org

Overall Project Outcomes and Results
The 2004 LCMR Parks Study and the 2003-2008 State Comprehensive Outdoor Recreation Plan (SCORP) recommended better coordination among Minnesota's outdoor recreation providers. This project addressed these recommendations by engaging public and private outdoor recreation leaders to transform better coordination into shared knowledge and practices.

Two native prairie demonstration projects will identify best management practices and maintenance methodologies as the sites continue to mature. The first native prairie demonstration area is located within Cedar Creek Ecosystem Science Reserve in East Bethel, Minnesota. One-half of the area was mowed, and one-half was burned prior to seeding. This 23-acre demonstration area features five treatments: burn/broadcast seed; burn/drill seed; mow/broadcast seed; mow/drill seed; and forb plantings.

The second native prairie demonstration project is located within two city parks in Hutchinson, Minnesota. The two areas' objectives were to restore turf back to native prairie, and to further an oak savanna restoration. This approximately 10-acre demonstration area (total acreage within the two sites) features four treatments: drill seed near lowland river area; broadcast seed near high-ground river area; hand-seed; and over-seeding of a continued restoration project.

Three regional workshops were conducted to exchange information and techniques used during the demonstrations, and overall native prairie best practices. The first regional workshop focused on native prairie impacts, research, and reconnecting children to nature. Session content included biodiversity and its impacts on prairie ecosystems; bioenergy; climate; productivity and resistance to drought, disease, and pests; and reconnecting children with the native environment by teaching them the value of the native prairies, lands, and waterways.

The second regional workshop was designed to gather a cross-section of professionals to discuss strategies and solutions for best practices in native prairie management. Session content included best practices in native prairie management from numerous perspectives: engineering, wildlife, natural resources, park resources, and water resources. Workshop presenters also provided information on partnerships, stormwater program and vegetation, prairie maintenance, prairie seed installation, and forestry inventories.

The third regional workshop centered on small and large suburban native prairie areas. Session content included prairie and native plant/tree protection and restoration; and agricultural development that has been one of the largest sources of local habitat removal with current efforts to restore these prairies to their original native habitats. Workshop presenters also provided information on efforts to convert 600 acres of former agricultural land to native prairie and wetland.

Projects Results Use and Dissemination
The two demonstration areas were components of two of the regional workshops to share the site preparation, seed selection, and methodology information with participants. Project results have been provided within the Minnesota Recreation and Park Association's 2009 annual report, and Minnesota's state report during National Recreation and Park Association meetings.

Additionally, project updates are included on the Minnesota Recreation and Park Association's website and the best practices website. Further project results dissemination will be shared during Minnesota Recreation and Park Association educational conferences and trainings.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Impacts of Climate Change and CO2 on Prairie and Forest Production
Subd. 3p $180,000

Peter Reich
University of Minnesota
1530 Cleveland Ave N
St. Paul, MN 55108

Phone: (612) 624-4270
Email: preich@umn.edu
Fax: (612) 625-5212
Web: http://www.forestry.umn.edu/people/facstaff/reich/

RESEARCH

Biofuels from perennial plants could be an important part of Minnesota's energy future; however, much uncertainty surrounds the growth potential and carbon sequestration potential of different perennial biofuels, especially with respect to anticipated changes in climate and atmospheric chemistry over the next century. The University of Minnesota will accelerate research simulating future climate and atmospheric conditions to determine their impacts on biomass production, carbon sequestration, and water quality in prairie and tree species.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Biofuel Production and Wildlife Conservation in Working Prairies
Subd. 3q $500,000

Clarence Lehman
University of Minnesota
100 Ecology Building,1987 Upper Buford Circle
St. Paul, MN 55108

Phone: (612) 625-5734
Email: lehman@umn.edu
Fax: (612) 624-6777
Web: http://www.cbs.umn.edu/eeb/faculty/LehmanClarence/

RESEARCH

Biofuels are likely to be an important component of future energy production. Biofuel production in Minnesota and around the globe has the potential to either improve conditions for wildlife species or make conditions markedly worse. The University of Minnesota will identify and research management practices that promote wildlife conservation and associated habitat biodiversity on future working prairies used for renewable bioenergy production.

Project due to be completed: 6/30/2011
Work Program

Subd. 4 Water Resources

Back to top of page

Future of Energy and Minnesota Water Resources
Subd. 4a $270,000

Sangwon Suh
University of California - Santa Barbara
3422 Bren Hall
Santa Barbara, CA 93106-5131

Phone: (805) 893-7185
Email: suh@bren.ucsb.edu

RESEARCH

Overall Project Outcome and Results

Minnesota's water resources are poised to undergo significant changes in the coming decades. For example, with new bioenergy policies aiming to reduce fossil fuel dependency, Minnesota has become one of the top five bioethanol producers in the United States in the past two decades. Bio-energy production, together with increasing population, energy demand, and climate uncertainties present a great challenge for water authorities seeking to sustainable future water supply. There is an urgent need to integrate an analysis of demands on Minnesota's water resources with scenarios of future energy production. This project aimed to envision Minnesota's temporal and spatial water schemes by 2030 in response to population, energy, and climate scenarios, by integrating a system dynamics model with geographic information system (GIS) data. We developed an integrated spatial model that analyzes the future of Minnesota's water budget with particular attention to changes in water demand under different scenarios. Key trends incorporated into the scenarios include (1) biofuel production (considering water needs for irrigation of the biofuel feedstock as well as for processing); (2) changes in the electricity grid mix considering Minnesota's Renewable Energy Standards; (3) demographic changes; and (4) climate change. Scenarios of water demand was combined with GIS mapping and water balance techniques, which can deliver spatially and temporally explicit water budget projections for each scenario.

The results indicate that population growth and increasing demand on electric power generation are two primary factors driving increasing future water demand in Minnesota. Water management should be coupled with urban development and planning to reduce water stress induced by population growth and electric power generation. Late summer and winter are two periods of time in which it is particularly challenging to support human demand of water without the potential of drawing down the water resources. This report produced by this project presents maps and regional monthly water availability graphs for various scenarios tested in this study. These system characteristics shown in the current scenario analysis can play an important part of future water conservation and management planning.

Project Results Use and Dissemination
The study results were presented in more than four national and international conferences hosted in the US and Portugal, in which a poster summarizing the findings of this study won the poster contest in the prestigious Gordon Research Conference in 2010. One paper was published in a high-impact journal, Environmental Science and Technology (ES&T) in 2009; the paper was one of the top-three most-cited and downloaded articles in September, 2009. Another, follow-up article has been submitted to the same journal and is currently under review. In 2008, a round-table forum was hosted at the University of Minnesota to discus water sustainability modeling and its application. Scholars from state agencies, research institutes, and NGOs attended the forum to brainstorm feasible frameworks for assessing Minnesota's water future under different uncertainties. Detailed information of the presentations in this forum and relevant supporting information can be found at http://www.iel.umn.edu/forum/waterforum.htm PI. Suh is participating in a publication by the United Nations Environmental Programme (UNEP) on biofuel's water implication as an author based on the knowledge and findings gathered from this project. The publication is expected to be released in early 2010.

PROJECT PUBLICATION: The Future of Energy and Minnesota's Water Resources

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Accelerating Plans for Integrated Control of the Common Carp
Subd. 4b $550,000

Peter Sorensen
University of Minnesota
1980 Folwell Ave
St. Paul, MN 55108

Phone: (612) 624-4997
Email: soren003@umn.edu
Fax: (612) 625-5299
Web: http://fwcb.cfans.umn.edu/sorensen/

RESEARCH

The common carp, first introduced and widely distributed across the United States in the late 1800s, is one of the most damaging invasive fish species in Minnesota and around the country. Common carp reduce food sources needed by native fish, stir up sediment and reduce water clarity, and harm underwater plants that maintain water quality and provide food and shelter for other fish. Various methods of control have proven either unsuccessful or environmentally damaging. These funds enable the University of Minnesota to continue, expand, and accelerate research into new and better options for controlling common carp by building upon major findings from a previous Environment and Natural Resources Trust Fund funded phase of this research [ML 2005, First Special Session, Chapter 1, Article 2, Section 11, Subd 5(g)], which identified

recruitment (i.e. the process by which newly hatched fish survive to a year in age) as a key weakness in the life history of the common carp.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Testing Pesticides and Degradates in Public Drinking Water
Subd. 4c $368,000

John Hines
MN Department of Agriculture (MDA)
625 Robert St N
St Paul, MN 55155

Phone: (651) 201-6694
Email: john.w.hines@state.mn.us
Fax: (651) 201-6117
Web: http://www.mda.state.mn.us/chemicals/pesticides/maace.aspx

Overall Project Outcome and Results
Pesticides are known to impact Minnesota's groundwater and there are new pesticides being developed and registered for use every year. To ensure the safe use of new pesticides it is essential to measure the concentration and frequency of their detection in the state's water resources. In addition it is critically important, for proper pesticide management, to be able to analyze water samples for the compounds parent pesticides break down into. It is only through the precise measurement of extremely small quantities of pesticides in the state's water resources that impacts to human and ecological health may be determined.

Through this project the Minnesota Department of Agriculture (MDA) laboratory acquired the necessary analytical equipment and developed appropriate analytical methods for analyzing water samples for additional new generation pesticides and their degradates in groundwater and drinking water in Minnesota. The new equipment and related methods expanded the spectrum of compounds the MDA is able to detect in water samples, increased precision of water sample analysis, and improved the overall efficiency of water sample analysis at the MDA. Furthermore, the MDA laboratory is now capable of measuring many pesticides to levels of sub parts-per-trillion in a water sample. Measures of such precision will allow the MDA to manage pesticide use to keep concentrations below levels injurious to humans or the environment.

Prior to completion of this project the MDA was able to analyze water samples for 36 pesticide parent compounds and 11 breakdown products. The new methods are able to analyze samples for 88 parent pesticides and 22 breakdown products. Before the new methods were developed the lowest measurable value for a specific pesticide was between 50 and 1000 parts-per-trillion while the laboratory is now able to measure pesticide quantities between 0.8 and 50 parts-per-trillion, depending on the specific pesticide being measured.

Sample results for monitoring conducted by the MDA during winter and spring periods in 2010 are showing interesting results. A small number of pesticides never before discovered have been detected, albeit at very low concentrations. A clearer image of the occurrence of various pesticide breakdown products is also beginning to emerge and ongoing work should provide insight to the balance between pesticide parent and degradate detections in the state's water resources. These results will also allow the MDA to more precisely determine pesticide impacts to the water resources and aid in understanding the effectiveness of recommended BMPs and other pesticide management practices.

To the degree that time and lab resources allow, the equipment purchased and methods developed through this project will also be available for use by any future publicly funded projects at no cost except standard operating expenses.

Project Results Use and Dissemination
Immediately following successful development of the new methods the MDA laboratory analyzed 100 samples from public drinking water wells across the state. These wells were selected and sampled by the Minnesota Department of Health from the available community wells that are not typically included in the US-EPA Safe Drinking Water Act pesticide monitoring requirements. As of this report results are just becoming available. Results of the testing will be made available by the Department of Health following proper notification of the participating communities.

In addition to the one time sampling of the community wells, every sample collected by the MDA monitoring program for both surface water and groundwater will be analyzed with the new methods. The first results from the MDA monitoring program samples will be published in mid 2011 as part of the program's annual water quality monitoring data report. Development of the methods and analysis of samples utilizing the methods will also be reported to the US-EPA as part of the federal reporting requirements enabling the registration of pesticides for use in the state of Minnesota.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Assessment of Riparian Buffers in the Whitewater River Watershed
Subd. 4d $52,000

Megan Kranz-McGuire
Whitewater Joint Powers Board
400 Wilson St, Box 39
Lewiston, MN 55952

Phone: (507) 523-2171
Email: megankm@charterinternet.com
Fax: (507) 523-3717
Web: http://www.whitewaterwatershed.org

Funds enable an effort in southeastern Minnesota led by the Whitewater Joint Powers Board that will assist in the prioritization of stream restoration efforts to improve water quality and habitat and in the enforcement of riparian buffers. An inventory of streams and adjacent land use and a survey of riparian landowners throughout the region will be conducted.

FINAL REPORT RECEIVED - CURRENTLY UNDER TECHNICAL REVIEW

Project completed: 6/30/2010
Work Program

Back to top of page

Intra-Lake Zoning To Protect Sensitive Lakeshore Areas
Subd. 4e $125,000

Paul Radomski
MN Department of Natural Resources (DNR)
1601 Minnesota Dr
Brainerd, MN 56401

Phone: (218) 833-8643
Email: paul.radomski@dnr.state.mn.us
Fax: (218) 828-6043
Web: http://www.dnr.state.mn.us

Funds continue and expand a previous Environment and Natural Resources Trust Fund funded cooperative effort [ML 2007, Chap. 30, Sec. 2, Subd. 5(h)] between Cass County and the Department of Natural Resources (DNR) to identify sensitive shorelines on highest priority area lakes and implement innovative zoning practices to protect water quality and lakeshore habitat.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Native Shoreland Buffer Incentives Program
Subd. 4f $225,000

Erika Rivers
MN Department of Natural Resources (DNR)
1201 E Highway 2
Grand Rapids, MN 55744

Phone: (218) 999-7914
Email: erika.rivers@dnr.state.mn.us
Fax: (218) 327-4263
Web: http://www.dnr.state.mn.us

Shoreline buffers of native vegetation filter excess nutrients and pollutants from runoff and provide habitat. Across Minnesota, thousands of shoreline miles of native vegetation buffers have been stripped because landowners lacked understanding of the important ecological function of buffers and any incentive for maintaining them. These funds enable the Department of Natural Resources (DNR) to accelerate a native shoreland buffer incentive program through market research, technical assistance, and competitive matching grants of $75,000 to local governments to craft and implement shoreland protection incentive programs that encourage maintaining and restoring native shoreland buffers.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Southeast MN Stream Restoration Projects
Subd. 4g $240,000

Jeff Hastings
Trout Unlimited
E7740 Hastings Ln
Westby, WI 54667

Phone: (608) 606-4158
Email: jhastings@tu.org
Web: http://www.tu.org/driftless

Early European settlement and agricultural practices from the 1850's to the 1930's left a legacy of erosion, flooding, and alteration on coldwater streams in southeast Minnesota that is still negatively impacting those streams today. Funds enable Trout Unlimited to accelerate streambank stabilization and restoration on at least six miles of stream in southeast Minnesota while simultaneously building the capacity of area government agencies and private citizens to implement future stream restoration projects.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

South-Central MN Groundwater Monitoring and County Geologic Atlases
Subd. 4h $1,600,000

Part 1 ($706,000)
Dale Setterholm
Minnesota Geological Survey
University of Minnesota
2642 University Ave. W.
St. Paul, MN 55114

Phone: 612) 627-4780
Email: sette001@umn.edu
Fax: (612) 627-4778
Web: http://www.geo.umn.edu/mgs/

Part 2 ($894,000)
Jim Berg
MN Department of Natural Resources (DNR)
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 259-5680
Email: jim.berg@dnr.state.mn.us
Fax: (651) 296-0445
Web: http://www.dnr.state.mn.us

The Minnesota Geological Survey and the Department of Natural Resources (DNR)will continue their joint long-term effort of mapping the location, size, boundaries, and vulnerability of the state's groundwater to support wise use and protection of groundwater and other resources. In this phase of work, DNR will: 1) develop a plan for a statewide network of water level

monitoring wells, and 2) investigate physical and recharge characteristics of the Mt. Simon Aquifer - the deepest bedrock aquifer of south central Minnesota and the Twin Cities metro area. In this phase of work, Minnesota Geologic Survey will: 1)initiate atlases in Blue Earth, Le Sueur, and Nicollet counties, and 2)provide processing and analysis support for the DNR's drilling work.

Project due to be completed: 6/30/2011
Work Program - Dale Setterholm
Work Program - Jim Berg

Back to top of page

Lake Superior Research
Subd. 4i $86,000 (GLPA)

Steve Colman
University of Minnesota
Large Lakes Observatory, UMD
2205 E. 5th St.
Duluth, MN 55812

Phone: (218) 726-8522
Email: scolman@d.umn.edu
Fax: (218) 726-6979
Web: http://www.d.umn.edu/llo

RESEARCH

Overall Project Outcome and Results
There is a surprising lack of study and understanding of the ecosystems of the Great Lakes and their properties, especially in the deepwater basins. We know more about many marine systems than we know about the Great Lakes. With current concerns about the environmental health of the Great Lakes, studies supported through this project aimed to contribute to alleviating some of the unknowns. A series of studies were conducted that research the condition, functioning, and processes of Lake Superior, its sediments, and its ecosystem including:

- Studies related to the entire living ecosystem, from top predator fish down to picoplankton.
- Studies of the circulation of the lake using numerical models and oceanographic instrumentation.
- Studies of the water column including the balance between CO2 production and oxygen consumption, the processes related to the fate of organic matter and nutrients, and the effect of these and other water column processes on primary producers.
- Studies of the transport and delivery of organic and inorganic materials to the lake floor as sediments that accumulate in deep waters of the lake and the erosion, transport, and storage of coarse-grained sediment in coastal waters.

In all of these studies, we took a holistic, "physics to fish" approach, examining the interactions between physical and biological processes.

We conducted a total of 24 field projects, with project funds going primarily to the cost of using of our research ship for an aggregate of 53 days at sea. Project funds leveraged other funding as most of these studies were small pilot projects, extensions to projects funded from other sources, and projects to collect preliminary data often required for proposals to the national science agencies. The projects have a common theme of understanding the dynamics of Lake Superior, its sediments, and its ecosystem. Through these studies, we hope to provide Minnesotans, from lay citizens to environmental managers, a better understanding of how Lake Superior works and how it might change in response to climate change and human activity.

Project Results Use and Dissemination
We have now collected a wealth of environmental data for Lake Superior. A significant part of those data have already been used for larger research proposals to the National Science Foundation and other agencies, some of which have already been successful in bringing new federal funding into the state. Plans are for the results of studies supported through this project to be published in peer-reviewed journals where they will be available to Minnesota managers and regulators. With other funding, we are in the process of developing a system called the Global Great Lakes Data and Modeling Center, which will allow incorporation and assimilation of existing data, new data like those collected in this project, and ongoing real-time observational data. The Data and Modeling Center will allow numerical models to be run and compared in real time using the different data sets and make all data readily available though an internet interface.

FINAL REPORT

Project completed: 10/31/2009

Subd. 5 Natural Resource Information

Back to top of page

Updating the National Wetlands Inventory for Minnesota
Subd. 5a $550,000

Doug Norris
MN Department of Natural Resources (DNR)
500 Lafayette Rd, Box 25
St. Paul, MN 55155

Phone: (651) 259-5125
Email: doug.norris@dnr.state.mn.us
Fax: (651) 296-1811
Web: http://www.dnr.state.mn.us/eco/wetlands/index.html

Wetland inventories are an essential tool for effective wetland management, protection, and restoration. The data is used at all levels of government, as well as by private industry and non-profit organizations, for wetland regulation and management, land use and conservation planning, environmental impact assessment, and natural resource inventories. The original National Wetland Inventory for Minnesota is outdated and updating the data for Minnesota has been identified as an important priority. Funds enable the DNR to begin a multi-phase process of updating the National Wetland Inventory statewide.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Soil Survey
Subd. 5b $400,000

Megan Lennon
MN Board of Water and Soil Resources (BWSR)
520 Lafayette Road North
Saint Paul, MN 55155

Phone: (651) 296-1285
Email: megan.lennon@state.mn.us
Fax: (651) 297-5615
Web: http://www.bwsr.state.mn.us

Overall Project Outcome and Results
Accurate soils information is essential for evaluating the potential for land to support development, crop and forest production, and for identifying the most suitable locations for conservation practices and other land uses. Readily accessible local soil information is critical to informing conservation decisions and provides a foundation for sustainable land use planning. The soil survey is the mechanism for how this basic natural resource information is made available to land use authorities and landowners to make the best land use decisions.

In the ongoing, multi-year project to map, classify, interpret, and Web-publish an inventory of the soils of Minnesota, this one-year phase of the project focused on accelerating the completion of a Statewide soil survey, increase soil mapping in targeted areas, and enhancing soils data through increased sample collection, availability, and interpretation. Specifically:

1. 71,000 acres mapped in Crow Wing County;
2. 32,000 acres mapped in Pine County;
3. 85,000 acres mapped in Koochiching County;
4. 80,000 acres mapped in the Crane Lake subset of St. Louis County;
5. Data from 1,000 soil samples (some dating back to the 1970's) were interpreted for the first time and incorporated into Soil Surveys for many Minnesota counties;
6. Landuse effects on soil carbon were determined on 118 sites in 14 counties throughout the State, this data can be used to develop soil carbon management guidance.

The soil survey project was extremely successful and many of the mapping goals were exceeded. Mapping surpassed initial acreage goals in both Crow Wing and Pine Counties, and the soil surveys for Koochiching and St. Louis Counties were completed 1 year ahead of schedule. A report detailing the results of re-analysis of lab samples from the 1970's highlighting landuse impacts on soil carbon will be available in January 2011.

Project Results Use and Dissemination
The Soil Survey project funded by the Minnesota Environment and Natural Resources Trust Fund is highlighted as a BWSR feature project (www.bwsr.state.mn.us/projects/soil_survey.pdf) on the Agency's homepage. All the data, mapping information, and interpretations are available on the Web Soil Survey as a user-friendly, GIS-based application. Web Soil Survey provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Updating Precipitation Intensities for Runoff Estimation and Infrastructure Designs
Subd. 5c $100,000

Bruce Wilson
MN Pollution Control Agency (PCA)
520 N Lafayette Rd
Saint Paul, MN 55155

Phone: (651) 282-2619
Email: bruce.wilson@state.mn.us
Fax: (651) 297-8337
Web: http://www.pca.state.mn.us

Accurate estimates of rainfall intensities and duration are necessary for detection of climate change and related consequences for natural resources management and infrastructure design efforts. Most existing estimates are based on data that has not been updated since 1961, and which is believed to not reflect current rainfall patterns as altered by climate change. Funds enable to the Pollution Control Agency to participate in a multi-state cooperative effort with the National Oceanic and Atmospheric Administration to obtain updated climate change related rainfall frequencies. This data will have broad application for storm water conveyance and infrastructure design throughout Minnesota.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

The MN Breeding Bird Atlas
Subd. 5d $270,000

Part 1 ($169,000)
Mark Martell
Audubon Minnesota
2357 Ventura Dr, Ste 106
St. Paul, MN 55125

Phone: (651) 739-9332
Email: mmartell@audubon.org
Fax: (651) 731-1330
Web: http://www.mnbba.org/

Part 2 ($101,000)
Gerald Niemi
Natural Resources Research Institute (NRRI) - University of Minnesota
5013 Miller Trunk Hwy
Duluth, MN 55811

Phone: (218) 720-4270
Email: gniemi@nrri.umn.edu
Fax: (218) 720-4328
Web: http://www.mnbba.org/

PART 1: AUDUBON MINNESOTA

Overall Project Outcome and Results
These were the first 2-years of an anticipated six-year effort which will result in a comprehensive, statewide survey documenting the breeding distribution of all species of birds in Minnesota. After six years the final atlas products will include the publication of a book and an interactive on-line atlas, both with detailed distribution maps, data on species breeding status, and a summary of data from other surveys. Full access to the information will be provided to the public as well as conservation agencies and organizations.

The first two years of the project, focused on project development, volunteer recruitment, establishment of a data management system, and 2 seasons of data collection. This is a statewide multi-partner project overseen and advised by steering and technical committees. One full-time and one part-time temporary project staff were hired during this period and were assisted by 30 volunteer coordinators overseeing 638 volunteer surveyors. Written materials, workshops, and field sessions were used to recruit and train participants in the project. A data access and information website was established (http://www.mnbba.org) and we contracted with Cornell University to adapt their web-based data entry, management, and reporting system (the e-bird database) to our project (http://bird.atlasing.org/Atlas/MN/Main?cmd=Start). The MNBBA website and the Cornell database are linked and complement each other.

Each Township in the state is divided into 4 "blocks" with one block (usually the NE) designated as the "priority block". Data collection began in spring of 2009 and by the end of the six-year project will include every one of the approximately 2,120 Township in Minnesota. An all-species, volunteer driven survey, and a separate specialized "point count" survey (overseen by NRRI) will be conducted in each of townships across the state. By June 30, 2010 data had been entered into our database from 2,076 survey blocks. The 638 volunteers reported spending 6,939 hours doing surveys. A total of 48,425 individual sightings were submitted on 238 species.

Project Results Use and Dissemination
Results from the Breeding Bird Survey are updated daily and available on our website at http://www.mnbba.org. Further analysis and dissemination of the data will be available at the conclusion of the project at the end of year 6 or 7. To date the Minnesota Breeding Bird Atlas has received coverage in a number of newspapers statewide and various organizational publications and newsletters.

FINAL REPORT

Project completed: 6/30/2010

PART 2: NRRI

Overall Project Outcome and Results
This project is the first two-years of an anticipated six-year effort in the development of the Minnesota Breeding Bird Atlas - the first-ever comprehensive survey of Minnesota's breeding birds. The overall project is divided into two parts - 1) volunteer observations organized by Audubon Minnesota and 2) systematic surveys of Minnesota's breeding birds organized by the University of Minnesota (summarized here). Because of the vastness of Minnesota, both of these efforts are necessary and complementary. Objectives of this portion of the project were to gain uniform statewide coverage for all of Minnesota's birds, estimate breeding bird populations by habitat type, and contribute to a nationwide network of bird atlases in the United States. The first two years of this project focused on the experimental design to sample all townships in Minnesota over a five-year period, an interactive data entry system, data gathering using standard 10-minute point counts, and a brief data summary. Data gathering was primarily completed by graduate and undergraduate students at the University of Minnesota, Duluth and Twin Cities campuses. All were required to pass a test of 80 bird songs, verify their hearing ability, and participated in field standardization exercises.

Over the two breeding seasons (2009 and 2010) covered by this project, the target of 40% of Minnesota townships (>920) was sampled. We observed over 200 species of birds and counted over 78,000 individual birds during the first two years of these efforts in over 950 townships and in over 2800 individual point counts. In addition, all bird censusers contributed thousands of observations to the volunteer data base in the complementary study organized by Audubon Minnesota, including over 4,000 probable or confirmed breeding records for Minnesota birds. Over 98 % of the data gathered in 2009 and 2010 have been entered and error checked.

Project Results Use and Dissemination
These data will be downloaded to the Minnesota breeding bird atlas during the fall of 2010 through the Cornell University interface. All of these data will be incorporated into a comprehensive atlas of Minnesota's breeding birds that will be used as 1) a first-ever baseline on the current population status of this important Minnesota resource, 2) critical information for future conservation planning, and 3) as a guide for such activities as identifying important bird areas or for nature-based tourism activities.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Restorable Wetlands Inventory
Subd. 5e $245,000

Darin Blunck
Ducks Unlimited, Inc.
1 Waterfowl Way
Memphis, TN 38103

Phone: (901) 758-3788
Email: dblunck@ducks.org
Fax: (701) 355-3575
Web: http://www.ducks.org

Overall Project Outcome and Results
The Restorable Wetlands Inventory (RWI) is a complement to the National Wetlands Inventory (NWI) completed in late-1980s by the U.S. Fish & Wildlife Service. An administrative decision was made developing the original NWI not to map wetland basins in Minnesota identified as completely drained. The number and acreage of completely drained wetlands that were not mapped by the NWI process is significant.

The RWI project identifies and digitizes the completely-drained depressional wetlands that were not mapped by the NWI process. Restorable wetlands mapping is based upon protocols established for NWI allowing seamless integration of the two datasets.

In the Southwest Prairie Complex, over 300,000 individual restorable wetland basins were identified and mapped. Upon completing the Southwest Prairie Complex mapping, townships in 42 western and south-central counties in the prairie and transition zone eco-regions of Minnesota have been mapped, adding an important component to the State's spatial data infrastructure that informs environmental planning and research. Through this investment in RWI - combined with the National Wetlands Inventory, landcover classifications, and a growing catalogue of high-resolution elevation data - our capacity to understand (and importantly, restore and manage) Minnesota's wetland resources is continuing to improve.

Project Partners were the LCCMR, Ducks Unlimited, Inc., and the U.S. Fish and Wildlife Service. The photo-interpretation and digitization work was contracted to the GIS Lab at South Dakota State University.

Project Results Use and Dissemination
The Restorable Wetlands Inventory mapping product for the Southwest Prairie Complex is complete and will be distributed on the Minnesota Data Deli and Ducks Unlimited, Inc. websites by the end of August 2010 in GIS-compatible formats.

Attached are maps showing mapping extent of the current M.L. 2008 appropriation and the cumulative RWI mapping effort.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Wildlife Disease Data Surveillance and Analysis
Subd. 5f $100,000

Patrick Redig
University of Minnesota
1920 Fitch Ave
St. Paul, MN 55108

Phone: (612) 624-4969
Email: redig001@umn.edu
Fax: (612) 624-8740
Web: http://www.theraptorcenter.org

RESEARCH

Overall Project Outcome and Results

Wildlife is an integral part of the complex interrelationship between human, animal, and environmental health, yet there is no centralized system for collection of wildlife health data. The study of wildlife health is limited by the logistics and expenses involved with sample acquisition. Wildlife rehabilitation centers represent an untapped resource as they admit a larger number of wild animals with a greater variety of species than any other resource.

This project developed a centralized database for tracking morbidity and mortality of wildlife seen in wildlife rehabilitation centers in Minnesota. A central goal was the development of standardized terminology, a critical step in the ability to integrate data from multiple rehabilitation centers. Initially, a survey was designed and distributed to ascertain current practices for clinical wildlife health data management. Next, a series of workshops was held with experts in the field of wildlife health to define data sets for signalment, animal recovery information, cause of admission and initial clinical signs. The animal recovery and signalment descriptors were used to integrate 10 years of historical data from Minnesota's two largest wildlife rehabilitation facilities. This established baseline data for normal patterns of wildlife admissions and created a preliminary GIS and web-based information system. A pilot project involving six wildlife hospitals focusing on avian species susceptible to lead poisoning, was begun to evaluate the functionality of the circumstances of admission, clinical signs and pathophysiological diagnosis terminology. This project is ongoing.

The results of this project were instrumental in the creation of a template for wildlife health data reporting and the development of a system for surveillance of wildlife health issues. This information will be important for wildlife conservation projects, wildlife management, disease surveillance, and as an indicator of ecosystem health. The data can be accessed through the new web site, http://wildlifedisease.nbii.gov/cwhi/, or by contacting The Raptor Center.

Project Results Use and Dissemination
The information resulting from this project has already been used to inform the development of a wildlife health reporting system being developed by the Wildlife Center of Virginia and to be distributed to wildlife rehabilitation centers around the country. A secondary outcome of this project, the development of a collaborative group called the Clinical Wildlife Health Initiative, has resulted in the expansion of this work to a national level. Discussions are underway on the potential use of this information in the United States Fish and Wildlife Service permitting process for rehabilitation center reporting, as well as the use of the new system for long-term monitoring at rehabilitation centers along the Gulf Coast as a result of the Deepwater Horizon Oil Spill.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Conservation Easement Stewardship, Oversight and Maintenance
Subd. 5g $180,000

Kevin Lines
MN Board of Water and Soil Resources (BWSR)
520 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 297-8025
Email: kevin.lines@bwsr.state.mn.us
Fax: (651) 297-5615
Web: http://www.bwsr.state.mn.us

Funds enable the Board of Water and Soil Resources (BWSR) to enhance long-term stewardship, oversight, and maintenance of conservation easements held by BWSR.

Project due to be completed: 6/30/2011
Work Program

Back to top of page

Conservation Easement Stewardship and Enforcement Program Plan
Subd. 5h $520,000

Kathy Lewis
MN Department of Natural Resources (DNR)
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 259-5404

Email: kathy.lewis@dnr.state.mn.us
Fax: (651) 296-6047
Web: http://www.dnr.state.mn.us

Co-Project Manager
Susan Damon
MN Department of Natural Resources (DNR)
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 259-5961
Email: susan.damon@dnr.state.mn.us
Web: http://www.dnr.state.mn.us

Funds enable the Department of Natural Resources (DNR) to inventory anddigitize conservation easements held by DNR and to prepare a plan for long-term stewardship, monitoring, and enforcement of those easements.

Project due to be completed: 6/30/2011
Work Program

Subd. 6 Environmental Education

Back to top of page

Waters of Minnesota Documentary on Watersheds
Subd. 6a $349,000

Barbara Coffin
Bell Museum of Natural History - University of Minnesota
10 Church St SE
Minneapolis, MN 55455

Phone: (612) 624-4986
Email: bcoffin@umn.edu
Fax: (612) 626-7704
Web: http://www.bellmuseum.org/

Overall Project Outcome and Results
The documentary film that resulted from this project, Troubled Waters: A Mississippi River Story, examines our relationship to the Mississippi River and its surrounding watershed through the competing interests of food, fuel, and environment. Excess nitrogen and phosphorus, fertilizers essential to the growth of plants, are contaminating the nation's rivers, lakes, and aquifers at the same time as precious soils wash away. The film tells the complex story of these troubled waters, both here in Minnesota and downstream as far away as the Gulf of Mexico, and highlights innovative solutions, such as high-tech farmers that practice precision agriculture and conservation farming methods; cattle farming while maintaining perennial cover on the landscape; and new technologies that hold water back on the land. Farmers, scientists, and entrepreneurs offer new ideas for meeting the goals of an ambitious, food-producing nation while ensuring the long-term health and sustainability of one of its most precious resources: the Mississippi River and its watershed.

Engaging, serious, and hopeful documentary video has proven to be an innovative and effective environmental education tool that reaches a broad audience of students and adults. Following the successful model of the recent Emmy award-winning television series Minnesota: A History of the Land, this new documentary will be broadcast on public television and be available in DVD format for local distribution.

Project Results Use and Dissemination
Troubled Waters: A Mississippi River Story will be broadcast on Twin Cities Public Television. Subsequent broadcasts are planned for the Minnesota Channel. Public television stations along the length of the Mississippi River will have the opportunity to air the film. A public premiere screening event is planned for October 3, 2010. The documentary is available in professional quality DVD format for educational uses. The DVD will be distributed to Mississippi River venues (e.g. the National Mississippi River Museum & Aquarium and Mississippi National River and Recreation Area Interpretive Center).

View **"Troubled Waters: A Mississippi River Story"** online for free on the Twin Cities Public Television website.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Global Warming - Reducing Carbon Footprint of Minnesota Schools
Subd. 6b $750,000

William Sierks
MN Pollution Control Agency (PCA)
520 N Lafayette Road, Ste. 200
Saint Paul, MN 55155

Phone: (651) 757-2722
Email: bill.sierks@state.mn.us
Fax: (651) 215-0246
Web: http://www.pca.state.mn.us

Funds will be used by the Pollution Control Agency (PCA) to provide information and technical assistance and to enact a grant program designed to help high schools, colleges, and universities to play a key role in addressing climate change. Up to 100 schools statewide will receive guidance and assistance identifying their carbon footprints and developing and implementing plans to reduce carbon emissions.

Project due to be completed: 6/30/2011
Work Program

Subd. 7 Establishment of an Emerging Issues Account

Back to top of page

Emerging Issues Account
Subd. 7 $155,000

Susan Thornton, Director
LCCMR
100 Rev. Dr. Martin Luther King Blvd.
Rm 65 State Office Bldg
St. Paul, MN 55155

Phone: (651) 296-2406
Email: susan.thrornton@lccmr.leg.mn
Fax: (651) 296-1321
Web: http://www.lccmr.leg.mn

Funds will be used by the LCCMR to provide assistance for an unexpected, urgent, or emergency need where time is of the essence, as authorized in Minnesota Statutes, section 116P.08, subdivision 4, paragraph (d).

WENT TO:

Statewide Ecological Ranking Conservation Reserve Program (CRP) and Other Critical Lands - $155,000 (completion date for this portion is 6/30/2010)

Other funds include:
M.L. 2007, Chp. 30, Sec. 2, Subd. 7 "Emerging Issues Account" - $13,000 (completion date for this portion is 6/30/2009)

M.L. 2009, Chp. 143, Sec. 2, Subd. 4g "Statewide Ecological Ranking of Conservation Reserve Program (CRP) and Other Critical Lands" - $107,000 (Project due to be completed: 6/30/2011)

Project due to be completed: 6/30/2011

2007 PROJECTS

MN Laws 2007, Chapter 30, Section 2 (beginning July 1, 2007)

NOTE: For all projects, contact us to obtain the most up-to-date work programs for current projects (project updates are required twice each year) or the final reports of completed projects.

The following documents are short abstracts for projects funded during the 2007 Legislative Session. The final date of completion for these projects is listed at the end of the abstract. When available, we have provided links to a projects web site. The sites linked to this page are not created, maintained, or endorsed by the LCCMR office or the Minnesota Legislature.

Subd. 3 LCCMR and Contract Administration

3a Legislative-Citizen Commission on Minnesota Resources
3b Contract Administration

Subd. 4 Land

4a Forest Legacy Conservation Easements
4b Minnesota's Habitat Corridors Partnership - Phase IV
4c Metro Conservation Corridors (MeCC) - Phase III
4d Prairie Stewardship Assistance for Private Landowners
4e State Parks and Trails Land Acquisition
4f Metropolitan Regional Park System Land Acquisition
4g Non-Metropolitan Regional Parks and Natural Scenic Area Acquisition
4h LAWCON Federal Reimbursement
4i Biological Control of European Buckthorn and Garlic Mustard - **RESEARCH**
4j Neutralization of Reed Canary Grass Rood Exudates - **RESEARCH**

Subd. 5 Water Resources

5a Local Water Management Matching Challenge Grants
5b Protection of Rare and Unique Rock Outcrop Wetlands
5c Land Retirement Effects on Minnesota River Basin Streams - **RESEARCH**
5d Demonstrating Benefits of Conservation Grasslands on Water Quality - **RESEARCH**
5e Improved River Quality Monitoring Using Airborne Remote Sensing - **RESEARCH**
5f Evaluating Riparian Timber Harvesting Guidelines: Phase 3 - **RESEARCH**
5g Innovative Springshed Mapping for Trout Stream Management - **RESEARCH**
5h Intra-Lake Zoning to Protect Sensitive Lakeshore Areas
5i Water Resource Sustainability - **RESEARCH**
5j County Geologic Atlas Program Acceleration
5k Minnesota's Water Resources: Impacts of Climate Change - Phase II - **RESEARCH**
5l Pharmaceutical and Microbiological Pollution - **RESEARCH**
5m Threat of Emerging Contaminants to Upper Mississippi Walleye - **RESEARCH**
5n Cedar Creek Groundwater Project using Prairie Biofuel Buffers
5o Pyrolysis Pilot Project

Subd. 6 Natural Resource Information

6a Minnesota County Biological Survey
6b Soil Surveys
6c Field Guide for Evaluating Vegetation of Restored Wetlands
6d For Analysis and Implementation of Critical State Natural Resource Data Collection and Mapping

Subd. 7 Establishment of an Emerging Issues Account

Funding Sources: (**note: all projects are TF, unless otherwise noted)
Environment and Natural Resources Trust Fund (TF)
State Land and Water Conservation Account (LAWCON)

Subd. 3 Administration

Back to top of page

Legislative-Citizen Commission on Minnesota Resources
Subd. 3a $1,278,000

John Velin, Director
LCCMR
100 Rev. Dr. Martin Luther King Blvd.
Rm 65 State Office Bldg
St. Paul, MN 55155

Phone: (651) 296-2406
Email: lccmr@lccmr.leg.mn
Fax: (651) 296-1321
Web: http://www.lccmr.leg.mn

This funding provides for two years of the administration of the LCCMR, its project proposal and recommendation process, and the contract management and project reporting of Trust Fund funded projects. Since 1963, the program that LCCMR is a legacy of has played a foundational role in the appropriation of over $550 million to more than 1,250 projects directly benefiting Minnesota's environment and natural resources.

Project completed: 6/30/2009

Back to top of page

Contract Administration
Subd. 3b $40,000

Bill Becker
DNR
500 Lafayette Rd
St.Paul, MN 55155

Phone: (651) 296-3093
Email: bill.becker@dnr.state.mn.us
Fax: (651) 296-6047
Web: http://www.dnr.state.mn.us

For agency Contract Administration
This funding provides for one year of the monetary administration and accounting of Trust Fund appropriations to projects by non-state entities.

Project completed: 6/30/2009

Subd. 4 Land

Back to top of page

Forest Legacy Conservation Easements
Subd. 4a $2,000,000

Richard Peterson
DNR
1810 30th Street NW
Faribault, MN 55021

Phone: (507) 333-2012
Email: richard.peterson@dnr.state.mn.us
Fax: (507) 333-2008
Web: http://www.dnr.state.mn.us

Overall Project Outcome and Results
The Blufflands landscape of southeastern Minnesota has been identified by the Department of Natural Resources as an important area for conservation. The mix of forest, bluff prairies, and rivers provides habitat for numerous rare and declining

species as well as many common species, and the oak forests are an important source of hardwood logs for area sawmills. Conserving and protecting large blocks of priority forest habitat through working forest conservation easements is a cost effective method to protect forests in an area where nearly 90% of the land is in private ownership.

The goal of this project was to identify and protect the highest priority parcels with working forest conservation easements. All applications were reviewed and ranked according to program ranking criteria (project size, location, forest quality, adjacency to public land, etc). Five applicants from a group of seventeen applicants were selected and appraisals were completed and certified during 2009 and 2010.

Two projects were completed and closed in December 2009, two in June 2010 and the final project closed in October 2010. A total of 1911.61 acres of private forestland and associated habitats in southeastern Minnesota were protected at an average cost of about $1,055/acre. Total funds expended were $2,017,454.4 and includes $1,975,724 from the Environment and Natural Resources Trust Fund and $41,730.4 from Capital Bonding.

The easements will be held by the State of Minnesota, Department of Natural Resources and monitored on a regular basis beginning in 2011.

These five projects are strategically located or nearby other publicly protected lands and these acquisitions help maintain larger blocks of deciduous forest adjacent or nearby public forests and buffer the publicly owned forest land and provide habitat linkages between publicly owned lands. They also contain productive forest resources of predominantly native forest species that have not been subject to any extensive development and which provide valuable habitat for a diversity of wildlife species.

Project Results Use and Dissemination
Project information will be reported in the Forest Legacy Information System for projects used to provide matching funds for the Koochiching Forest Legacy Project which was completed during this Project period. Project information has been used in a recent StarTribune graphic included in a December 15, 2010 article on the forest legacy program accomplishments.

Minimum Standards and Guidelines for State Forest Legacy Easements in Minnesota (pdf file)

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Minnesota's Habitat Corridors Partnership - Phase IV
Subd. 4b $4,200,000

Matt Holland
Pheasants Forever, Inc
679 W River Dr
New London, MN 56273

Phone: (320) 354-4377
Email: mholland@pheasantsforever.org
Fax: (320) 354-4377
Web: http://www.mnhabitatcorridors.org

Overall Project Outcome and Results:
Between 7/1/07 and 6/30/09, Minnesota's Habitat Conservation Partnership (HCP) restored, enhanced or protected a total of 32,334 in defined project areas using $16,011,693. This consisted of 17,650 acres with $4,121,730 from the Environment and Natural Resources Trust Fund (ENRTF) and 14,684 acres with $11,889,963 in leveraged funds. See the Final Report posted below or go to http://www.mnhabitatcorridors.org for complete information.

Partners restored/enhanced a total of 27,556 acres (16,788 acres ENRTF; 10,768 acres Other Funds) at a cost of $3,460,895 ($1,180,184 ENRTF, $2,280,711 Other Funds). Total acres exceeded the proposed HCP-Phase IV goal of 6,398 acres due to increased non-state funding being spent upon easement restoration projects during the grant period. Work included 14,610 acres of grassland restoration/enhancement, 7,547 acres of wetland restoration, 91 acres of woodland restoration, 1,040 acres of wetland enhancement, 496 acres of dam modification, 115 acres of shoreline restoration, and 29 acres of wild rice restoration. Other accomplishments included shallow lake surveys, lake aeration, site access/development, and lakescaping demonstration projects/workshops.

Partners acquired a total 3,926 acres (375 acres ENRTF; 3,551 acres Other Funds) of perpetual conservation easements at a cost of $9,448,237 ($910,784 ENTF, $8,537,453 Other Funds). HCP fell shy of the proposed HCP-Phase IV goal of 4,320

acres due to increased nonstate funds being used for habitat restoration activities on easements. Shoreline habitats continued to be a priority for HCP partners working on easement, with over 8.6 shoreline miles protected. Habitats protected were grasslands, wetlands, and woodlands.

Partners acquired a total of 852 acres (487 acres ENRTF; 365 acres Other Funds) in fee-title at a cost of $2,931,662 ($1,857,8078 ENTF, $1,063,800 Other Funds). HCP fell short of the proposed HCP-Phase IV goal of 1,254 acres due to land prices being high, the focus on shoreline (higher priced lands), and other fund projects falling through. HCP achieved 408 acres of new Wildlife Management Areas (WMA), 136 acres of Aquatic Management Areas (AMA), 78 acres of Wildlife Production Areas (WPA), and 230 acres of private/local government lands.

HCP Partners included: Ducks Unlimited; Fond du Lac Reservation; Leech Lake Band of Ojibwe; MN Deer Hunters Association; MN Department of Natural Resources; MN Land Trust; MN Valley National Wildlife Refuge Trust, Inc; National Wild Turkey Federation; Pheasants Forever; The Nature Conservancy; Trust for Public Land; U.S. Fish and Wildlife Service; U.S. Natural Resources Conservation Service.

COMPLETE OVERALL FINAL REPORT

Abstracts and Reports of Individual Partner Projects - available online at: http://www.lccmr.leg.mn/all_projects/2007_projects.html#20074b

- 0x Overall Summary of HCP - Phase IV
- 1a Project Coordination and Mapping (Pheasants Forever)
- 1b Restorable Wetlands Inventory (Ducks Unlimited)
- 2a Hides for Habitat Restoration (Minnesota Deer Hunter Association)
- 2b Partners for Fish and Wildlife (U.S. Fish and Wildlife Service)
- 2c Living Lakes Enhancement (Ducks Unlimited)
- 2d Shallow Lakes Assessment and Management (DNR)
- 2e2 Shallow Lake Impoundment and Management (Leech Lake Band of Ojibwe)
- 2e3 Wild Rice Habitat Restoration (Fon du Lac Band of Chippewa)
- 2g Wildlife Areas Management (DNR)
- 2h Fish Habitat Restoration (DNR)
- 2i Set out Seedlings (National Wild Turkey Federation)
- 2j Lakescaping (DNR)
- 2k Prairie Management (DNR)
- 2n Campaign for Conservation - Restoration (The Nature Conservancy)
- 2o Working Lands Initiative (U.S. Fish and Wildlife Service)
- 3a Shorelands Protection Program (Minnesota Land Trust)
- 3c Shallow Lakes Easements (Ducks Unlimited)
- 3d Wetlands Reserve Program (Ducks Unlimited and U.S. Natural Resources Conservation Service)
- 3f Habitat Encroachment Buffers (Pheasants Forever)
- 3g Campaign for Conservation (The Nature Conservancy)
- 4a Critical Lands Conservation Initiative IV (Pheasants Forever)
- 4b Fisheries Acquisition (DNR)
- 4c Critical Lands Protection Program (Trust for Public Land)
- 4f Minnesota NWTF Super Fund (National Wild Turkey Federation)
- 4g Campaign for Conservation - Acquisition (Nature Conservancy)
- 4h Minnesota Valley Refuge Expansion (Minnesota Valley National Wildlife Refuge Trust)
- 4i Habitat Acquisition - Professional Services (DNR)

Project completed: 06/30/2009

Back to top of page

Metro Conservation Corridors (MeCC) - Phase III
Subd. 4c $2,500,000

Wayne Sames
DNR
500 Lafayette Road
St. Paul, MN 55155-4010

Phone: (651) 259-5559
Email: wayne.sames@dnr.state.mn.us
Fax: (651) 296-6047
Web: http://www.dnr.state.mn.us/metroconservationcorridors

Overall Project Outcome and Results:
During the third phase of the Metro Corridors project, the Metro Conservation Corridors Partners continued their work to accelerate protection and restoration of remaining high-quality natural lands in the greater Twin Cities Metropolitan Area by strategically coordinating and focusing conservation efforts within a connected and scientifically-identified network of critical lands. This corridor network stretches from the area's urban core to its rural perimeter, including portions of 16 counties. The Partners employed a multi-faceted approach, which included accomplishments in four specific result areas:

1. Coordinate Metro Conservation Corridors and Metro Greenways Programs: Partners met quarterly to review project accomplishments and coordinate activity. With DNR support, the partners also launched development of an online database to facilitate tracking and reporting of MeCC projects over time.
2. Restore and Enhance Significant Habitat: Collectively, the partners restored 770 acres of land, including 1.26 miles of shoreline. Restoration of an additional 259 acres was completed using other funds.
3. Acquire Significant Habitat: Collectively, the partners protected 721 acres of land, including more than one-half mile of shoreline through acquisition of fee title and conservation easements and leveraged an additional 232 acres of land and 1/4-mile of shoreline using other funds.
4. Provide Community Conservation Assistance: The Metro Greenways Program assisted four cities and two counties with the integration of natural resources information into local development and conservation planning and policy decisions.

Accomplishments during this phase also helped address a number of recommendations of the Statewide Conservation and Preservation Plan, including: protecting priority land habitats; protecting critical shorelands of streams and lakes; restoring land, wetlands, and wetland-associated watersheds; and improving connectivity and access to outdoor recreation.

Project Results Use and Dissemination
As projects were completed, the individual partners were encouraged to publicize accomplishments through press releases, organization newsletters, and websites. These efforts resulted in information being distributed to the public through websites, email lists, daily and weekly newspapers, newsletters, and other print materials. Additionally, once the MeCC database development is complete, the partnership hopes to be able to better disseminate information on its accomplishments through a public web portal.

COMPLETE OVERALL FINAL REPORT

Abstracts and Reports of Individual Partner Projects - available online at: http://www.lccmr.leg.mn/all_projects/2007_projects.html#20074c

1.1 Overall Summary and Coordination (DNR)
2.1 Restore/Enhance Significant Watershed Habitat (Friends of the Mississippi River)
2.2 Lower Minnesota River Watershed Restoration & Enhancement Project (Friends of Minnesota Valley)
2.3 Restore and Enhance Significant Habitat (Great River Greening)
2.4 Habitat Restoration and Enhancement Grants (DNR)
2.5 Scientific and Natural Area (SNA) Restoration and Enhancement (DNR)
2.6 Stream Habitat Restoration (Trout Unlimited)
3.1 Critical Lands Protection Program - Fee Title & Conservation Easement Acquisition (Trust for Public Land)
3.2 Protecting Significant Habitat by Acquiring Conservation Easements (Minnesota Land Trust)
3.3 Fee Acquisition for Minnesota Valley National Wildlife Refuge (Minnesota Valley National Wildlife Refuge Trust)
3.4 Grants and Acquisition of Fee Title & Conservation Easements (DNR)
3.5 DNR Fish and Wildlife Acquisition (DNR)
3.6 Acquisition of Significant Habitat (DNR)
4.1 Assist Local Governments to Promote Conservation of Natural Habitats (DNR)

Project completed: 06/30/2009

Back to top of page

Prairie Stewardship Assistance for Private Landowners
Subd. 4d $220,000

Jason Garms
DNR
175 County Rd 26
Windom, MN 56101

Phone: (507) 831-2900
Email: jason.garms@dnr.state.mn.us
Fax: (507) 831-2921
Web: http://www.dnr.state.mn.us

Overall Project Outcome and Results
This project provided voluntary, long-range conservation planning and management assistance to private landowners with native prairie. Native prairie is Minnesota's most threatened natural habitat. Less than 1% of the state's native prairie survives - and most of this is on private land. This project provided native prairie landowners with stewardship plans that inventoried and evaluated native prairie and other land resources on their property, identified the landowner's goals and objectives, and recommended ecologically sound management strategies. A total of 25 Prairie Stewardship Plans were created with this project's funds. Landowners were also given an opportunity to participate in 3 different workshops and field days where they could learn more about appreciating and managing their prairies. Furthermore, this project helped landowners with existing stewardship plans to implement their plans by providing cost-share assistance for management practices. Examples of practices cost-shared include prescribed burning (349 acre completed), invasive species treatments (65 acres completed), prairie reconstruction (33 acres completed), and woody encroachment removal (273 acres completed).

Project Results Use and Dissemination
Copies of Stewardship Plans are provided to local DNR managers and used by the landowner with other agencies and programs.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

State Parks and Trails Land Acquisition
Subd. 4e $1,500,000

Larry Peterson (Parks) and Ron Potter (Trails)
DNR
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 259-5593 (Larry) or (651) 259-5632 (Ron)
Email: larry.peterson@dnr.state.mn.us or ron.potter@dnr.state.mn.us
Fax: (651) 296-6532 (Parks) or (651) 297-5475 (Trails)
Web: **Parks -** http://www.dnr.state.mn.us/state_parks/index.html
Trails - http://www.dnr.state.mn.us/state_trails/index.html

Overall Project Outcome and Results
Environment and Natural Resources Trust Fund funding allowed for the following State Parks and State Trails fee title land acquisition projects:

- Ownership of approximately 48 acres within the statutory boundary of William O'Brien State Park. Acquisition of this the land eliminated the potential for development on this parcel and its associated impacts to the park, and buffered the park from existing residential development in the area. This parcel added to the existing 1,580 acres already protected within William O'Brien State Park within a Metro Wildlife Corridors Project Area that follows the St. Croix River valley. Preservation of this upland parcel protects the water quality of the adjacent wetlands and sub-watershed leading to the St. Croix River. This parcel provides a route for the proposed Gateway State Trail extension.
- Ownership of approximately 87 acres within the statutory boundary of Frontenac State Park. This parcel consists of primarily wetlands adjacent to Wells Creek delta, a significant migratory waterfowl stopover. The property also includes about 400 feet of shoreline on Lake Pepin and supports many "species of concern" identified in the County Biological Survey. The site is also surrounded by park ownership and is located within a Metro Wildlife Corridors Project Area.
- Ownership of 360 acres within the statutory boundary of George Crosby Manitou State Park. Acquisition of this parcel provided protection to one of the largest and highest quality old-growth northern hardwood forest complexes in the Lake Superior Highlands.
- Ownership of approximately 175 acres along the authorized Casey Jones State Trail corridor. Acquisition of this property secured a location for the future development of approximately one mile of trail corridor for the Casey Jones State Trail along Plum Creek, between Lake Shetek State Park and the community of Walnut Grove.

All acquisitions were from willing sellers, within the statutory boundaries of state parks and for statutory authorized state trails as determined by the Commissioner.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Metropolitan Regional Park System Land Acquisition
Subd. 4f $2,500,000

Arne Stefferud
Metropolitan Council
390 North Robert Street
St. Paul, MN 55101

Phone: (651) 602-1360
Email: arne.stefferud@metc.state.mn.us
Fax: (651) 602-1674
Web: http://www.metrocouncil.org/parks/parks.htm

Overall Project Outcome and Results:
This appropriation leveraged a total of $18.1 million of other funds to acquire 528 acres for the Metropolitan Regional Park System as follows:

- 61 acres on the southern shore of Cedar Lake for Cedar Lake Farm Regional Park in Scott County ($600,000 Environment Trust Funds, $400,000 Metro Council bonds and $3,526,192 of Scott County funds for a total of $4,526,192).
- 8.2 acres including shoreline on the Mississippi River for Grey Cloud Island Regional Park in Washington County ($109,256 Environment Trust Funds, $72,838 Metro Council bonds, and $273,141 Washington County funds for a total of $455,235).
- 3 acres including shoreline on Lake Waconia for Lake Waconia Regional Park in Carver County ($600,000 Environment Trust Funds, $400,000 Metro Council bonds and $1,530,000 Carver County funds for a total of $2,530,000).
- 456 acres which encompasses the entire park for Empire Wetlands Regional Park in Dakota County ($1,020,000 Environment Trust Funds, $680,000 Metro Council bonds, $800,000 other Metro Council grant approved in 2006, $6 million of 2006 State bonds, $3,444,000 of Dakota County funds for a total of $11,940,000).
- 47 acres including shoreline of St. Catherines Lake for Doyle-Kennefick Regional Park in Scott County ($170,744 Environment Trust Funds, $677,625 Metro Council bonds and $282,789 of FY 2009 Metro Greenways Grant for a total of $1,1131,158).

Project Results Use and Dissemination:
Each regional park agency that received a grant or grants from this appropriation informs the public about the land acquisitionwith its own website and news releases. The Metropolitan Council also publishes a "Regional Parks Directory and Map" that informs the public about the recreation activities available at each regional park and trail and includes website addresses and phone numbers for each park agency for more information. Finally, the Metropolitan Council's website includes an interactive parks map that contains the same information as the paper version of the "Regional Parks Directory and Map" at http://www.metrocouncil.org/parks/r-pk-map.htm

FINAL REPORT

Project completed: 10/22/2008

Back to top of page

Non-Metropolitan Regional Parks and Natural and Scenic Area Acquisition
Subd. 4g $1,000,000

Wayne Sames
DNR
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 259-5559
Email: wayne.sames@dnr.state.mn.us
Fax: (651) 296-6047
Web: http://www.metrocouncil.org/parks/

Overall Project Outcome and Results
These programs provide competitive state matching grants to help and encourage local governments to acquire non-metropolitan regional parks and natural areas to meet current and future needs. For the regional park project, every $3 of state grants was matched with $2 of local funds. For the natural and scenic area projects, every dollar of state grants was matched by a dollar of local funds. Three acquisition grants were completed: one Regional Park Grant and two Natural And Scenic Area Grant. The total acreage acquired through all three projects was 310 acres. Approximately one mile of lake

shore line was protected.

Regional Park Grant: One Regional Park Grant totaling $548,000 was made to Stearns County for the acquisition of 265 acres for a new regional park on Kraemer Lake near St. Joseph. Acquisition of this land provides the only publicly owned access to the lake. Much of the property was identified by the County Biological Survey as a significant native plant community. This land, part of the Avon Hills area, was acquired by the county in November, 2007.

Scenic and Natural Area Grant: Two grants were made for natural and scenic areas. In November 2007 the City of Prior Lake acquired 30 acres on Pike Lake for a new city park and natural area with a state grant of $230,000. This acquisition protects one of the largest remaining areas of undeveloped shoreline in the city. In 2008 the City of Red Wing acquired 15 acres for an addition to an existing 72 acre Bluff Land Conservation Area with a state grant of $156,000.

The remaining $66,000 covered DNR administrative/personnel costs for the program.

Project Results, Use and Dissemination
Profiles and photos of these projects are available on the DNR web site at www.mndnr.gov. Click on "Grants" and then "Land Conservation" to find the links to the Regional Park Grants and Natural and Scenic Areas programs. Click on "Park Profiles" or "Project Profiles". Then go to the individual project profiles for a photo of the site, brief summary and links to local web pages.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

LAWCON Federal Reimbursement
Subd 4h $500,000

Wayne Sames
DNR
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 259-5559
Email: wayne.sames@state.mn.us
Fax: (651) 296-6047

Overall Project Outcome and Results
The appropriation was used to pay for the state's administration of the Land and Water Conservation (LAWCON) program. This included administration of annual LAWCON grant solicitations for local projects, all grant management activities related to funded projects, all federal reporting requirements, management of funds used for state projects, management of several conversions of previously funded projects, and all monitoring and inspection activities required as a condition of acceptance of the federal funds. In addition, $125,000 was used to fund purchase of picnic tables and fire rings/grates, most of which are accessible, for several state parks as follows:

State Park	Total # Tables	Accessible Table	Fire Rings*
Crow Wing	25	25	15
Father Hennepin	0	0	9
Fort Snelling	10	10	6
Frontenac	25	6	15
Maplewood	53	9	34
McCarthy Beach	25	8	15
Sibley	0	0	31
Upper Sioux Agency	25	25	15
Wild River	25	10	15
Afton	4	2	4
Total =	**192**	**95**	**159**

* All fire rings are accessible.

This project was consistent with action priorities outlined in the state's 2008-2012 State Comprehensive Outdoor Recreation Plan (SCORP) including:

- "Maintain and adequately fund current infrastructure, including improvements for safety, accessibility and energy efficiency."

- "Identify and address barriers to outdoor recreation, including economic issues, facility design, public awareness, and safety and security concerns."

Project Results Use and Dissemination
See chart above for location of funded tables and fire rings.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Biological Control of European Buckthorn and Garlic Mustard
Subd. 4i $300,000

Luke Skinner
DNR
500 Lafayette Rd Box 25
St. Paul, MN 55155

Phone: (651) 259-5140
Email: luke.skinner@state.mn.us
Fax: (651) 296-1811
Web: http://www.dnr.state.mn.us

RESEARCH

http://www.dnr.state.mn.us/invasives

Overall Project Outcome and Results
Garlic mustard (Alliaria petiolata) and European/common buckthorn (Rhamnus cathartica) are non-native invasive plants that severely threaten native plant communities and degrade wildlife habitat. This project focused on development of biological control as a long-term management strategy for these species. Reports describing the garlic mustard and buckthorn research in detail are attached to the project's Final Report. Garlic mustard biocontrol agents have not yet been approved for release in the US. Garlic mustard research focused on monitoring the 12 field sites for pre-release research. Garlic mustard monitoring data from 2005 to 2009 showed that garlic mustard populations can vary considerably from year to year. Garlic mustard plants are occurring at high population densities (mean densities up to 133 adult plants/m2 and 720 seedlings/m2) and are currently experiencing very little herbivore attack in Minnesota. Work will continue on monitoring the field sites, developing rearing methods, and conducting field releases once insects are available. Buckthorn biocontrol research carried out in 2007-09 concentrated on a leaf-feeding moth, a leaf-margin gall psyllid, and a seed-feeding midge as potential biocontrol agents. The moth was found to lack enough host-specificity and was eliminated from consideration as a biocontrol agent. Host-specificity testing will continue for the leaf gall psyllid as larvae did not develop on the North American Rhamnus species tested. One complication is that the phytoplasma 'Candidatus Phytoplasma rhamni' has been detected in the leaf gall psyllid. Future work will explore the implications of this phytoplasma for using the leaf-gall psyllid as a biocontrol agent. Initial success in rearing a population of the seed-feed midge will allow for future host-specificity testing of this insect. Future work will concentrate on 3 promising potential biocontrol agents, 2 psyllids, and the midge.

Project Results Use and Dissemination
The results of the garlic mustard and buckthorn research projects have been shared widely. Updates on the garlic mustard monitoring and biocontrol research and buckthorn biocontrol research were presented at the Minnesota Invasive Species Conference (Oct. 26-29, 2008, Duluth MN) and the upcoming Minnesota-Wisconsin Invasive Species Conference (Nov. 8-10, 2010, St. Paul, MN). In addition, results have been shared across the state through such venues as County Agriculture Inspector meetings, DNR meetings, and Master Gardener meetings. There is considerable interest in these programs and enthusiasm for the potential for biological control of garlic mustard and buckthorn. The results of the garlic mustard monitoring research were reported in the article "Population Biology of garlic mustard (Alliaria petiolata) in Minnesota hardwood forests" by L. Van Riper, R. Becker, and L. Skinner in 2010 in the journal Invasive Plant Science and Management (3:48-59). Results of the buckthorn research were reported in the article "Use of native range surveys to determine the potential host range of arthropod herbivores for biological control of two related weed species, Rhamnus cathartica and Frangula alnus" by A. Gassmann, I. Tosevski, and L. Skinner in 2008 in the journal Biological Control (45:11-20).

Project Publications:

1. Biological control of backthorns, *Rhamus catartica* and *Frangula alnus* - Report 2008-2009
2. Monitoring garlic mustard (*Alliaria petiolata*) in anticipation of future biocontrol release (2005-2009)

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Neutralization of Reed Canary Grass Root Exudates
Subd. 4j $115,000

Bradley Cook
MN State University
242 Trafton S
Mankato, MN 56001

Phone: (507) 389-5728
Email: bradley.cook@mnsu.edu
Fax: (507) 389-2788
Web: http://cset.mnsu.edu/biology/people/cook/index.html

RESEARCH

Overall Project Outcome and Results
Reed canary grass (Phalaris arundinaceae; hereafter Pa) is an aggressive plant invading wetlands in the Midwest. Invasion by Pa leads to a reduction of native plant diversity and loss of wetland functionality. Our ability to control invasion by Pa and reestablish native plant communities has been unsuccessful because of our limited understanding of the mechanisms that allow Pa to become invasive. The study of plant-soil feedbacks as a mechanism for dominance is a two-step process: plants alter their soil microbial community; and the altered soil microbial community has a positive feedback on plant growth or a negative feedback on neighboring plants. Results from three experiments comparing soil microbial communities and plant growth revealed that Phalaris arundinacea (Pa) used plant-soil feedbacks to outcompete tussock sedge (Carex stricta; hereafter Cs).

In a soil training experiment, Pa and Cs cultured their soil microbial communities in a manner that differed in both magnitude and composition. Soil training had a neutral feedback on Pa growth and a negative feedback on Cs.

In our first reciprocal transplant experiment, growth of Pa and Cs was greater in their corresponding native soils than in the soil of the other species. Thus, both plants receive positive feedback from their native soil microbial communities. Soil microbial communities were similar when cultivated by Pa regardless of soil type, and Cs soil microbial community catabolic activity depended on soil type.

In our second reciprocal transplant experiment, the effects of competition were dependent on soil microbial communities. Pa growth was best in competition with Cs in Cs-native soils and Pa-sterile soils. Competition did not affect the growth of Cs; however, Cs growth was least in native soils from Pa and Cs. In sterile soils, soil microbial communities depended on the type of competition. In native Pa soils, heterospecific competition had a greater effect on soil microbial communities than did conspecific competition.

Denaturing gradient gel electrophoresis (DGGE) analysis indicated that Pa SMCs were stable and of low diversity, but Cs SMCs were dynamic and of comparatively high diversity.

Bioassays and gas chromatography-mass spectrometry (GC-MS) analyses revealed the presence of methyl esters of fatty acids known to have antimicrobial activity.

Our results suggest that Pa does not use alleopathy, but is induced to produce an antimicrobial compound that has a strong, directional effect on soil microbial communities, which promotes its growth and inhibits the growth of neighboring plants.

Project Results Use and Dissemination Portions of Results 1, 2, and 3 have been written as a manuscript (A plant-soil feedback as a mechanism for the invasive success of Phalaris arundinacea) and is being revised for publication. A second manuscript including Results 1-5 is in preparation by the investigators. Portions of this work were presented:

1. As an invited talk at the University of Bern, Switzerland (8/08)
2. At the 93rd Annual Ecological Society of America Meeting; Milwaukee, WI. (8/08)
3. At the 13th Annual Conference of the Wisconsin Wetland Association; Oconomowoc, WI. (2/08)
4. Two papers at the North American Lake Managers Society (NALMS) International Conference; Hartford, CT. (10/09)
5. Four papers at the 2008 and 2009 Minnesota State University Undergraduate Research Conference (4/08 and 4/09)

In addition, portions of this work were used for a M.S. thesis project, as class exercises in undergraduate courses, and as several undergraduate independent research projects at Minnesota State University.

FINAL REPORT

Project completed: 6/30/2009

Subd. 5 Water Resources

Back to top of page

Local Water Management Matching Challenge Grants
Subd. 5a $350,000

David Weirens
BWSR
520 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 297-3432
Email: david.weirens@state.mn.us
Fax: (651) 297-5615
Web: http://www.bwsr.state.mn.us

http://www.bwsr.state.mn.us/grantscostshare/lwplanning/index.html

Overall Project Outcome and Results
Grants were awarded to 4 counties, 5 soil and water conservation districts, 2 water management organizations, and 1 joint powers board for the purpose of implementing high priority actions identified in current state approved and locally adopted comprehensive water management plans. The funds were used to complete the following projects:

- Prevented agricultural tile flows from discharging to surface waters and monitored nitrate concentrations of these flows in the Nile Mile Creek watershed.
- Protected nearly 900 acres of land adjacent to lakes and streams in Cass and Aitkin Counties.
- Implemented 10 grazing plans to reduce fecal coliform loading to the Root River.
- Generated watershed delineations and lake volume calculations that contributed to the adoption of development restrictions on 44 lakes in Itasca County.
- Completed preparations that ultimately will stabilize a streambank to protect a cemetery in Hallock from a slumping streambank.
- Designed and stabilized a 2-mile segment of a judicial ditch in the Bostic Creek watershed of Lake of the Woods County.
- Demonstrated that straw bales result in decreased phosphorus concentrations in ditch flows to Lake Volney in Le Sueur County.
- Installed a grade stabilization structure in a gully to prevent the deposit of sediment into the St. Croix River.
- Restored shoreland along Mille Lacs Lake in Mille Lacs County.
- Reduced the discharge of stormwater from the City of Wadena.
- Tested the quality of water in the Mt. Simon Aquifer and sealed three wells in Washington County.

Project Results Use and Dissemination
Results of the specific projects are available upon request from the Board of Water and Soil Resources.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Protection of Rare and Unique Rock Outcrop Wetlands
Subd. 5b $563,000

Thomas Kalahar
Renville Soil & Water
1008 W Lincoln
Olivia, MN 56277

Phone: (320) 523-1559
Email: kalahar@yahoo.com
Fax: (320) 523-2389
Web: http://www.renvilleswcd.com

Overall Project Outcome and Results
The Minnesota River Valley contains ancient bedrock outcrops with associated wetlands that provide unique habitats for specialized plant and animal communities rarely found elsewhere in Minnesota. These resources are threatened by mining and other development interests, as removal of the rock results in the severe degradation or permanent loss of the wetlands located among the rock complexes. Although the wetlands vary greatly in size and duration, some of the smallest and most temporary basins harbor the rarest and most specialized plants. Many of these wetlands may not be protected due to de minimis (i.e. minimum size) exceptions to the Wetland Conservation Act. Rock outcrops are also a component of the Minnesota River's riparian zone and destruction of this unique habitat will continue to degrade the water quality and aquatic habitat of the Minnesota River and its tributaries. Unlike other mining operations, there is no reclamation plan possible for replacing this very unique landscape feature once it is removed. This project consisted of efforts to protect these unique habitats through conservation easements and habitat restoration activities.

For the conservation easements portion of the project, applications from 9 landowners totaling 788 acres were scored by a team of natural resource professionals to determine the highest quality sites under grant guidelines. The goal of this project was to protect 200 acres with Reinvest in Minnesota (RIM) perpetual conservation easements in Renville and Redwood Counties. That goal was exceeded and 212.4 acres were protected. Four landowners received $517,411 in easement payments from grant funds. In accordance with the RIM program, landowners retain ownership.

For the habitat restoration portion of the project, $16,049 in grant funds were used for invasive species control, along with $31,441 leveraged from other sources to assist in meeting the goals of the conservation plans developed on each easement as part of the RIM process.

Project partners were USDA NRCS, MN DNR Wildlife (Heritage Enhancement), DNR ECO-Non Game (Heritage Enhancement), State of Minnesota Native Buffer Cost Share Program, and US Fish & Wildlife Service.

Project Results Use and Dissemination
Initially staff from the Renville & Redwood Soil & Water Conservation Districts (SWCD) had face-to-face contact with landowners. This proved to be a very successful way of generating applications, as 788 acres were offered. The applications that were not funded were kept for future reference and landowners have all been contacted and given an opportunity to apply for dollars from the ML 2009 Environment and Natural Resources Trust Fund appropriation for $1.5 million, for which we have a goal of enrolling an additional 530 acres in perpetual easements.

Several newspaper articles have been published since the inception of the 2007 grant. The regional West Central Tribune in Willmar, MN has done articles about the program. In addition local newspapers have included articles about the program. Tom Kalahar, Project Manager, was interviewed by Fred Harris for an article published in the March-April 2009 issue of the Minnesota Conservation Volunteer. The early articles caused landowners in other counties to request information on how they could enroll their land into the program. This landowner interest resulted in Chippewa, Yellow Medicine and Lac qui Parle SWCD offices joining Renville & Redwood in making application for the 2009 funds.

The Renville SWCD continues to update the public on the status of the grants on their website www.renvilleswcd.com Tom Kalahar has done informational/educational talks on the Minnesota River Basin and the unique features of the Granite Rock Outcrops. Audiences included the general public in both Redwood Falls and New Ulm, a presentation for landowners in the Renville/Chippewa DNR Working Lands Initiative area, as well as a presentation to the Upper Sioux Community. DNR Private Lands Program staff have used their one-on-one contacts with landowners to promote the program in addition to sponsoring the Landowner Workshop which included Tom's presentation on the Rock Outcrop program.

In August 2008, Renville SWCD hosted the Board of Water & Soil Resources (BWSR) meeting. A one day tour for about 60 people included stopping at a rock outcrop site. SWCD staff used this opportunity to inform the BWSR and guests about the uniqueness of the natural resource and to give them an update on progress toward meeting the goals for the grant.

Local SWCD staff and supervisors continue to keep their local County Boards informed about progress of not only the 2007 grant but also about landowner interest for future funding.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Land Retirement Effects on Minnesota River Basin Streams
Subd. 5c $275,000

Victoria Christensen
U.S. Geological Survey
2280 Woodale Drive

Mounds View, MN 55112

Phone: (763) 783-3100
Email: dinger@smm.org
Fax: (763) 783-3103
Web: http://mn.water.usgs.gov/

RESEARCH

Overall Project Outcome and Results
The Minnesota River Basin lies within one of the most productive and intensively managed agricultural regions in the world. Current agricultural practices use large quantities of chemical fertilizer to maintain productivity - as much as 7.4 and 2.9 tons/mi2 for nitrogen and phosphorus, respectively. The excess of these nutrients have the potential for deleterious effects on stream quality through runoff. To address concerns about degradation of agricultural streams, the state of Minnesota was requested to provide funding to retire an additional 100,000 acres of agricultural lands to improve water quality and aquatic biology. This study was designed to provide a comprehensive evaluation of agricultural set-aside programs on a basin scale and their effect on water quality.

This study was divided into two phases. The primary Phase 1 objective was to compare water quality and aquatic biological conditions across three basins similar with respect to physical setting and hydrology, but differing in the degree of agricultural land retirement. The Phase 2 objective was to assess the relation between biotic integrity and land retirement across the Minnesota River Basin.

Fully-instrumented sampling sites with automated samplers, water-quality monitors, and streamflow gages were installed from 2005-2008. Findings include:

- Nitrogen concentrations were highest, with a mean of 15.0 mg/L, in South Branch Rush River, the subbasin with little land retirement; nitrogen concentrations were lower in Chetomba Creek (mean of 10.6 mg/L) and West Fork Beaver Creek (mean of 7.9 mg/L), subbasins with more land retirement at the basin scale.
- Total phosphorus concentrations were not directly related to land retirement percentages with average concentrations of 0.259 mg/L at West Fork Beaver Creek, 0.164 mg/L at Chetomba Creek, and 0.180 mg/L at South Branch Rush River.
- Index of biotic integrity (IBI) scores increased as local land retirement percentages (within 50 and 100 meters of the streams) increased.
- Comparisons made within the basins showed that nutrient, suspended-sediment, and chlorophyll-a concentrations decreased with increasing land retirement.

Data from this study can be used to evaluate the success of land retirement programs for improving stream quality. Two reports will be published in September 2009, describing Phase 1 and Phase 2 of the study.

Project Results Use and Dissemination
The results from this study were disseminated through USGS and BWSR websites, two abstracts, a conference proceeding paper, and several presentations and posters. The water-quality and streamflow information was provided in real-time through the USGS website. USGS and BWSR personnel have participated in basin activities highlighting the selected subbasins and emphasizing the effects of land retirement. A USGS Scientific Investigations Report entitled, "Water-Quality and Biological Characteristics and Responses to Agricultural Land Retirement in Streams of the Minnesota River Basin, Water Years 2006-08" is scheduled to be published by September 30, 2009. A manuscript has been completed covering Phase 2 of the study and will be submitted to a peer reviewed journal in September 2009.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Demonstrating Benefits of Conservation Grasslands on Water Quality
Subd. 5d $374,000

James Almendinger
Science Museum of Minnesota
16910 152nd St N
Marine on St. Croix, MN 55047

Phone: (651) 433-5953
Email: dinger@smm.org
Fax: (651) 433-5924
Web: http://www.smm.org/scwrs

RESEARCH

Overall Project Outcome and Results
This study used sediment accumulation rates in 26 lakes in southern and western Minnesota as a measure of the delivery of eroded soil and phosphorus from watershed uplands to the lakes. Accumulation rates were calculated for the periods 1963-1986 and 1986-2007 to characterize sediment and phosphorus delivery before and after 1986, when many agricultural lands were converted to grasslands as part of the Conservation Reserve Program (CRP). Inorganic sediment accumulation rates decreased with increasing area of conservation grassland in the watershed. This linear relation explained only about 20% of the variance, leaving substantial unexplained scatter. The relation predicted that sediment accumulation would decrease by 3-4% for every 10% of cropland converted to grassland. Consideration of wetland sediment traps within the watershed did not measurably improve the relationship, nor did consideration of soil erodibility, slope, or flow accumulation factors. The decrease in sediment phosphorus accumulation rates as a function of increasing grassland area was not statistically significant at the $p = 0.05$ level. Diatom analyses demonstrated biotic change in selected lakes over time. In two of these lakes the change appeared to be driven by lake-water phosphorus concentrations, which declined in the post-1986 period perhaps in response to increased grassland area. In the absence of substantial land-cover change, inorganic sediment accumulation increased by about 20% and sediment phosphorus increased by about 35%, indicating that other factors were influential. These factors could include changes in annual rainfall, artificial drainage, in-lake sediment transport processes, and lag effects in transport from uplands to lowlands.

We conclude that this study demonstrated a fundamental incoherence between field-scale parameters influencing erosion and watershed-scale measurements of erosion. We recognize the fundamental importance of the empirical plot-scale studies that have quantified the effects of erodibility, slope, flow length, land cover, and other factors on erosion and nutrient transport. Yet, the complexities of transport paths between field and receiving waters make watershed-scale erosion highly variable and difficult to predict. Use of plot-scale parameters without modification to predict watershed-scale sediment yields is inappropriate. We need better understanding to re-scale such parameters appropriately, which can only be achieved by intensive studies that bridge the intermediate scales between fields and watersheds. New data sets, especially improved topographic data from LiDAR, will help with this effort. However, nothing can replace the actual measurement of sediment yield at different scales, which will provide the necessary constraints for theoretical equations to give realistic results.

Project Results Use and Dissemination

- An interpretive summary report will be downloadable from the Museum web site.
- A short (2-4 pp.) fact sheet likewise will be downloadable from the Museum web site, with hardcopies made available as requested.
- Results will be published in the academic peer-reviewed literature.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Improved River Quality Monitoring Using Airborne Remote Sensing
Subd. 5e $159,000

Fei Yuan
Mankato State University
Earth Science Program, 7 Armstrong Hall
Mankato, MN 56001

Phone: (507) 389-2617
Email: fei.yuan@mnsu.edu
Fax: (507) 389-2980
Web: http://sbs.mnsu.edu/geography/people/feiyuan.html

RESEARCH

Overall Project Outcome and Results
To improve the study and monitoring of river water quality and riparian habitat in Minnesota this project proposed and successfully implemented a new and innovative research methodology, airborne dynamic hyperspectral remote sensing (remote sensing measures properties of the environment using sensors placed on aircraft or spacecraft). This study has more accurately and cost effectively identified water quality and critical sediment supply areas than possible through traditional or previously used monitoring methods. All methods and results developed here can readily be applied to other

watersheds.

For the first time ever in the USA we employed the highly cost effective Civil Air Patrol (CAP) ARCHER (Airborne Real-time Cueing Hyperspectral Enhanced Reconnaissance) remote sensing system to monitor water quality in a river. In addition to successfully piloting this new methodology in the highly impacted Blue Earth River (BER) watershed, tangible results and products include:

- Located highly erodible lands in the BER riparian corridor.
- ARCHER can successfully identify Total Suspended Sediment, Turbidity and other water quality measures thus potentially reducing time and costs using traditional methods in any watershed.
- Identified locations of high sediment input areas and spatial and temporal patterns of river water quality.
- Developed a hydrologic model to predict amount and location of sediment and stream flow based upon the size and intensity of precipitation events.
- A Geographic Information System database was developed that contains all project data.
- Two full years of detailed water quality data collected from ARCHER flights, traditional field sampling methods and related laboratory analyses. Water samples were collected along the entire river system at the same time as ARCHER flyovers, during spring runoff and during nearly all rainfall events.
- Processed remote sensing imagery and laboratory data from this study is ready for use in future studies and management decisions.

Project Results Use and Dissemination
The results and findings were documented in project updates to the LCCMR, through multiple conference presentations by the project scientists and their graduate students, three Minnesota State University (MSU) Geography Department master's theses, several academic articles, and further professional presentations are in preparation, with some of these items already available on the web. Partnerships established to complete the project include local, county, regional, state and federal agencies and scientists at those agencies and at other universities. Communication and outreach has flourished with the creation of a nation-wide ARCHER working group founded by this project's scientists: members include MSU, and professionals from 13 other state and federal agencies, universities, and the private sector. A meeting of the working group will take place April 2010 at the annual meeting of the Association of American Geographers (AAG) in Washington, DC.

To implement and complete the project we established partnerships with MPCA, Faribault & Martin Co. Soil & Water Conservation Districts, U.S. Army Corps of Engineers, and University of Minnesota. In 2008, we were contacted by USGS and Missouri (Mo) DNR who were interested in knowing more about our projects and findings. Thereafter, we formed an ARCHER working group to "provide a forum for agencies/researchers with on-going or anticipated projects using ARCHER imagery to collaborate, exchange information on promising applications and share analytical techniques" (http://rmgsc.cr.usgs.gov/awg/index.shtml). Besides us, other members include CAP, USGS, USFWS, EPA, FEMA, BLM, MoDNR, MoRAP (Missouri Resource Assessment Partnership), Space Computer Corporation, and other university and industry-based individuals. The working group holds monthly conference calls and exchanges lots of e-mail and phone communications. We have organized special sessions on ARCHER applications in the 2010 national conference of the AAG (Association of American Geographers) in Washington, DC.

Especially noteworthy is our partnership with the CAP (Civil Air Patrol). Based on methodologies we developed specifically for this project to pre-process ARCHER data, the CAP has now adopted our methods and has now supplied the needed software to all 16 ARCHER stations across the country. This is of great significance because of the potential for using ARCHER in environmental monitoring nationwide.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Evaluating Riparian Timber Harvesting Guidelines: Phase 3
Subd. 5f $400,000

Charles Blinn
U of M
1530 Cleveland Avenue N
St. Paul, MN 55108

Phone: (612) 624-3788
Email: cblinn@umn.edu
Fax: (612) 625-5212
Web:http://www.forestry.umn.edu/people/facstaff/blinn/

RESEARCH

Overall Project Outcome and Results
This project continues research begun with M.L. 2001 and M.L. 2005 appropriations from the Environment and Natural Resources Trust Fund.

Research addressing the long-term effectiveness of riparian guidelines to mitigate harvesting impacts is critical to resolve management conflicts and sustain Minnesota's forest resources. This project:

1. Evaluated the long-term effectiveness of Minnesota's riparian timber harvesting guidelines within Pokegama Creek (single-basin study) and on eight separate basins located across northern Minnesota (multiple-basin study);
2. Began to combine and synthesize data from the various study components through a "meta-analysis";
3. Provided outreach information.

Terrestrial findings that can help guide future management of Minnesota's forests and streams include:

- Partially-harvested riparian management zone (RMZ) treatments resulted in fully-stocked stands, however, species composition differed among treatments;
- Northern white cedar and balsam fir seedlings survive and grow well in non-wet microsites with medium residual basal area;
- Cedar seedlings require protection from deer browsing;
- Different treatments had minimal impact on the amount of organic matter input to streams;
- Residual tree blowdown was low, but future potential is still high.

Effects of riparian harvest on fish and fish habitat were assessed at the basin scale. Sediment levels remained above 1997 pre-harvest conditions until fall 2007. Riparian harvest may have contributed to increased stream temperatures, but fish abundances were negatively associated with differences in mean summer air temperature.

Aquatic findings that can help guide future management of Minnesota's forests and streams include:

- No differences in water chemistry between harvested and unharvested riparian reaches;
- Trends toward higher in-stream light levels and elevated periphyton standing crops within harvested riparian areas compared to control reaches;
- Trends toward a greater proportion of scraper invertebrates and fewer shredder invertebrates in harvested riparian reaches.

At the single-basin tributary sites, the majority of bird species present were associated with mature forest habitat pre-harvest. After harvest, early successional habitat associated species maintained dominance in all sites. The pre-harvest bird community was neither maintained nor able to reestablish on unharvested riparian buffers 9-11 years after harvest.

We observed interannual variation in diversity and species richness within the macroinvertebrate and fish communities, but few effects related to harvest treatments. Few changes in diversity and richness were observed in the bird community but changes were observed by the replacement of mature forest species by early successional avian species, related closely to the vegetation type.

There is a need to continue monitoring the sites to more fully assess effects over time.

Project Results Use and Dissemination
A workshop entitled "At the Water's Edge: Current State of Riparian Forest Management Research in Minnesota" was presented in Grand Rapids on May 20, 21, and 22, 2008. The purpose of the workshop was to interpret research results from the single- and multiple-basin riparian effectiveness monitoring studies as well as the Minnesota Forest Resource Council's Riparian Science Technical Committee findings for natural resource managers and loggers. The program included both indoor and outdoor components. There were 102 participants over the course of the three days.

A website was developed to provide information about the project, including a project overview, more detailed descriptions of our research, information about project personnel, a listing of project cooperators, project publications, and information presented during our workshop. The url for that website is http://rmzharvest.cfans.umn.edu/. A second website was created to allow project researchers to access data (http://rmzharvest.cfans.umn.edu/login).

Beyond the workshops and website, project results were disseminated to scientists, natural resource managers, private landowners, researchers, and others through nine presentations, one refereed manuscript, and one field tour. Three additional manuscripts are in preparation. One graduate student produced a thesis from their project work. Other graduate students continue to collect, analyze, and summarize data which will result in additional theses. Annual summaries of project results were provided to the Minnesota Forest Resources Council for inclusion in their Annual Report.

As this research study was designed to be a long-term assessment with little dissemination during the initial project phases, researchers will continue to monitor, analyze, and report post-harvest effects in the future as funding permits. With that

additional information, we will be able to assess how birds and terrestrial and aquatic ecosystems respond to timber harvesting within RMZs over the long-term. Results will then be used to inform on-the-ground decision making as well as suggest changes to the guidelines to more effectively manage forested riparian areas.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Innovative Springshed Mapping for Trout Stream Management
Subd. 5g $270,000

E. Calvin Alexander, Jr.
U of M
Geology & Geophysics
310 Pillsbury Dr. SE
Minneapolis, MN 55455

Phone: (612) 624-3517
Email: alexa001@umn.edu
Fax: (612) 624-3819
Web: http://www.geo.umn.edu/people/profs/ALEXANDER.html

RESEARCH

Overall Project Outcome and Results
Trout streams depend on a steady supply of clean, cold water to exist. The U of M's Geology and Geophysics Dept. and the DNR Waters worked to identify and map the karst springs and their recharge areas that supply water to southeastern Minnesota's 173 trout streams and to assess the impacts that both land and aquatic development are having on these springs.

Delineation of the recharge areas or springsheds of the trout springs is a crucial first step in the protection of the trout fisheries and the restoration of those that have been degraded. Established fluorescent dye tracing techniques were refined, accelerated and expanded into springsheds parts of southeastern Minnesota not previously traced. Traces in Fillmore and Olmsted counties defined new trout stream springsheds and expanded and refined information on previously known trout stream springsheds in the Galena Aquifer. The traces in Winona and Houston Counties began the definition of trout stream springsheds draining the Prairie du Chien Aquifer. Prairie du Chien springs supply water to several major fish hatcheries and trout streams.

Although many of southeastern Minnesota's trout stream are headed by springs flowing from the St. Lawrence Formation, the St. Lawrence has been assumed to be an aquitard in Minnesota Rules. Three successful traces through the St. Lawrence Formation in Winona and Houston Counties demonstrated that water flows rapidly through the St. Lawrence to trout springs. This unexpected discovery is a major advance in our understanding and management of these trout springs and is resulting in a significant reevaluation the hydrogeology of the St. Lawrence Formation.

In addition to dye tracing, four innovative Trout Springshed Assessment protocols were investigated. The first was the use of data logger technology to characterize time variations in the thermal and chemical properties of trout springs. The temperature loggers identified at least four distinct patterns of temperature variations present in trout springs which inturn yield information about the respective springsheds. The second innovative technique was the construction of new, high precision structural contour maps of the geologic strata hosting trout springsheds. This tool looks promising but will require more precise mapping that is currently available. The third innovation was an investigation of the relationship between the size of springsheds and the base flow volume of the trout springs. This technique is promising but requires more well defined springsheds to become a practical tool. The last technique investigated was the measurement of dissolved organic compounds (DOC) in the springs. Significant differences in the amount and composition of the DOCs were observed which may be relatable to varying land uses in the springsheds.

The springsheds defined by the tracing and the other tools allow an accurate documentation of the rapid, direct impact of surface land uses in the springsheds and the water quality in the trout streams. This inturn allows better management of the springsheds to protect the trout streams and groundwater resources.

Project Results Use and Dissemination
The dissemination and use of the results of the trout springsheds delineation has varied depending on the level of the user. At the local level one of the most effective dissemination tools has been to get the landowners and users involved in the research itself. This has included getting Harmony High School students involved in the traces around Harmony, Minnesota.

Getting many of the local residents involved in the tracing. Getting the County staffs, local organizations, the trout fishing community and the trout hatchery staffs involved in the tracing. We send copies of the reports into the hands to the affected landowners and residents involved. All of these people now know the speed at which the surface runoff can reach their trout streams. They are the "first line of defense" in maintaining and improving the water quality in the trout streams.

At the regional and state levels Alexander and Green have made numerous presentations various state water management and ground water meetings. We have led field trips highlighting the results of this project. Contribute the results of this information at a variety of levels inside the Minnesota State Government. The information is built into short courses, training sessions, technical comments and University of Minnesota courses. The discovery that water moves rapidly through the St. Lawrence "aquitard" is already impacting management rules and practices in several State Agencies. The increasingly detailed knowledge of the springsheds is an important part of the TMDL effort to protect and improve water quality in trout streams in southeasten Minnesota.

At the national level the results obtained in this project were presented at the 11th Multidisciplinary Conference on Sinkhole and the Engineering and Environmental Impacts of Karst, at Geological Society of America meetings and published in their Proceedings. National Science Foundation summer interns have participated in the research effort and taken the knowledge and experience back to other states.

PROJECT PUBLICATIONS:

1. Spring Characterization Methods and Springshed Mapping
2. Dye Tracing Within the St. Lawrence Confining Unit in Southeastern Minnesota
3. 2 July 2007 Morehart Farm Dye Trace
4. Frego Creek Dye Trace
5. Harmony Spring 2008 Dye Trace
6. A Quantitative Dye Trace in the Bat River System & Poster
7. Peptidoglycan Degradation Fluorescence: Applications to Karst Groundwater Mapping & Poster
8. Forestville North Dye Trace
9. Sinks and Rises of the South Branch Root River, Fillmore Co., MN
10. Flow Path Characterization using Spring Thermographs
11. Holy Grail Cave, Fillmore County, Minnesota
12. Harmony Fall 2008 Dye Trace
13. Frego Creek Spring 2009 Dye Trace

FINAL REPORT

Project completed: 6/30/2009
Work Program

Back to top of page

Intra-Lake Zoning to Protect Sensitive Lakeshore Areas
Subd. 5h $110,000

Paul Radomski
DNR
1601 Minnesota Drive
Brainerd, MN 56401

Phone: (218) 833-8643
Email: paul.radomski@dnr.state.mn.us
Fax: (218) 828-6043
Web: http://www.dnr.state.mn.us

Overall Project Outcome and Results
Minnesota's lakes are one of its most valuable resources. In particular, naturally vegetated shorelines provide feeding, nesting, and breeding habitat for many species. These areas, defined by natural and biological features that provide unique or critical ecological habitat, are known as sensitive lakeshores. Increasing development pressure within shorelands may have negative impacts on these sensitive areas - and Minnesota's shorelands are being developed at a rapid rate.

With this in mind, the Minnesota Department of Natural Resources developed a protocol for identifying sensitive lakeshores. The project focused on seventeen high priority lakes, identified by Cass County. These lakes represent some of the county's most valuable waters - large lakes with significant undeveloped shorelands. Protocol to identify sensitive lakeshores consists of several components:

- Field surveys evaluate the distribution of high priority plant and animal species.
- An ecological spatial model, based on scientific data, ranks lakeshore areas for sensitive area designation. The model

provides objective, repeatable results that can be used as the basis for regulatory action.

Field surveys were conducted on all seventeen high priority lakes as well as three connecting lakes. Sensitive lakeshore area assessments were completed on nine high priority lakes. Reports summarizing these assessments were delivered to Cass County and interested organizations that could use the information to maintain high quality environmental conditions. To date, 48 miles of shoreline (approximately 36 percent of total surveyed shoreline miles) have been identified as sensitive lakeshore. Cass County is working to develop provisions in their land use ordinance that will require conservation-oriented development standards for sensitive areas. They will then propose and implement resource protection zoning districts. These resource protection districts will help promote healthy near-shore communities and protect critical fish and wildlife habitat.

Project Results Use and Dissemination
Nine Sensitive Lakeshore Reports were produced, and these reports are posted on the project's website. Public presentations were made explaining the project and the details of the sensitive lakeshore reports to the Cass County Board of Commissioners, the Cass County Planning Commission, the Association of Cass County Lake Associations, U.S. Forest Service, seven lake associations, and several interested groups and organizations. Cass County will hold public hearings on shoreland ordinance revisions and reclassifications in an effort to protect identified sensitive lakeshores, and all required processes for public input, review, and comment will be adhered to, including the rights afforded to challenge such ordinance and zoning district changes.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Water Resource Sustainability
Subd. 5i $292,000

John Nieber
U of M
1390 Eckles Avenue Rm 203
Minneapolis, MN 55108

Phone: (612) 625-6724
Email: nieber@umn.edu
Fax: (612) 624-3005
Web: https://wiki.umn.edu/view/Water_Sustainability

RESEARCH

Overall Project Outcome and Results
To assure that our use of freshwater within Minnesota is sustainable into the indefinite future it is necessary to know beforehand the rate of renewal of our freshwater supplies on an annual basis. The rate of renewal of freshwater supplies is a measure of the limits of the natural system to sustain both human needs as well as the needs of nature (ecological services). This project quantified this rate of renewal across the state and related the rate to various characteristics of the local landscape. This quantification was achieved using streamflow records for gauged watersheds located throughout Minnesota. The final result is in the form of atlases of mean minimum annual groundwater recharge (the rate of annual renewal of the freshwater resource) at three different geographical scales: statewide, regional, and county. Regional atlases were developed for the east central, southeast, and south central regions of the state. County atlases were created for Pope, Lac Qui Parle and Olmsted counties. Based on these atlases and the MNDNR water permits a database was produced that will allow the quantitative comparison of renewable freshwater supply and the water demand for human use down to the scale of individual township sections. The database provides the information needed to assess freshwater sustainability on any desired geographical scale. The atlases and the database supplied by this project will be of value to water planners at all geographical levels. One limitation of the current results provided is that they do not account for changes that occur in time, and therefore do not account for possible effect of future climate change. This aspect is needed to provide additional information to water planners for consideration of the risks posed by climate change.

Project Results Use and Dissemination
To date the project results have been used for an assessment of siting of a gas-fired power plant in Chisago County. In this case John Nieber was requested by 'The Friends of the Sunrise' to speak to their group, and other interested citizens regarding to the availability of groundwater resources for projected use by the power plant. The Minnesota Environmental Quality Board used results from the precursor study in helping to formulate the EQBs 2008 report on water resources sustainability, and it is expected that the results of the current study will be used for similar statewide assessments in the future. Of course it is the hope of the PI and co-PI of the project that the results will be used by the MNDNR, the MPCA,

and by other agencies in conducting water resource planning activities. A website for the project exists at https://wiki.umn.edu/view/Water_Sustainability. Many presentations have been made regarding this project every since the project began in 2007.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

County Geologic Atlas Program Acceleration
Subd. 5j $400,000

Dale Setterholm
MN Geological Survey
2642 University Ave W
St. Paul, MN 55114

Phone: (612) 627-4780
Email: sette001@umn.edu
Fax: (612) 627-4778
Web: http://www.geo.umn.edu/mgs

http://talc.geo.umn.edu/mgs/county_atlas/countyatlas.htm

Overall Project Outcome and Results
The County Geologic Atlas program creates geologic maps and associated databases at scales appropriate for resource management, especially ground water management, at the local scale. This grant funded progress on such mapping for Benton and Chisago counties. The counties qualified for participation by establishing accurate digital locations for water wells with construction records that are used as a basic data element in creating the maps. For each county the following products have been constructed:

- Database of well record information with geologic interpretations and a location map;
- Map of the glacial materials occurring at the land surface;
- Map of the bedrock types occurring at the surface of the bedrock;
- Closely-spaced cross-sectional views of the distribution of glacial materials between the land surface and the bedrock surface;
- Map of the elevation of the bedrock surface;
- Map of the thickness of glacial materials above the bedrock surface.

Tasks remaining include:

- Map or maps of the distribution of aquifers within the glacial materials;
- Digital surfaces for multiple sedimentary bedrock formations;
- CD or DVD with digital files of all the maps and databases and a GIS project to display and manipulate those maps and data;
- Printed copies of all the maps. These unfinished products will be created under our 2008 LCCMR grant.

The final outcome of completed county geologic atlases is an understanding of the distribution of aquifers and wells including how the aquifers are connected with each other, how they are connected to the land surface, and how they are connected to surface water features. Hydrologic maps and databases will be created by DNR Waters. The LCCMR funds were augmented with a matching grant of $41,110 from the United States Geological Survey under the STATEMAP program.

Project Results Use and Dissemination
When the additional products for Benton and Chisago counties are complete (expected December 2009 using M.L. 2008 appropriation from the Environment and Natural Resources Trust Fund) a workshop will be arranged to present this work to local users, and to explain how it was created and how it might be applied to resource management. The MGS provides ongoing support of these products as well. Logical applications that have arisen already include the search for municipal well sites for the City of Foley, evaluation of the effects of quarrying on local ground water in Benton County, and an evaluation of the ground water implications of a proposed power plant in Chisago County. Draft versions of some products have already been distributed to parties involved in these issues. The digital versions of the products will be available on CD or DVD and from the website of the Minnesota Geological Survey, and 1,000 printed copies will be distributed to each county. The County Geologic Atlases are a well-known and well-used source of data and geologic interpretations for state and local agencies, consultants, well construction contractors, and citizens. Many of the elements of the atlases are specifically named in the data needs identified in sustainable ground water management plans under development in Minnesota. They are provided in formats appropriate for the complete spectrum of users, including those who don't use

computers through users that require digital files appropriate for modeling and simulation of the ground water system.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Minnesota's Water Resources: Impacts of Climate Change- Phase II
Subd. 5k $300,000

Lucinda Johnson
U of M - NRRI
5013 Miller Trunk Highway
Duluth, MN 55811

Phone: (217) 720-4251
Email: ljohnson@d.umn.edu
Fax: (218) 720-4328
Web: http://www.nrri.umn.edu

RESEARCH

Overall Project Outcome and Results
Minnesota's climate has become increasingly warmer, wetter, and variable, resulting in unquantified economic and ecological impacts. Our team assessed future climate scenarios, quantified hydrologic responses to past climate, conducted an economic analysis to assess implications of changing climate to water resources, and identified water quality and fish indicators of response that could be used for future monitoring. Specific products included:

- Data tools to extract and summarize historic climate data from the State Climatology Office database,
- A water quality reporting tool,
- Climate predictions to the end of the century,
- Assessment of economic impacts of climat change on fisheries and water resources,
- Recommendations of indicators for inclusion in future monitoring programs.

Our findings include the following:

- Temperature increases are projected to be greatest in the latter half of this century, with temperatures generally above 2°C above the average from 1950-1999.
- Precipitation is projected to increase on an annual basis, but will decrease or be unchanged during the growing season, resulting in drier growing conditions.
- Overall, water temperatures in streams are projected to increase between 3 and 5°C.
- Ice out dates were found to be occuring about 1.44 days earlier per decade since the 1950's, and trends for increasing air temperatures in the future imply further declines in ice-free days.
- Historic data were utilized to identify climate periods in the record that were extreme (either due to temperature or precipitation). These extreme periods were then used to assess possible water quality and fish responses during those periods. Indicators of water quality responses were identified (e.g., water clarity, surface water temperature, conductivity); no specific fish responses were detected.
- Walleye spawning dates are changing with ice out dates, and there is evidence that some fish species are expanding their distributions (especially largemouth bass, bluegill and black bullhead). Cisco (tullibee) abundance is declining in northern lakes.
- Water quality and biological indicators were recommended for future monitoring.

Individual project components show detailed analyses and results.

Project Results Use and Dissemination
Project team members and their collaborators have made numerous presentations to general audiences, to agencies, and at professional conferences. Additional outreach and communications products include:

- Data from Kristal Schneider's Master's thesis regarding the relationship between walleye spawning and ice out has been published in the Transactions of the American Fisheries Society 139(4):1198-1210.. http://afsjournals.org/doi/abs/10.1577/T09-129.1. Further publications are planned.
- A mapping tools was created to display trends for lakes having between 5 to >18 years of data. Because of the large number of options for analyzing this broad data set, a comprehensive subproject website was constructed to make the trend results available to other project scientists and ultimately others: (http://mnbeaches.org/gmap/trendswebsite). The website includes "processed raw" data, complete metadata, summary tables, links to Google Maps that identify sites with descriptive statistics, and graphs (box and whisker and regressions). The data are also incorporated into the larger

project database that is now being used for more detailed examinations of climatic associations, geographic patterns, size and depth patterns, and associations with fish, and ice cover data.
- The climate data retrieval tool, developed by the State Climatology Office, was essential to all climatic research undertaken in this project. The climate data retrieval tool enabled project participants to extract climate variables important to their own specific questions, at time and space scales they deem relevant. While the climate data retrieval tool is available to project investigators only at the present time, the Office of the State Climatologist plans to make it available widely to Minnesota resource managers and researchers at the conclusion of this project.
- A third product is an annotated bibliography for the economics of climate change and environmental quality.

FINAL REPORT

Associated Project Publications

Appendix A: Potential Impacts of Climate Change on Minnesota's Water Resources: An Economic Analysis
Appendix B: Economic Impacts of Global Climate Change on Minnesota Fisheries Through Decreases in Lake Ice
Appendix C: Annotated Literature Review of Economic Analysis of Water Impacts from Climate Change
Appendix D: Online Climatic Data Retrieval Tool
Appendix E: Minnesota Climate in Century 21
Appendix F: Ice-out timing trend analysis for Minnesota lakes 1948-2008
Appendix G: Annual Stream Runoff and Climate in Minnesota's River Basins
Appendix H: Projecting the Impact of Climate Change on Coldwater Stream Temperatures in Minnesota Using Equilibrium Temperature Models
Appendix I: Biological Indicators of Climate Change: Trends in Fish Communities and the Timing of Walleye Spawning Runs in Minnesota
Appendix J: Trend Analyses for Species of Concern: Analysis of CPUE Data for Walleye, Cisco, and Smallmouth Bass 1970-2008
Appendix K: Water Quality Responses During Historical Climate Regimes (Scenarios)

Project completed: 6/30/2010

Back to top of page

Pharmaceutical and Microbiological Pollution
Subd. 5l $302,000

Timothy LaPara
U of M
500 Pillsbury Drive SE
Minneapolis, MN 55455

Phone: (612) 624-6028
Email: lapar001@umn.edu
Fax: (612) 626-7750
Web: http://www.ce.umn.edu/people/faculty/lapara/index

RESEARCH

Overall Project Outcome and Results

The goal of this project was to develop technologies that eliminate antibiotic-resistant bacteria, hormones, and other pharmaceutical compounds from Minnesota's surface waters. Laboratory-scale digesters were established in which wastewater solids were treated under both aerobic and anaerobic conditions at temperatures of 72°F, 98°F, 115°F, and 130°F. Our results demonstrated that aerobic digestion had no significant effect on the destruction of these genes; in contrast, the anaerobic digesters operated at 115°F and 130°F showed a very significant ability to reduce the quantities of these genes (with 130°F performing better than 115°F). This research demonstrates that anaerobic digesters treating wastewater solids (or agricultural manure) should be operated at the highest feasible temperature to help eliminate antibiotic resistance genes, which should help slow the proliferation of these organisms. In terms of antibiotic removal, the aerobic and anaerobic digesters were effective in the removal sulfamethoxazole, trimethoprim, and tylosin, with removal generally being greater at higher temperatures. Digestion did not lead to removal of the antibacterial triclosan or the estrogens tested. Laboratory and pilot-scale photolysis experiments revealed the compounds subject to direct photolysis (triclosan, tetracycline, tylosin) are likely to be amenable to degradation in wastewater treatment stabilization ponds or treatment wetlands. Cover materials either had minimal or inhibitory effects on photolysis rates. Two compounds (sulfamethoxazole and trimethoprim) were photodegraded more rapidly in wastewater effluent than in surface water or purified water, indicating that photodegradation is more likely to occur (and perhaps should be encouraged by design) in sunlit wastewater treatment process steps than in the environment. While solar photolysis shows some promise for treatment of pharmaceuticals, no evidence for removal of antibiotic resistance genes was in the photoreactor.

Project Results Use and Dissemination

This project has been used in numerous ways. First, we have communicated the results back to the State Legislature via informal (i.e., with individual State Senators and Representatives) and formal (i.e., hearings). Second, we have communicated these results to our various partners who operate municipal wastewater treatment facilities as well as other municipalities who operate municipal wastewater treatment facilities. Finally, we have disseminated our research results as broadly as possible, including via presentations at national and regional technical meetings as well as via publication in the peer-reviewed technical literature.

FINAL REPORT

Project due to be completed: 6/30/2010

Back to top of page

Threat of Emerging Contaminants to Upper Mississippi Walleye
Subd. 5m $97,000

Heiko Schoenfuss
St. Cloud State University
720 Fourth Avenue South WSB-273
St. Cloud, MN 56301

Phone: (320) 308-3130
Email: hschoenfuss@stcloudstate.edu
Fax: (320) 308-4166
Web: http://web.stcloudstate.edu/aquatictox/

RESEARCH

Overall Project Outcome and Results
In this combined field and laboratory study we assessed whether populations of native walleye in the Upper Mississippi River experienced altered genetic diversity correlated with the exposure to estrogenic endocrine active compounds. We collected fin-clips for genetic analysis from almost 600 walleye (13 sites) and sub-sampled over 360 of these fish (6 sites) for blood and reproductive organs. We further enhanced our sample size by adding genetic data from over 900 walleye analyzed for previous studies. Finally, we caged male fathead minnows at three of the sample sites to confirm the presence of estrogenic endocrine active compounds. Our findings indicate that male walleye in four river segments produce measurable concentrations of plasma vitellogenin (an egg-yolk protein and, when expressed in male fish, a biomarker of acute estrogenic exposure), a finding consistent with the presence of estrogenic endocrine active compounds and consistent with published historical data for at least three of these study sites (Grand Rapids, Pool 2, Lake Pepin). Patterns of vitellogenin induction were consistent for native walleye and caged fathead minnows. No widespread occurrence of histopathological changes such as intersex was found. To assess the genetic diversity of the walleye populations at the study sites, we DNA fingerprinted individual fish using molecular genetic markers. Genetic differences were observed between populations, however, these differences were consistent with geographic distance between populations (greater geographic distance=greater genetic difference) with the largest observed difference in genetic diversity found between fish upstream and downstream of St. Anthony Falls (and/or Lock and Dam 1 of the Mississippi River), a historical barrier to fish movement. In summary, while the persistent occurrence of endocrine disruption in wild fish populations is troubling, this occurence has not resulted in the degradation of reproductive organs in individual walleye or alteration in genetic diversity of walleye populations.

Project Results Use and Dissemination
Project results have been provided to the LCCMR on a semi-annual basis and in this final report. A related report on some of the genetic findings is also being prepared for the MN Department of Natural Resources. We plan to present the results of this study to the scientific community in form of a peer-reviewed manuscript in the near future. Furthermore, we will present our results to the regional scientific community and stakeholders at upcoming fisheries (i.e., Annual Meeting of the American Fisheries Society, Minnesota Chapter) and toxicological (i.e., Annual Meeting of the Society for Environmental Toxicology & Chemistry, Midwest Chapter) meetings. We have also provided limited project information on the website of the Aquatic Toxicology Laboratory at St. Cloud State University (http://web.stcloudstate.edu/aquatictox/) and will provide a more extensive review of the study after approval of the final report by the LCCMR.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Cedar Creek Groundwater Project using Prairie Biofuel Buffers
Subd. 5n $659,000

Clarence Lehman
U of M
1987 Upper Buford Cir
St. Paul, MN 55108

Phone: (612) 625-5734
Email: lehman@umn.edu
Fax: (612) 624-6777
Web: http://www.cedarcreek.umn.edu

RESEARCH

Overall Project Outcome and Results
Two great environmental challenges ahead-for Minnesota and the world-concern water and energy. This project has gathered new information on how the production of bioenergy can simultaneously improve water quality in the state. It is one of an integrated suite of existing and proposed projects to understand the potential for bioenergy to help improve wildlife habitat, water quality, natural landscape management, electrical generation efficiency, climate, and the general ecological integrity of the landscape.

The project has established an "underground observatory" to monitor water and what it carries from the surface to our groundwater and aquifers below. The project examined water filtered by the soil and roots beneath three different potential bioenergy sources: prairie, hay, and corn.

As expected, the deep roots of restored native prairies were best at filtering nitrogen contaminants from water. In addition, a number of less expected discoveries of the project will help in future planning and development:

1. Water retention in the soils was poorest in corn and bare ground, intermediate in hay, and greatest in prairie.
2. Prairies did not significantly decrease the total quantity of water re-supplied to groundwater but improved its quality.
3. Nitrogen removed by prairie plants significantly increased the quantity of biofuel they produced while not reducing biodiversity.
4. Effects on levels of pharmaceutical contaminants is still under analysis.
5. Significant carbon sequestration occurred in prairie soils but not those of hay, corn, or bare ground.
6. The downward flow of dissolved substances through even sandy soils is much slower than expected.

The underground observatory is a valuable ongoing resource, with much remaining to learn. The project organizers will seek continued funding from various sources to enable further understanding of how we can sustainably inhabit our planet.

Project Results Use and Dissemination
We have a project website available through the Cedar Creek Natural History Area website (http://www.cedarcreek.umn.edu). Many public and private tours are conducted at Cedar Creek annually and the plots in the present study were featured among them during relevant tours. Visitors receive verbal and written descriptions of the research and its implications, including handouts and review of installed signage. Presentations (oral or poster) to special interest groups, research groups, and other interested parties were given by project collaborators throughout the duration of the project. Publication of the results in a peer-reviewed scientific journal will be completed after field data has all been collected, summarized, and analyzed.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Pyrolysis Pilot Project
Subd. 5o $500,000

Roger Ruan
U of M
Rm 206 BAE Bldg, 1390 Eckles Ave
St. Paul, MN 55108

Phone: (612) 625-1710
Email: ruanx001@umn.edu
Fax: (612) 624-3005
Web: http://biorefining.cfans.umn.edu/home.php

Overall Project Outcome and Results
Diversified perennial plants throughout watersheds in rural areas of Minnesota are a source of biomass feedstock which can

be converted biofuels while also producing ecosystem and water quality benefits. The nature of sporadic production of this biomass in lands away from power and convenient water supply requires conversion technologies to be mobile, portable, self energy sufficient, and water free. The goal of our project was to develop, build, and demonstrate a mobile microwave assisted pyrolysis system which can be operated on biomass production sites. The two specific aims of the project were: (1) developing water free microwave assisted pyrolysis (MAP) system for conversion of cellulosic feedstocks to biofuels, and (2) demonstrating the technology through outreach and communication. We first optimized the processes which we developed from our previous research. Based on the optimized processes, we designed and constructed our first generation pilot system. We then conducted a series of pilot scale experiments and identified technical and engineering problems. Finally we designed and built the mobile demo system. Our pilot scale system has been demonstrated to more than 300 people including university researchers, government officials, private interests, biomass feedstock producers, bioenergy producers, students, and investors. The mobile system has been tested on the manufacture site and further testing will occur in Minnesota at the University of Minnesota's UMore Park. The technology developed was presented to a broader audience through more than 15 outreach events. Nine (9) peer-reviewed papers have been published and over 30 presentations and reports were made to the public. Our co-PI's company Rural Advantages also developed and offered numerous educational outreach and demonstration events totaling over 78 events with 285 speakers and reaching at least 5,410 attendees.

Project Results Use and Dissemination
Information obtained from the project was disseminated through demonstration of the static pilot scale system, outreach and educational events, and peer-reviewed publications. The results have successfully reached a wide range of audience including university researchers, government officials, private interests, biomass feedstock producers, bioenergy producers, students, and investors. A number of publications have aroused strong interests from investors. The project also led to efforts to seek additional funding to support work which will employ the new technology and system developed through this project.

FINAL REPORT

Project completed: 6/30/2010

Subd. 6 Natural Resource Information

Back to top of page

Minnesota County Biological Survey
Subd. 6a $1,500,000

Carmen Converse
DNR
500 Lafayette Rd
St Paul, MN 55155

Phone: (651) 259-5083
Email: carmen.converse@dnr.state.mn.us
Fax: (651) 296-1811
Web: http://www.dnr.state.mn.us/eco/mcbs/index.html

Overall Project Outcome and Results
This appropriation continued and accelerated the ongoing Minnesota County Biological Survey (MCBS), which identifies significant natural areas and systematically collects and interprets data on the distribution and ecology of native plant communities, rare plants, and rare animals. The information gathered by MCBS serves as a foundation for the conservation of critical components of Minnesota's biological diversity through ecological monitoring, environmental review, planning, and critical habitat protection.

In this phase of the MCBS, surveys were completed in Hubbard, Wadena, Itasca, Lincoln, Murray, Cottonwood, Jackson, Watonwan, and Martin counties. Surveys were accelerated in the Border Lakes and Nashwauk ecological subsections. Since 1987, MCBS has added 17,054 new rare feature records to DNR's Rare Features Database. Over 47,000 polygons of native plant communities and over 7,000 MCBS site polygons are available to external customers on DNR's "Data Deli", including MCBS sites of biodiversity significance. Aquatic plant data have been collected from 1,528 lakes.

New locations of animal species documented during this period included Prairie Vole, Chestnut-collared Longspur, Black-throated Blue Warbler, and Four-toed Salamander. Plants documented included *Najas guadalupensis var. olivacea*, a Great Lakes endemic aquatic plant and *Carex supina*, a cliff-dwelling sedge last observed in Minnesota in the 1930's. Sioux quartzite rock outcrop surveys yielded nearly 100 new records of rare plants. Since 1987, Twenty-one species and one hybrid not previously documented in Minnesota were recorded, with a 2008 addition of the aquatic plant *Potamogeton confervoides*.

Project Results Use and Dissemination
Data delivery and technical assistance were provided as related to:

- Forest certification
- DNR and US Forest Service forest planning
- Peatland management planning
- State land exchanges
- Woody and grasslands biomass guidelines
- Off Highway Vehicle guidelines
- State Wildlife Action plan implementation
- Quality lake identification
- Forest legacy projects
- Landscape collaborative planning
- Lake and native prairie monitoring
- Native prairie bank
- Updates to the state lists of rare species and calcareous fens.

Locally, aquatic plant data were delivered to lake associations, staff led field trips for county residents, and training sessions in plant community and plant identification. The publication, Native plant communities and rare species of the Minnesota River Counties was well-received by communities bordering the river corridor.

MCBS provided ecological evaluations for Franconia Bluffs, Seminary Fen, Butternut Valley Prairie, and Langhei Prairie that have since become Scientific and Natural Areas.

A statewide web map of the current extent of native prairie as compared to 100 years ago informs prairie ecosystem conservation planning. Another product is an easily downloaded booklet of the Ecological Systems in the Laurentian Mixed Forest Province.

Several MCBS related articles have been published in the *Minnesota Conservation Volunteer*; examples include "Elusive orchids" and "Rock pools on the prairie".

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Soil Surveys
Subd. 6b $400,000

Greg Larson
Board of Water and Soil Resources
520 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 296-3767
Email: greg.larson@bwsr.state.mn.us
Fax: (651) 297-5615
Web: http://www.bwsr.state.mn.us

http://soils.usda.gov/survey/printed_surveys/state.asp?state=Minnesota&abbr=MN

Overall Project Outcome and Results
In the ongoing multi-year process to map, classify, interpret and Web-publish an inventory of the soils of Minnesota, this two-year phase of the project focused on accelerating the completion of soil mapping, developing new soil interpretations and developing linkages of soils data with other related natural resources data. Specifically:

- 165,000 acres were addressed in Crow Wing County resulting in a digital soil survey for a portion of Crow Wing County, the Glacial Lake Brainerd area, to be released in the fall of 2009;
- 80,000 acres were addressed by NRCS soil scientists in Koochiching and Saint Louis Counties, resulting in soil mapping for Koochiching County being completed one year ahead of schedule;
- Soil productivity indices for cropland and forests were developed for 84 and 19 counties, respectively, in order to replace the outmoded Crop Equivalent Ratings (CER);
- Web-based decision support system was developed that integrates soils data with other natural resources data;
- Support was provided for the University of Minnesota Land Economics website to better complement USDA Web Soil Survey interpretations;

- Six counties (Cass, Carlton, St. Louis-Duluth subset, Lincoln, Scott and Benton) were digitized and posted on the Web Soil Survey bringing the total to 81 survey areas.

Two key lessons were learned during this 2007 phase that were incorporated into the on-going 2008 and 2009 project. The use of current NRCS employees brought to Minnesota on a work assignment ("detailees") is an efficient way to increase the completion of soil surveys after the initial investigative phase has been completed and a mapping legend has been developed. Additionally, we have determined that the USDA Web Soil Survey system is effective and sufficient for Web-publishing of Minnesota's soil survey data, so an independent system does not need to be developed by the state.

Project Results Use and Dissemination
Digital data through the WEB Soil Survey http://websoilsurvey.nrcs.usda.govare available for 83 project areas (Two additional survey areas have been completed with 2008 funds). Soil interpretations such as soil erosion and forest productivity indices are available at the University of Minnesota Land Economics Website http://www.landeconomics.umn.edu Soils data for areas not yet mapped and digitized are available to the public on a request basis.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Field Guide for Evaluating Vegetation of Restored Wetlands
Subd. 6c $53,000

Paul Bockenstedt
Bonestroo, Rosene, Anderlik, & Assoc., Inc.
2335 W Hwy 36
St. Paul, MN 55113

Phone: (651) 604-4812
Email: pbockenstedt@bonestroo.com
Fax: (651) 636-1311
Web: http://www.bonestroo.com

Overall Project Outcome and Results
Wetland mitigations in Minnesota are expected to be required to meet minimum native vegetation requirements for approval in the near future. The *Minnesota Field Guide to Wetland & Buffer Plant Seedlings* was developed as an easy-to-use guide to assist in evaluation of the quality of vegetation in wetland restorations in Minnesota.

Bonestroo staff gathered necessary graphic resources for the guide and met with BWSR and MPCA staff to discuss and refine the project layout and contents. Bonestroo graphic designers developed a layout template for the guide. Plant drawings and art were purchased from artist Mark Muller, and additional photos/graphics for native plant seeds and seedlings gathered by Bonestroo staff. Michael Bourdaghs of MPCA assisted with preparation of an abbreviated description of the Floristic Quality Assessment Index (FQAI) process for inclusion as the field methodology for evaluating wetlands.

A total of 2,450 guides were printed (original proposed 2,000) by Modern Press of St. Paul following a competitive bid process. These were distributed to a variety of state and county agencies, as well as federal agencies with Minnesota offices, professional organizations, and educational groups/institutions. A small number of printed guides and the final print-ready version of the guide were provided to Dan Shaw of BWSR. This project created the first guide of its kind for identifying wetland plants, their seeds and seedlings, as well as information on the wetland vegetation evaluation methodology being developed by MPCA. Printed guides were distributed to wetland professionals through a broad network of groups, professional organizations, and local, state and federal agencies. The *Minnesota Field Guide to Wetland & Buffer Plant Seedlings* is also available as a free of charge downloadable PDF on Bonestroo's website at http://www.bonestroo.com. It is also available to State agencies for posting to their websites, should they choose to do so in the future.

Project Results Use and Dissemination
The *Minnesota Field Guide to Wetland & Buffer Plant Seedlings* is being used as both a printed and online resource by wetland professionals. The guide has been distributed at wetland delineators training sessions, as well as by other wetland and natural resource professional groups. The guide is intended to be a supporting reference for plant identification for the wetland evaluation methodology (FQAI) being developed by the Minnesota Pollution Control Agency. This MPCA-developed methodology is anticipated for completion in 2010. The Guide to Minnesota Wetland and Buffer Plant Seedlings is being promoted both through word of mouth, as well as announcements at meetings, workshops, and conferences, by Bonestroo, agency, and nonprofit staff. A distribution list for printed guides was provided to LCCMR staff along with the final project report in July/August 2009.

Project Publication: Minnesota Field Guide to Wetland & Buffer Plant Seedlings

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Appropriation titled "Natural Resources Data Collection and Mapping" BECAME:

DataWorkshop: Democratizing access to Minnesota's data assets - a user friendly data integration and visualization tool
Subd. 6d $49,000

Terry Brown
Natural Resources Research Institute, University of MN
5013 Miller Trunk HWY
Duluth, MN, 55811

Phone: (218) 720-4345
Email: tbrown@nrri.umn.edu
Fax: (651) 296-1321
Web: http://gisdata.nrri.umn.edu/Tracker/DataWorkshop/

Overall Project Outcome and Results
Originally developed to facilitate the work behind the Statewide Conservation and Preservation Plan, the DataWorkshop is a tool that allows users to combine and cross reference existing GIS datasets to synthesize new information. The DataWorkshop is now available for use by other users such as the public, municipalities, non-profits, and state and county agencies The ability to integrate existing datasets through a web browser without the need for additional software and with only a basic computer background makes the tool unique. Users previously lacking any such capability are enfranchised and users with GIS resources may find DataWorkshop simpler and more efficient for some analysis tasks.

For example, a user may wish to produce a map of all the lakes larger than 100 acres in the western prairie habitat zone. The user would use this system to select the DNR's lake and habitat zone datasets, select from the lake dataset those lakes with an area greater than 100 acres, and from that subset, only those lakes which overlap the prairie habitat zone.

The project has used free (open source) software technologies to minimize the cost associated with hosting this service on the web. These include UMN-Mapserver, Postgis, and Python. NRRI will temporarily host a demonstration site to allow interested parties to evaluate the system and until a permanent location is determined on a Minnesota state agency website. The project will also be promoted at the upcoming MN GIS/LIS Consortium conference. Although projects of this kind can only be truly evaluated by their long term adoption and use, we are hopeful that this work has been a valuable step towards democratizing access to Minnesota's data assets.

Project Results Use and Dissemination
At the time of writing we are in the final stages of releasing the project, which we will promote through our contacts with agencies, potential users, and the MN GIS/LIS Consortium conference in Duluth in October.

NRRI will host a demonstration version of the website at http://gisdata.nrri.umn.edu/Tracker/DataWorkshop/ - this site should be available starting Jan. 1 2010 when a necessary server upgrade is complete.

FINAL REPORT

Project completed: 6/30/2009

Subd. 7 Establishment of an Emerging Issues Account

Back to top of page

Emerging Issues Account
Subd. 7 $160,000

John Velin , Director
LCCMR
100 Rev. Dr. Martin Luther King Blvd.

Rm 65 State Office Bldg
St. Paul, MN 55155

Phone: (651) 296-2406
Email: lccmr@lccmr.leg.mn
Fax: (651) 296-1321
Web: http://www.lccmr.leg.mn

Emerging Issues Account

WENT TO:

Statewide Conservation and Preservation Plan (SCPP) - $147,000

http://www.mnconservationplan.net

The Trust Fund funded Statewide Conservation and Preservation Plan (SCPP) is a collaborative effort providing a long term vision and guide for Minnesota's environment and natural resources. This funding continues and expands this effort by enabling the SCPP team to do additional more in-depth analysis on transportation and mercury issues in Minnesota.

Project completed: 6/30/2009

and

Statewide Ecological Ranking Conservation Reserve Program (CRP) and Other Critical Lands - $13,000 (completion date for this portion is 6/30/2009)

Other funds include:
M.L. 2008, Chp. 367, Sec. 2, Subd. 7 "Emerging Issues Account" - $155,000 (completion date for this portion is 6/30/2010)

M.L. 2009, Chp. 143, Sec. 2, Subd. 4g "Statewide Ecological Ranking of Conservation Reserve Program (CRP) and Other Critical Lands" - $107,000 (Project due to be completed: 6/30/2011)

Project due to be completed: 6/30/2011

Project due to be completed: 6/30/2011

2006 PROJECTS

MN Laws 2006, Chapter 243, Section 19 & Section 20 (beginning July 1, 2006)

Fish and Wildlife Habitat

Back to top of page

Land Exchange Revolving Fund for Aitkin, Cass, and Crow Wing Counties
Section 20, Subd. 08 $290,000

Mark Jacobs
Aitkin County
209 - 2nd Street NW
Aitkin, MN 56431

Phone: 218-927-7364
Fax: 218-927-7249
Email: mjacobs@co.aitkin.mn.us
Web: http://www.co.aitkin.mn.us

To establish a six-year revolving loan fund for Aitkin, Cass, and Crow Wing Counties to improve public and private land ownership patterns, increase management efficiency, and protect critical habitat.

Project due to be completed: 6/30/2011

Water Resources

Back to top of page

Lake Superior Research
Section 20, Subd. 06 $295,000 ($267,000 TF + $28,000 GLP)

Steven M. Colman
Large Lakes Observatory, UMD
2205 E. 5th Street
Duluth, MN 55812

Phone: 218-726-8128
Fax: 218-726-6979
Email: scolman@d.umn.edu
Web: http://www.d.umn.edu/llo

RESEARCH

Overall Project Outcome and Results
There is a surprising lack of study and understanding of the ecosystems of the Great Lakes and their properties, especially in the deepwater basins. We know more about many marine systems than we know about the Great Lakes. With current concerns about the environmental health of the Great Lakes, studies supported through this project aimed to contribute to alleviating some of the unknowns. A series of studies were conducted that research the condition, functioning, and processes of Lake Superior, its sediments, and its ecosystem including:

- Studies related to the entire living ecosystem, from top predator fish down to picoplankton.
- Studies of the circulation of the lake using numerical models and oceanographic instrumentation.
- Studies of the water column including the balance between CO2 production and oxygen consumption, the processes related to the fate of organic matter and nutrients, and the effect of these and other water column processes on primary producers.
- Studies of the transport and delivery of organic and inorganic materials to the lake floor as sediments that accumulate in deep waters of the lake and the erosion, transport, and storage of coarse-grained sediment in coastal waters.

In all of these studies, we took a holistic, "physics to fish" approach, examining the interactions between physical and biological processes.

We conducted a total of 24 field projects, with project funds going primarily to the cost of using of our research ship for an aggregate of 53 days at sea. Project funds leveraged other funding as most of these studies were small pilot projects, extensions to projects funded from other sources, and projects to collect preliminary data often required for proposals to the national science agencies. The projects have a common theme of understanding the dynamics of Lake Superior, its

sediments, and its ecosystem. Through these studies, we hope to provide Minnesotans, from lay citizens to environmental managers, a better understanding of how Lake Superior works and how it might change in response to climate change and human activity.

Project Results Use and Dissemination
We have now collected a wealth of environmental data for Lake Superior. A significant part of those data have already been used for larger research proposals to the National Science Foundation and other agencies, some of which have already been successful in bringing new federal funding into the state. Plans are for the results of studies supported through this project to be published in peer-reviewed journals where they will be available to Minnesota managers and regulators. With other funding, we are in the process of developing a system called the Global Great Lakes Data and Modeling Center, which will allow incorporation and assimilation of existing data, new data like those collected in this project, and ongoing real-time observational data. The Data and Modeling Center will allow numerical models to be run and compared in real time using the different data sets and make all data readily available though an internet interface.

FINAL REPORT

Project completed: 6/30/2009

Back to top of page

Impacts on Minnesota's Aquatic Resources from Climate Change
Section 20, Subd. 07 $250,000

Lucinda Johnson
UMD - Natural Resources Research Institute
5013 Miller Trunk Hwy.
Duluth, MN 55811

Phone: 218-720-4251
Fax: 218-720-4328
Email: ljohnson@nrri.umn.edu
Web: http://www.nrri.umn.edu/cwe/staff/ljohnsonintro.htm

RESEARCH

Overall Project Outcome and Results
This project examined historic climate records and developed a database on key climatic measures and their variability. We also analyzed hydrologic (e.g., streamflow, lake levels, water quantity and quality) and ecological response data (e.g., fish species distributions, walleye spawning phenology). We found that the following trends are evident:

- Temperatures are increasing throughout the state but changes are greater in the northern third. Changes have accelerated since the 1980s, with greater increases in night time temperatures and in the winter.
- Precipitation in the form of both rain and snow has been increasing since the 1930s, although there is variation across the state.
- Lake evaporation is increasing in some regions but not others. Trends in lake levels are not consistent across the state: some regions show large and significant increases in lake levels, while other regions show no significant trend.
- Stream flows are generally increasing, especially in the south to central part of the state.
- Review of historic ice out data show a trend towards earlier ice out dates across the state. Walleye spawning dates are correlated with ice out date. There is some evidence that fish communities are also changing.
- A sizeable fraction of lakes with many years of data indicated a warming of surface waters. Other trends, found in a smaller fraction of lakes, suggest that the summer thermocline of lakes is becoming somewhat more stable consistent with the warming trend.
- A substantial fraction of lakes in the data set also showed increases in various measures of salinity that are consistent with increased warming and increased watershed loading from stormwater and de-icing salts.
- An interesting trend, likely unrelated to climate, is an increase in water clarity of lakes, and a decline in associated nutrients and chlorophyll-a.

Several tools for downloading and visualizing results have been developed. Additional analyses are ongoing.

Project Results Use and Dissemination
Results of these analyses have been presented in various venues, including:

1. Johnson, L.B. Climate change and Minnesota's aquatic ecosystems. Science Museum of Minnesota, Thursday Evening Lecture Series. Exploring Water. 9 April 2009.
2. Johnson, L.B. Climate change and Minnesota's Aquatic Resources. Symposium. Minnesota Waters, Rochester, MN. May 2009.
3. Johnson, L.B. Adapting to climate change in Minnesota. Invited presentation to Minnesota Pollution Control Agency- Committee to evaluate adaption to climate change in Minnesota. 1 September 2009.

4. Schneider, K.N., D.L. Pereira, V. Card, R.M. Newman, and S. Weisberg. Timing of walleye spawning runs as an indicator of climate change. 138th Annual Meeting of the American Fisheries Society, Ottawa, ON, Canada. 20 August 2008.
5. Schneider, K.N. Timing of walleye spawning runs as an indicator of climate change. Conservation Biology Seminar Series, University of Minnesota, Saint Paul, MN. 16 September 2008.

Project results have been eagerly awaited by numerous agencies and committees working on statewide strategies for assessing adaptation to climate change. Dr. David Thornton invited Lucinda Johnson to present this project's findings to a newly convened committee to address adaptation strategies across state agencies. Results will also be used to inform a newly funded project to quantify impacts of climate change and land use change on cisco habitat (i.e., coldwater lake) in the glacial lakes region of the Midwestern US. In addition, several scientific publications are planned based on results of these analyses.

FINAL REPORT
ASSOCIATED PROJECT PUBLICATIONS:
Appendix A: Timing of Walleye Spawning as an Indicator of Climate Change
Appendix B: Minnesota lake water quality on-line database and visualization tools for exploratory trend analyses
Appendix C: Lake Level Response to Climate in Minnesota
Appendix D: Lake Evaporation Response to Climate in Minnesota
Appendix E: Stream Flow Response to Climate in Minnesota
Appendix F: Minnesota lake water quality on-line database and visualization tools for exploratory trend analyses
Appendix G: Symposium

Project completed: 6/30/2009

Environmental Education

Back to top of page

Enhancing Civic Understanding of Groundwater
Section 20, Subd. 02 $150,000

Patrick Hamilton
Science Museum of Minnesota
120 W. Kellogg Blvd.
St. Paul, MN 55102

Phone: 651-221-4761
Fax: 651-221-4514
Email: hamilton@smm.org
Web: http://www.smm.org

Overall Project Outcome and Results
Ground water is a resource in great and growing demand in Minnesota. Yet many citizens are unaware of the links between land use and ground water and the interconnections between ground water and surface water. The Science Museum of Minnesota, with the help of many partners, created outdoor ground water exhibits for visitors to the Museum and a ground water classroom program for delivery to schools throughout Minnesota.

The creation of the Ground Water Plaza in the Science Museum of Minnesota's outdoor science park, the Big Back Yard, significantly leveraged resources provided by LCMR. The Minnesota Ground Water Association provided $20,463 to drill the artesian well that provides the water for the ground water exhibits. A gift of $10,000 from the Toro Giving Program and in-kind donations from numerous entities also helped make the Ground Water Plaza possible.

Since its opening in August 2007, the Ground Water Plaza has become one of the key educational attractions in the Big Back Yard. About 40,000 people visit the park each summer season. The Big Back Yard and the Ground Water Plaza have become so popular as a destination for field trips that the Museum now sets aside two full weeks each September for exclusive use of the park by schools.

The Ground Water Classroom Program began visiting schools throughout Minnesota in spring 2008. The program reached a total of 50 schools and 7,324 students through spring 2009. Although the LCMR project, Enhancing Civic Understanding of Ground Water has concluded, the ground water classroom program will continue to be offered to schools. It is now included under the Water Residency heading on Science Museum of Minnesota's residency program website - http://www.smm.org /schools/atyourschool/residencies/.

Project Results Use and Dissemination
The Science Museum and the American Museum of Natural History in partnership produced an internationally traveling exhibit about water that opened in New York City in November 2007. Two Ground Water Plaza outdoor exhibit components

were modified for indoor use and replicated for inclusion in the 7,000 square-foot water exhibition. The National Ground Water Association provided $54,000 to cover the cost of building these two ground water components. Two copies of the Water exhibition with its ground water components were produced - one to tour North American venues and the second for overseas venues. To date, 712,000 people have seen the Water exhibition with its ground water components and several million more will as the show continues to tour for several more years.

FINAL REPORT

Project completed: 6/30/2009

2005 PROJECTS

Subd. 05 Fish and Wildlife Habitat

Back to top of page

Integrated and Pheromonal Control of Common Carp
Subd. 05g $550,000

Peter Sorensen
U of M
1980 Folwell Ave.
St. Paul, MN 55108

Phone: (612) 624-4997
Email: soren003@umn.edu
Fax: (612) 625-5299

RESEARCH

Overall Project Outcome and Results:
The common carp (Cyprinus carpio) is an invasive fish that has dominated our shallow lake ecosystems for the past century and caused enormous damage to their water quality, plants, waterfowl and fisheries. The overarching goal of this project was to develop guidelines for an integrated control scheme for the common carp based on its life history and reliance on pheromones (species-specific chemical signals). The possible use and identity of a female pheromonal attractant was studied in the laboratory while the reproductive habits of carp in the field were documented to determine how these traits might be targeted for control. Basic elements of carp biology were also examined to produce a statistical model that explored carp population dynamics and control strategies. Several key discoveries were made. First, behavior tests combined with chemical analysis confirmed the presence of a highly attractive, male-derived sex pheromone. This cue has polar and non-polar components with androstendione serving as a key component. While the presence of androsetendione causes the pheromone to attract sexually-active carp, the other components also serve as a strong species-specific signal that attracts all life stages and thus have potential for application. Detailed studies of carp spawning for two years demonstrated that while females prefer to spawn in fine-leafed, shallow vegetation in the spring and aggregate in the winter, removal schemes are possible. Lastly, a study of carp population dynamics discovered that while carp are mobile (they migrate into spawn each year), long-lived (over 50 years), fecund (females have up to 3 million eggs), but their young rarely survive. Further, larval survival only occurs in shallow, interconnected wetlands in years following severe winter-kills after which predatory native fish are not present: it appears that game-fish can control carp. This discovery was confirmed by modeling and demonstrates that carp control likely is feasible using an integrated scheme.

Project Results Use and Dissemination
The results of this project are being used by two large watershed districts (Riley Purgatory Creek, Ramsey Metro Washington) to study and start experimental projects to control carp. Both districts are contributing to the costs and are using techniques from this project. In addition, we are speaking with and advising at least half a dozen other groups on this topic across the state. The DNR is consulting with us. Late summer we disseminate our findings at the National Meeting of the American Fisheries Society where we have organized an entire day-long symposium on carp control. Since the inception of the study, we have been giving 4-8 public talks a year on carp to various groups including watersheds. Our results have been covered by both the Star Tribune and Pioneer Press, The Chanhassen Villager, and Outdoor News; Kare11 TV and the syndicated TV show "Minnesota Bound" have done shows on us; and we were covered twice by NPR. Two peer reviewed publications are in press with four others in preparation.

FINAL REPORT

Project completed: 06/30/2008

Subd. 06 Recreation

Back to top of page

Metropolitan Regional Parks Acquisition, Rehabilitation and Development
Subd. 06e $2,000,000

Arne Stefferud
Metropolitan Council
230 E. 5th Street
St. Paul, MN 55101

Phone: (651) 602-1360
Email: arne.stefferud@metc.state.mn.us
Fax: (651) 602-1467
Web: http://www.metrocouncil.org

Overall Project Outcome and Results:
This appropriation leveraged $1,333,000 of Metropolitan Council bonds and $701,000 of 2005 State bonds in grants from the Metropolitan Council to regional park agencies to accomplish the following:

- Acquire 567 acres in 4 parks (0.8 acre for Long Lake Regional Park in Ramsey County , 543 acres for Rice Creek Chain of Lakes Park Reserve in Anoka County , 18.6 acres for Lake Waconia Regional Park in Carver County , and 5 acres for Big Marine Park Reserve in Washington County).
- Acquire a permanent trail easement from Burlington Northern Railroad for a 0.8 mile of right-of-way for the Bruce Vento Regional Trail in Ramsey County.
- Partially finance trail and shoreline rehabilitation at Lake of the Isles in Minneapolis.
- Replace 4 pit toilets with sewer-served restrooms for picnic areas at Keller Regional Park in Ramsey County.
- Rehabilitate 0.7 miles of separated bike/pedestrian trails, lighting and landscaping along East Lakeshore Drive at Como Regional Park in St. Paul.
- Build 2 classrooms, storage and reception areas for a visitor center at Gale Woods Special Recreation Feature in Three Rivers Park District.
- Design/engineering for 1.5 miles of North Urban Regional Trail in Dakota County.
- Build a picnic shelter at the Sucker Lake portion of Grass-Vadnais Regional Park in Ramsey County.

A partial extension to the appropriation timeline is allowing Anoka County to use $524,000 remaining from a land acquisition grant to match $1,050,000 of Federal Transportation Enhancement grant funds to construct two linked sections of the Rice Creek North Regional Trail within Rice Creek Chain of Lakes Park Reserve that totals 4 miles.

Project Results Use and Dissemination:
The parks and trails where these projects are located had 9,233,000 visits in 2007, which was 28% of all visits to the Metropolitan Regional Park System in 2007.

Each regional park agency that received a grant or grants from this appropriation informs the public about the land acquisition, or new or rehabilitated park facilities with its own website and news releases. The Metropolitan Council also publishes a "Regional Parks Directory and Map" that informs the public about the recreation activities available at each regional park and trail and includes website addresses and phone numbers for each park agency for more information. Finally, the Metropolitan Council's website includes an interactive parks map that contains the same information as the paper version of the "Regional Parks Directory and Map" at http://www.metrocouncil.org/parks/r-pk-map.htm

Project completed: 12/31/2010

Back to top of page

Gitchi-Gami State Trail
Subd. 06f $500,000

Kevin Johnson
DNR
1568 Hwy #2
Two Harbors, MN 55616

Phone: (218) 834-6240
Email: kevin.johnson@dnr.state.mn.us
Fax: (218) 834-6639

To design and construct approximately two miles of Gitchi-Gami state trail segments.

Project due to be completed: Open through timeframe of federal match funding

---

Back to top of page

The Casey Jones State Trail
Subd. 06g $1,200,000

Michael Salmon
DNR - Trails & Waterways
1756 County Road 26

Windom, MN 56101

Phone: (507) 831-2900, x-225
Email: michael.salmon@dnr.state.mn.us
Fax: (507) 831-2921

Overall Project Outcome and Results
This project expanded and further developed the Casey Jones State Trail in southwestern Minnesota. Development included bituminous paving of five miles of existing state owned trail corridor in Pipestone county, along with construction of two trail bridges. Acquisition from willing sellers added one and a half miles of state owned trail corridor and also preserved 180 acres of remnant native prairie/oak savanna on the banks of Plum Creek in Murray County. The parcels acquired include:

- Eunice Anderson Living Trust: 19.58 acres (1 mile of trail corridor)
- Ralph Manwarren Estate: 180 acres (1/2 mile of trail corridor & remnant prairie)

The Anderson acquisition was significant because it extended one mile west the Lake Wilson segment of state owned trail corridor, reducing the gap to 3 miles between the Lake Wilson and Pipestone county trail corridor. The Manwarren acquisition on Plum Creek will serve as a significant trail foundation as we acquire trail corridor southwest to Lake Shetek State Park, and northeast to Plum Creek County Park near Walnut Grove.

Project Results Use and Dissemination
DNR Trails & Waterways in conjunction with Friends of the Casey Jones Trail Association and the City of Pipestone held a Grand Opening Trail Dedication on July 10th, 2008, celebrating the development of the first five miles of trail. Updated information on acquired parcels and trail development is published on DNR trail maps & the DNR website.

FINAL REPORT

Project completed: 06/30/2009

Back to top of page

Paul Bunyan State Trail Connection
Subd. 06h $400,000

Tony Walzer
DNR - Bemidji
6603 Bemidji Ave. North
Bemidji, MN 56601

Phone: (218) 308-2379
Email: tony.walzer@state.mn.us
Fax: (218) 755-4063

Overall Project Outcome and Results
The City of Bemidji acquired approximately 7.42 acres of land in the Wye area from Burlington Northern Santa Fe Railway. The DNR acquired approximately 4 acres of the Wye area from the City for $845,000. $400,000 from the Environment and Natural Resources Trust Fund was used to acquire the portion of the Wye area needed for the Paul Bunyan State Trail corridor from the City. The DNR used 2006 bonding funding to supplement the acquisition of this property.

The Wye area will be used to accommodate the trail corridor and future trail bridge over TH 197, along with trail amenities such as a parking lot and rest area. The City of Bemidji and DNR will continue to work together to cooperatively develop this area. Additional property rights will need to be acquired from the City, as it continues to work with CP Railway and Burlington Northern Santa Fe Railway and other residential property owners along the trail route. The Wye area corridor will connect the south lake Bemidji area trail corridor to the Clausen Avenue trail corridor.

This land acquisition and future trail construction will help to provide a major connection for the trail through the City and an amenity to the City's south shore economic development project. Future funding will be required to construct a bridge over TH 197. Once these projects are completed, a continuous paved trail will be provided from Lake Bemidji State Park to Crow Wing State Park.

Project Results Use and Dissemination
Information about the project has primarily been disseminated through the local media in relation the City's south shore development project. The Bemidji City Manager and City Council used this information as part of their overall development project, since the City was relying on the DNR acquisition funds to help with their south shore development project.

No articles appeared in the paper specific to the DNR acquisition of the City property, except for when the project was referenced in relation to the City's overall development project and reliance on the acquisition funds as part of that project. Once the trail is constructed, a news release will be submitted indicating the funding sources for the acquisition and construction.

An article did appear in the Bemidji Pioneer on August 13, 2008, pertaining to an LCCMR visit to Bemidji to get an update on the project, along with others in the area. See attached article for details.

FINAL REPORT

Project completed: 06/30/2010

Back to top of page

Local and Regional Trail Grant Initiative Program
Subd. 06l $700,000

Andrew Korsberg
DNR
500 Lafayette Rd.
St. Paul, MN 55155

Phone: (651) 259-5642
Email: andrew.korsberg@dnr.state.mn.us
Fax: (651) 297-5475

To provide matching grants to local units of government for the cost of acquisition, development, engineering services, and enhancement of existing and new trail facilities.

Project due to be completed: 06/30/2011 (Extended due to availability of Federal grant)

Back to top of page

Mesabi Trail
Subd. 06m $1,000,000

Bob Manzoline
St. Louis/Lake Counties Reg. Railroad Authority
801 SE Hwy 169, suite #4
Chisholm, MN 55719

Phone: (218) 254-2575
Email: bob.manzoline@ironworld.com
Fax: (218) 254-7972

To acquire and develop segments of the Mesabi Trail.

Project due to be completed: Open through timeframe of federal match funding

---

Back to top of page

Land Acquisition, Minnesota Landscape Arboretum
Subd. 06p $650,000*
*An equal match of non-state dollars was required for this project.

Peter Olin
U of M - MN Landscape Arboretum
3675 Arboretum Drive
Chaska, MN 55318

Phone: (952) 443-1412
Email: peter@arboretum.umn.edu
Fax: (952) 443-2946

Overall Project Outcome and Results:
A 90-acre parcel within the boundaries of the Minnesota Landscape Arboretum was acquired on September 22, 2009 by

combining these Environment and Natural Resources Trust Fund (ENRTF) funds with funds from a ML 2003 ENRTF appropriation. This particular land acquisition concluded a 25 year long process to acquire this parcel. The acquisition provides an internal connection to the Horticultural Research Center and adds to the Arboretum additional big woods, high quality wetlands, prairie remnants, oak savanna, and valuable tillable land for future research and education programs.

A master planning effort by the Minnesota Landscape Arboretum determined that, to a great extent, the Arboretum's watershed follows the surrounding roadways. By purchasing lands within the roadways, the Arboretum aims to secure approximately 90 - 95% of its watershed, control adjacent development, preserve a major part of the ecosystem in the Chanhassen/Victoria/Chaska area, and make the area accessible to the general public.

The Arboretum's planning efforts identified 278 acres of lands to acquire. With the 90 acres added through this project, to date, 241 of the identified acres have been acquired and 37 acres of in-holdings remain left to purchase. This progress has been made possible by $2.38 million from the Environment and Natural Resources Trust Fund along with $2.38 million in privately-raised matching funds.

Project Results Use and Dissemination:
Information about this purchase and the ENRTF funding support will be disseminated through Arboretum publications and through information resources at the University Of Minnesota.

FINAL REPORT

Project completed: 06/30/2009

Subd. 07 Water Resources

Back to top of page

Improving Water Quality on the Central Sands
Subd. 07i $587,000

John Moncrief and Carl Rosen
University of Minnesota
University of MN, 1991 Upper Buford Circle, Dept. Soil, Water & Climate
St. Paul, MN 55108

Phone: (612) 625-2771
Email: moncr001@umn.edu
Web: http://www.mnpi.umn.edu/psat.htm

RESEARCH

Overall Project Outcome and Results
Nitrate leaching to groundwater and phosphorus runoff to surface water are major concerns in sandy ecoregions in Minnesota. Some of these concerns can be attributed to agricultural crop management. This project was comprised of research, demonstration, and outreach to address strategies that can be used to minimize or reduce nitrate leaching and phosphorus runoff in agricultural settings.

Research evaluating slowed nitrogen transformation products, nitrogen application timing, and nitrogen rates was conducted on potatoes, kidney beans, and corn under irrigation on sandy soils. For potatoes, variety response to nitrogen rate, source, and timing was also evaluated. Results showed several nitrogen management approaches reduced nitrate leaching while maintaining economic yields. Based on these results, promising treatments were demonstrated at a field scale using cost share monies. In some cases, producers tested or adopted new practices without the cost share incentive.

- For potatoes, results show that at equivalent nitrogen rates, use of slow release nitrogen reduced nitrate leaching on average by 20 lb nitrogen per acre. Economically optimum nitrogen rates could be reduced by an average of 15 lb nitrogen per acre with slow release nitrogen. In addition, a primary advantage of using slow release nitrogen was that only one application was required instead of multiple applications, which resulted in lower application costs. As a result of this research, slow release nitrogen is being used on ~15,000 acres in the state or about 1/3 of the potato acreage. The reduction in leaching to groundwater based on these results is 300,000 lbs of nitrogen in the state for potatoes alone.
- For corn the slow nitrogen release product applied at planting resulted in a 29 bu/acre increase over the one time application of untreated urea at planting and also allowed eliminating a split nitrogen application. Nitrate leaching was also significantly reduced.
- Similar results were found for kidney beans. It was also shown that the kidney bean nitrogen rate could be reduced by one third when the coated urea was used at planting. A number of best management practices for using polymer coated urea in irrigated potato, kidney bean, and corn production systems have been developed as result of this research.

The research and demonstration results were the basis for a number of educational programs for farmers and those that advise farmers to encourage implementation over a wide area with high risk soils and aquifers. In cooperation with the Minnesota Department of Agriculture, two surveys were also conducted in 12 counties with sandy soils and surficial aquifers to determine nitrate levels in private and municipal well water and the economics of treating water from them. The survey was targeted to sandy regions by combining a zip code map with a soil association map or with nitrate probability maps from the Minnesota Department of Health. In the private well water survey about 6% of the wells were found to be above the USEPA drinking water standard of 10 ppm nitrate-nitrogen. The survey highlighted the economics of nitrate leaching and some of the options that municipalities and private well owners have taken to deal with high nitrate in their drinking water. The Minnesota Phosphorus Source Assessment Tool (PSAT) was developed to allow evaluation of phosphorus sources in small watersheds for educational and planning purposes. The PSAT is currently being used by water planners such as Soil and Water Conservation Districts, Watershed Districts, and Lake Associations. Six peer reviewed publications and three fact sheets have been produced based on the research conducted in this project.

Project Results Use and Dissemination
Presentations were made to various organizations and at various conferences throughout the project period. This included presentations to the Northern Plains Potato Growers Association, Soil Science Society of America, American Society for Horticultural Science, Minnesota Ground Water Association, and others. Additionally, hundreds of growers and grower consultants were contacted about the project and its findings. Hands-on demonstrations of the Phosphorus Source Assessment Tool (PSAT) were conducted across the state, and it is now being used by soil and water conservation districts, watershed districts, lake associations, and others. The tool, back ground information, and user manual are available at http://www.mnpi.umn.edu/psat.htm. Finally, the project findings were presented in numerous peer-reviewed articles and through numerous fact sheets available on the web.

FINAL REPORT (Project Publications Attached)

Project completed: 06/30/2010

Back to top of page

Improving Impaired Watersheds: Conservation Drainage Research
Subd. 07j $300,000

Mark Dittrich
Dept of Agriculture
625 Robert St. N.
St. Paul, MN 55155

Phone: (651) 201-6482
Email: mark.dittrich@state.mn.us
Fax: (651) 201-6120

RESEARCH

Overall Project Outcome and Result
Rural drainage systems are being repaired and replaced in Minnesota at an increasing rate. This provides a unique opportunity to simultaneously install conservation designs and practices with drainage repairs and improvements. This project measures the efficacy of three conservation practices with in-field methods and computer simulation of their performance in southern Minnesota. These innovative conservation practices may play a vital role in improving water quality in Minnesota and the hypoxic zone in the Gulf of Mexico.

Measuring the Efficacy of Three Conservation Practices:

1. Managed Drainage: Water control structures in drainage pipe designed to retain soil moisture by seasonally elevating the water table in the crop field within 2 feet from the soil surface.
2. Shallow Drainage: Drainage pipe installed at 2.5-3ft depth, rather than the traditional 4-5 ft depth.
3. Woodchip Bioreactor: Connecting drainage outlet pipe to an excavated area filled with woodchips, then area is capped with 12-18" of topsoil.

Results for Managed and Shallow Drainage: Field-based Studies
The field-based studies occurred in Nicollet and Mower County with fully instrumented flow measurement devices and weekly nitrate-nitrogen grab samples. There were two research plots, each approximately 10 acres for each site. Findings showed a 20% reduction in the flow discharge from managed drainage compared to conventional drainage. Nitrate concentrations between plots were very similar, and nitrate load reduction in managed drainage plots compared to conventional subsurface drainage practices were associated with the total amount of flow discharged, not the nitrate concentration.

Computer Simulation for Managed and Shallow Drainage
Computer modeling can help understand the range of impacts where field based studies may be cost prohibitive. Important site specific parameters for modeling subsurface drainage include soil and climate factors such as rainfall, temperature, and evapotranspiration. Together these dictate the range of potential effects a drainage system and the associated designs have upon the receiving water body. Also, simulations can associate the size and timing of the associated benefits with these two conservation management practices: managed and shallow drainage.

Three sites were chosen for simulation, as they provided needed baseline information for climate, soils and associated drainage management practices (managed and shallow drainage). The sites included were located in Redwood, Waseca and Mower counties, which provided a range of climate and soil parameters.

Results from Computer Simulation

- Redwood County site exhibited the greatest drainage volume reduction for shallow and managed drainage compared with conventional drainage: 18% and 38% respectively. The Mower County site exhibited the least volume reduction for shallow and managed drainage: 7% and 26% respectively.
- Managed drainage provided a 15% volume reduction beyond shallow drainage at each of the three site locations.

Woodchip Bioreactor: Rice and Dodge County Sites
The primary focus at these two sites was to measure the efficacy of a woodchip bioreactor, which is an excavated area intercepting subsurface drainage and retaining drainage water long enough to significantly reduce nutrient and bacteria concentrations. The two sites and infrastructure will be used for ongoing analysis of herbicide remediation in 2010-2011.

Results for Woodchip Bioreactor

- 50% of nitrate-nitrogen load was reduced within the woodchip trench in less than 32 hours, 30% of the load was reduced in 22 hours, and nearly 100% in 50 hours.
- Phosphorus concentrations were reduced by about 50%.

Project Results Use and Dissemination
The results from this study were disseminated through USDA and USEPA task force and coalition meetings that included industry in public-private partnerships with the research and field-based studies. Leadership and program development was provided primarily with the USDA - Natural Resources and Conservation Service (NRCS) and the USDA - Agricultural Research Service (ARS), beginning in 2003. Related activities included presentations to more than 32 groups, and delivering 2,200 publications to interested stakeholders and agency staff. These activities occurred in concert with Dr. Gary Sands's University of Minnesota "Drainage Outlet" website that has been redesigned to increase information delivery and overall ease-of-access. Full reports are located at www.mda.state.mn.us

FINAL REPORT

Project completed: 06/30/2009

Subd. 09 Agriculture and Natural Resource Industries

Back to top of page

Completing Third-Party Certification of DNR Forest Lands
Subd. 09a $250,000

Rebecca Barnard
DNR-Forestry
500 Lafayette Rd
St. Paul, MN 55155

Phone: (651) 624-5256
Email: Rebecca.Barnard@state.mn.us
Fax: (651) 259-5954
Web: www.dnr.state.mn.us/forestry/certification/index.html.

Due to the complexity and general lack of awareness of Forest Certification among the general public, numerous "Fact Sheets", briefing documents, newsletter articles, and general informational publications have also been produced and distributed to internal staff and/or external stakeholders. In some cases, these are also available on DNR's website.

Since initially pursuing dual certification in 2005, Minnesota DNR's Forest Certification Coordinator and other members of the Forest Certification Implementation Team (FCIT) have attended and presented a great number of conferences, stakeholder meetings, workshops, field tours, training sessions, etc. Over the course of the last five years, it is likely that several thousands, if not more, people have been reached via the methods described above.

More recently, Minnesota DNR has been closely engaged in the FSC and SFI Standard revision process. Minnesota DNR, along with other partners, has submitted extensive comments on the SFI and FSC Standard revisions and has also participated in several conference calls, face-to-face meetings, and in a field test of the newly proposed FSC National Standard. Through these efforts, Minnesota DNR has reached many more people and stakeholder groups, either directly or indirectly.

Supplementary Materials (available on DNR's website or upon request):

- FSC and SFI Forest Management Certificates for 2005-2010 (website)
- FSC and SFI Assessment and Annual Audit Reports (website)
- Map of Certified Forestlands in Minnesota (website)
- DNR's Internal Audit Team Reports (upon request)
- Minnesota DNR CAR Response (upon request)
- Issue "Fact Sheets" (upon request)
- Presentations (upon request)
- General Publications, Newsletter Articles, etc. (various sources - upon request)

FINAL REPORT

Project completed: 06/30/2010

SUBD. 10 ENERGY

Back to top of page

Clean Energy Resource Teams and Community Wind Energy Rebate and Financial Assistance Programs
Subd. 10a $700,000

Stacy Miller
Dept of Commerce - State Energy Office
85 - 7th Place E, Suite 500
St. Paul, MN 55101

Phone: (651) 282-5091
Email: stacy.miller@state.mn.us
Fax: (651) 297-7891
Web: http://www.commerce.state.mn.us

The project has been divided into two parts. Part 1 - Clean Energy Resources Teams for $300,000 was completed in 2007. Part 2 - Community Wind Energy Rebate and Financial Assistance Program for $400,000 which will be completed in 2010.

PART 1: Clean Energy Resouce Teams

Appropriation Amount: $300,000

Overall Project Outcome and Results:
The Clean Energy Resource Teams (CERTs) provide technical assistance to implement cost-effective conservation, energy efficiency, and renewable energy projects throughout Minnesota . This is accomplished through a network of six regional teams working with the statewide CERTs coordinators to implement community-based energy projects that addressed their respective regional priorities.

CERTs awarded grants for technical assistance for at least two projects in each region, funding fifteen in all. An estimated thirty energy efficiency and renewable energy projects received assistance from CERTs while countless individuals consulted with CERTs coordinators for project advice.

The CERTs model has proven to be an effective way for citizens to participate in energy efficiency and renewable energy development. In 2006, the Minnesota Environmental Initiative recognized the Clean Energy Resource Teams with the Partnership of the Year award. As further affirmation of the CERTs model, both the governor and the legislature budgeted for a second phase of CERTs through fiscal year 2009. (Minnesota State Laws 2007, 216C.385.) This legislation also appropriated funds to create a seventh CERT to serve the Twin Cities area. A survey titled, Report on the Clean Energy Resource Teams (CERTs) Project is part of the final report and measures volunteer satisfaction with the CERTs program statewide at 95%. (See Attachment D.)

Project Results Use and Dissemination:
Each CERT hosts a quarterly meeting that draws between 20 and 100 people. Additionally, there are frequent workshops and trainings. This year, the CERTs statewide conference drew 400 people from the public, private, and not-for-profit sectors.

Designing a Clean Energy Future: A Resource Manual was published in 2003 to highlight opportunities for communities to work together on energy issues. It offers basic information on energy efficiency, biofuels, solar, and wind as well as other renewable technologies with tips on how to implement projects. The manual is available in hard copy and athttp://www.cleanenergyresourceteams.org.

The CERTs website had nearly 16,000 new visitors this year. Additionally, there are 1,100 e-mail subscribers to CERTs monthly updates which cover upcoming events, funding opportunities and regional project highlights.

The CERT model is receiving recognition nationwide. This fall, CERTs is presenting to the Will Steger Foundation Summer Institute, the Rural Youth Summit in Ames, Iowa and the Western Mountains Alliance in Maine. The presentations will focus on how partnerships between land grant universities, not-for-profit organizations, and state energy offices can be an effective way for citizens to get involved in implementing successful community-based energy projects.

FINAL REPORT

Project completed: 06/30/2007

PART 2: Community Wind Energy Rebate and Financial Assistance Program
Appropriation Amount: $400,000

Overall Project Outcome and Results
The Community Wind Energy Rebate and Financial Assistance Program was designed to competitively select proposed community-owned wind energy projects to receive financial assistance and rebates of $200,000 for the successful completion of megawatt-scale, grid-connected wind turbines. The goal behind the program was to demonstrate how a local government could use local resources to utilize renewable energy development as a means to direct funding to the public and to help contribute to local renewable energy goals. Two local government projects were competitively selected to participate in this program including Winona County Economic Development Authority (EDA) and a collaborative effort by the Rural Minnesota Energy Board (RMEB) and the Metropolitan Energy Policy Coalition (MEPC), formerly known as the Metro County Energy Task Force (MCETF). Both entities found that publicly owned megawatt-scale wind projects are difficult to develop without private partnerships that allow for federal financial support.

In the case of Winona County EDA, there were a number of hurdles and barriers encountered. During the 2007 legislative session, the county first had to pursue legislation (Minn Laws 2007 Ch. 57, art. 2, Sec. 39) to allow the county to sell power. Following that a number of financing options were considered before one was settled upon. Based on the selected option, Winona County EDA submitted their proposal for approval to receive the rebate in January 2010. However, at this time Winona County EDA's effort was determined to be ineligible for a rebate due to the project ownership structure necessary to allow eligibility for federal grants. Under the proposal, the Winona County EDA would have entered into a partnership with private investors to create a limited liability corporation. Winona County EDA proposed receiving the Environment and Natural Resources Trust Fund dollars and in turn, lending the funds to the project partners. However, this structure was deemed not to fit the requirements of the grant that the project be owned by a public entity. In a letter dated April 28, 2010, the Department of Commerce officially requested that the $200,000 in funds reserved for Winona County EDA be returned to the Trust Fund.

While this program did not contribute financial assistance to a local government to support the development of a megawatt-scale local wind project, the grant opportunity was helpful in obtaining the legal authorization to own interest in a wind generation project and to do so on a timeline that will allow for the contribution of federal funds. The lessons learned through this exercise are included in the final report and may be valuable to other public entities seeking to participate in public-private partnerships.

RMEB is a Joint Powers of sixteen counties in southern Minnesota formed to provide policy guidance on issues surrounding energy development in rural Minnesota. MEPC is a member group of seven metro area counties and the Metropolitan Council with "longterm interest in the use of secure, safe, reliable, sustainable, economical and environmentally responsible energy for constituents." The RMEB-MEPC County Wind Initiative (CWI) was the result of discussions among RMEB and MEPC members with mutual interest to assist in developing local wind projects, especially in rural southwest counties, with the potential to provide rural and metro counties with clean renewable electricity and the opportunity to stabilize energy costs.

These initial discussions explored the technical and governmental framework necessary for constructing 5-20 MW of community-owned wind generation capacity. Due to the complexity of the development process, CWI requested that LCCMR allow funds to be directed to assist with the planning process rather than as a $200,000 rebate. The request was approved

with the objective of developing a procurement approach by which other public institutions in similar situations could develop and benefit from community-owned wind energy projects. The lessons learned through this exercise may be valuable to other public entities seeking to develop large-scale renewable energy projects by utilizing public-private partnerships and other governance structures.

FINAL REPORT

Project completed: 6/30/2010

Back to top of page

Wind to Hydrogen Demonstration
Subd. 10e $800,000

Mike Reese
U of M - W. Central Research & Outreach Ctr.
46352 State Hwy 329
Morris, MN 56267

Phone: (320) 589-1711
Email: reesem@morris.umn.edu
Fax: (320) 589-4870
Web: http://renewables.morris.umn.edu/

Overall Project Outcome and Results
The Wind to Hydrogen Demonstration project was funded by the Environment and Natural Resources Trust Fund in July 2005 with the goal of demonstrating the use of wind energy to store hydrogen for use as base load or peak power.

After a lengthy development process, in March 2010 the University granted final approvals necessary to proceed with construction of the facility. An electrolyzer capable of producing 1.2 lbs of hydrogen per hour was purchased from Proton Energy Systems and a 60 kilowatt engine generator was purchased from the Hydrogen Engine Center. The electrolyzer uses electricity to separate hydrogen and oxygen from water. The engine generator produces electrical energy by combusting hydrogen gas. The systems were installed at the West Central Research and Outreach Center in June 2010. Following installation, Proton Energy Systems and Hydrogen Engine Center commissioned the equipment and trained University staff. All commissioning steps were completed. The electrolyzer produced 3.5 cubic feet or 2.6 lbs of hydrogen. The hydrogen engine generator was brought up to full power generation.

The goal of the project to use wind energy to store hydrogen for use as base load or peak power has been successfully demonstrated. The University will continue to operate the pilot facility to determine the feasibility of using hydrogen to store wind energy and to create value-added products such as nitrogen fertilizer. Successful demonstration of the system can address main barriers for wind energy. Storage processes such as the production of hydrogen may be an opportunity to overcome the 'intermittency' barrier. The second barrier is the lack of transmission capacity. The production of hydrogen can impact this barrier by using excess wind energy to produce hydrogen and other value added components thereby diminishing the need for additional transmission to move power to load centers. Energy intense industries may then be created in rural areas with high wind resources. The benefits are three-fold: the grid is better managed, the environment benefits from increased use of renewable energy, and the state economy is enhanced.

Project Results Use and Dissemination:
The intent is for the results to lead to commercial wind to hydrogen production facilities. Initial funding for the Wind to Hydrogen Demonstration was provided by the Environment and Natural Resources Trust Fund. Additional funding from the State and the University for a second phase will be used to demonstrate using hydrogen to produce nitrogen fertilizer. It is anticipated that the combination of hydrogen storage for electrical energy generation and use for nitrogen fertilizer production could be a viable economic model in the near future. The information has been disseminated to a wide group of stakeholders and students through presentations, print materials, media articles, tours, and the web including seven national presentations, twenty-two regional presentations, and over fifty local presentations. Since its installation in June 2010, over 1,000 people have toured the facility. There have been several news articles primarily in agriculture magazines. The project has also been mentioned in hydrogen-related stories in the New York Times and the Washington Post. As a University of Minnesota Research and Outreach Center - inherent in the name and mission - information regarding the project will continue to be disseminated to a broad audience in multiple formats.

FINAL REPORT

Project completed: 06/30/2010
