



**Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan**

Date of Report: January 15, 2014
Date of Next Status Update Report: December 30, 2014
Date of Work Plan Approval:
Project Completion Date: June 30, 2016
Does this submission include an amendment request? No

PROJECT TITLE: Cattail management for wetland wildlife and bioenergy potential.

Project Manager: Dan Svedarsky, Research Biologist
Organization: Northwest Research and Outreach Center, U of Minnesota
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Location: Counties of Polk, Red Lake, Pennington, and Marshall.

Total ENRTF Project Budget: ENRTF Appropriation: \$ 74,000

Amount Spent: \$0

Balance: \$ 74,000

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 06i

Appropriation Language:

\$74,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota for the Northwest Research and Outreach Center in Crookston to evaluate different management techniques for cattail control and related wildlife impacts in northwest Minnesota and to assess the use of cattails as a biofuel feedstock.



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2014 Work Plan

I. PROJECT TITLE: Cattail management for wetland wildlife and bioenergy potential.

II. PROJECT STATEMENT: On many public lands (National Wildlife Refuges, Wildlife Management Areas, Waterfowl Production Areas, flood control impoundments) in northwest Minnesota, cattail growth has far exceeded the 50:50 distribution recommended for optimum wetland wildlife habitat (Weller and Spatcher, 1965; Murkin, et. al., 1981). The need for cattail control is supported by David Rave and Ray Norrgard, wetland scientists with the Minnesota Department of Natural Resources: *“There have been some studies examining the management of exotic cattails using flooding, herbicide treatments, and mechanical means such as roto-tilling. However, these methods are expensive and labor intensive. If a market could be established to utilize exotic cattails, management would become much more affordable. We are excited by the possibilities that this innovative research project may lead to in the management of exotic cattails in Minnesota wetlands, and fully endorse this project.* Also, David Bennett, manager of the Glacial Ridge National Wildlife near Crookston, and where extensive acreages of hybrid cattails are developing, commented: *“As a manager of a National Wildlife Refuge, cattail management has been a concern for nearly my entire 37 years with the U.S. Fish and Wildlife Service. Hybrid cattail encroachment of our nation's wetlands is having a negative effect on many water-nesting birds. I believe your project will provide the essential first steps to making the biomass harvest of cattails a viable wetland management tool.”* Cattails have also been recently demonstrated to have bioenergy potentials in Manitoba. Grosshans, et. al. (2011), noted that pelletized cattails have energy comparable to wood pellets at 17 MJ/Kg. (http://www.iisd.org/pdf/2011/netleylibau_marsh.pdf) Thus, cattails could be simultaneously managed for wetland wildlife and harvested for bioenergy. The U.S. is heavily dependent on fossil fuel energy. Using cattails as a partial substitute for fossil fuels could help mitigate climate change by reducing Greenhouse Gas emissions. Additionally, local rural economies could be boosted by harvesting an in-state, renewable resource since Minnesota has no fossil fuels. In 2012, an inventory of cattails in northwest Minnesota determined cattails can be effectively managed/harvested with conventional equipment in dry falls like 2012, but methods must be developed that can be employed in average to wet years and assure more dependable bioenergy harvest and fuel source. Along with management/harvest demonstrations, data on the response of wetland wildlife to these management applications will be collected to measure these effects.

Goals include the following:

- 1: Evaluate cattail management/harvesting techniques in representative habitats of northwest Minnesota.
- 2: Monitor wetland wildlife effects of cattail management/harvest.
- 3: Develop a publication that extends the findings to citizens, land managers, and policy makers.

This project will achieve the above goals by working with agencies and private contractors to do field tests using conventional and modified harvesting equipment to operate in a range of wet habitats. An agreement has been made with the Mattracks Company in Karlstad, Minnesota to rent a bi-directional tractor that is equipped with their custom designed tracks. It would also have a front-mounted swather (to cut and wind-row cattails) and a rear-mounted round baler that would also be equipped with tracks. Hopefully this arrangement would allow the baling of biomass with a single pass through a wetland and thereby save energy.

To augment field demonstrations, an extensive literature review of findings in North America and Europe will describe the range of equipment used for harvesting and processing in similar settings, different examples of using biomass in various applications, and wildlife effects of biofuel harvest in wetlands. This project will continue and intensify wildlife and cattail studies initiated on a pilot basis in 2013 at the Glacial Ridge National Wildlife Refuge near Crookston.



**Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan**

III. PROJECT STATUS UPDATES:

Project Status as of December 30, 2014:

Project Status as of June 30, 2015:

Project Status as of December 30, 2015:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1:

Description:

Cattail Management and Harvest

We will demonstrate and evaluate methods of cattail management in 3 northwest Minnesota settings; restored shallow wetlands landscape (Glacial Ridge National Wildlife Refuge), a representative flood control impoundment with water level control capability (Agassiz Valley Project or Parnell Impoundment), and a representative wetland wildlife management area with limited water level control capacity (Agassiz National Wildlife Refuge). Agassiz NWR received Lessard-Sams Outdoor Heritage Council (LSOHC) funding for chemical control of 600 acres of cattails in 2014 which will be followed by fall burning. Cattails will not be harvested at Agassiz NWR since they will be fall burned; only vegetation and bird effects will be monitored. Glacial Ridge NWR received Lessard-Sams Outdoor Heritage Council funding for mechanical management of cattails in shallow wetlands where conventional farm equipment will be used for 50% cattail harvest from study wetlands. Modified, track-mounted equipment will be used to harvest cattails in a flood-control impoundment removing about 50% of the biomass in a patch-work fashion. .

Summary Budget Information for Activity 1: ENRTF Budget: \$ 22,600

Amount Spent: \$ 0

Balance: \$ 22,600

Activity Completion Date: November 30, 2014

Outcome	Completion Date	Budget
<p>1. After harvest of cattails in a flood-control impoundment, an approximate 50-acre wetland will be present where 50% of the cattails have been removed in a checkerboard pattern. The outcome will be a demonstration area where “before and after” vegetation and bird survey data will be collected to measure effects of harvest. A bi-directional tractor will be equipped to do this harvest and produce a number (to be determined) of large round bales of cattails. The</p>	<p>November 30, 2014</p>	<p>\$ 22,000</p>



**Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan**

outcome will be performance data and observations of this operation.		
2. Harvest of cattails in shallow wetlands at Glacial Ridge NWR to provide the second demonstration and study area. Spraying of cattails at Agassiz National Wildlife Refuge to provide the 3rd area.	November 30, 2014	\$ 600

Activity Status as of December 30, 2014:

Activity Status as of June 30, 2015:

Activity Status as of December 30, 2015:

Final Report Summary:

ACTIVITY 2:

Description: Biological monitoring (includes both vegetation and birds).

Monitor vegetation structure and wildlife, especially breeding wetland birds, in the 3 study settings during the 2014 season (before cattail manipulation) and the 2015 and 2016 field seasons (after management). Travel, meals and some lodging is included in the budget for this monitoring activity. The Minnesota Department of Natural Resources will provide bird monitoring assistance

Summary Budget Information for Activity 2: ENRTF Budget: \$ 46,400

Amount Spent: \$ 0

Balance: \$ 46,400

Activity Completion Date: June 30, 2016

Outcome	Completion Date	Budget
1. Vegetation and bird survey data will be collected before and after cattail harvest or control to measure effects of cattail manipulation by baling and by chemical application. Vegetation structure (height and density) along transects and breeding birds in sample plots will be recorded. The data and associated observations will be the outcome.	June 30, 2016	\$46,400 (Includes \$ 8,000 for associated travel.)

Activity Status as of December 30, 2014:

Activity Status as of June 30, 2015:



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2014 Work Plan

Activity Status as of December 30, 2015:

Final Report Summary:

ACTIVITY 3:

Description: Outreach publication

Conduct extensive literature review, interview land managers and equipment operators, take photos, and work with publication and media personnel. Develop an illustrated informational booklet and a CD version that describes wetland wildlife values of cattail management/harvest and as a concurrent source of bioenergy. This will inform user groups, students, and policy makers. Electronic copies of the publication and a video clip summary will also be developed for distribution on the web sites of the University of Minnesota’s Northwest Research and Outreach Center and the U of MN – Crookston Center for Sustainability. Electronic copies will allow updating of content as new information is gathered.

Summary Budget Information for Activity 3: ENRTF Budget: \$ 5,000

Amount Spent: \$ 0

Balance: \$ 5,000

Activity Completion Date: June 30, 2016

Outcome	Completion Date	Budget
1. Produce 300 copies of the publication and 100 CD’s for free distribution at informational meeting, industry groups, and college classes. Publications and other information will be available on web sites.	June 30, 2016	5,000

Activity Status as of December 30, 2014:

Activity Status as of June 30, 2015:

Activity Status as of December 30, 2015:

Final Report Summary:

V. DISSEMINATION:

Description: Progress reports will be dissemination through the project website hosted by the Center for Sustainability and the Northwest Research and Outreach Center of the U of MN, oral presentations at wildlife and biomass conference, technical papers within wildlife and biomass journals/publications, U of MN’s Clean Energy Resource Teams (CERTS) meetings, and the resulting informational booklet that will be available in hard copy as well as electronically.



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2014 Work Plan

Activity Status as of December 30, 2014:

Activity Status as of June 30, 2015:

Activity Status as of December 30, 2015:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Explanation
Personnel:	\$ 38,000	Personnel: Vanessa Lane, research coordinator . 0.67 FTE = \$ 23 K (66.4% sal. 33.6% fringe). Two research technicians . 0 .83 FTE = \$ 15K (63.2% salary, 36.7% fringe)
Professional/Technical/Service Contracts:	\$ 22,600	Contracts: Rental of a track-mounted, bi-directional tractor and tracks for a baler from Mattracks, Inc in Karlstad, MN to harvest (cut and bale) 50 % of a 50-acre study area. Quoted price was \$ 190/hour for 40 hrs which includes an operator = \$ 7.6K. Rental of baler, front-end loader, and swather = \$ 5K. Modification of above equipment (i.e. attach tracks to baler) to attach to tractor = \$ 6 K. Cost of moving equipment from Karlstad to project site and transport of implements to attach to tractor = \$ 4 K.
Equipment/Tools/Supplies:	\$ 400	Flagging, field markers, notebooks, miscellaneous tools, waders.
Printing:	\$ 5,000	Publication of ~ 40-page booklet summarizing finding of cattail management efforts in northwest Minnesota and other similar settings. Production and printing costs of 300 hard copies and 100 CDs. Basis for cost estimate is past experience with production of similar publications.
Travel Expenses in MN:	\$ 8,000	For data collection, to and from study areas; \$ 1,200/month for research coordinator, technicians, and project coordinator: \$ 5K for



**Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan**

		2014 and 2015. Travel to in-state conferences and seminars to present finding to other land managers: \$ 1.5K. Coordinating meetings with agencies and contractors. \$ 1.5K.
TOTAL ENRTF BUDGET: \$ 74,000		

Explanation of Use of Classified Staff: NA

Explanation of Capital Expenditures Greater Than \$5,000: NA

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 1.5 FTEs

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: NA

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
State			
NW Research and Outreach Center, U of MN; MN DNR	\$ 31,000	\$ 31,00	Project manager salary, use of vehicle and ATV. In-kind. MN DNR assisting with biological monitoring. In-kind.
TOTAL OTHER FUNDS:	\$	\$ 31,000	

VII. PROJECT STRATEGY:

A. Project Partners:

*Dr. Vanessa Lane (and 2 student assistants/ year), Ornithologist, U of MN, Crookston. Vegetation and bird monitoring.

*Jeremy Reese, Mattracks, Inc. Karlstad, MN. Contract for track-mounted tractor and track mounts for baler plus operator.

*Northwest Research and Outreach Center and U of MN-Crookston, U of MN. Project coordination office space, equipment maintenance, and vehicle loans.

Commercial printing vendor. Will sub-contract for booklet production.

Trina Brennan and Jessica Dowler, Glacial Ridge NWR. Study site coordination and bird monitoring. In-kind.

Emily Hutchins and Dave Rave, MN DNR. Study site coordination and bird monitoring. In-kind.

Gregg Knutsen, Biologist, Agassiz NWR. Study site coordination. In-kind.

* Will receive money from this request.



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2014 Work Plan

B. Project Impact and Long-term Strategy:

BACKGROUND. The U of MN's Northwest Research and Outreach Center (NWROC) sought to assess the extent of larger expanses of cattail cover in northwest Minnesota and evaluate their potential for concurrent bioenergy harvest and wetland management. Cattails are a major problem because of their growth in many areas in excess of the 50:50 ratio of emergent vegetation (cattails and bulrushes) to open water desired for optimum wetland wildlife habitat. If effective methods of cattail harvest and fuelstock preparation can be developed in concert with appropriate combustion facilities, this initiative could result in win-win projects; cattails could be removed for wildlife benefits while generating a fuel product. In recent years, Richard Grosshans and colleagues at the International Institute for Sustainable Development (IISD) in Winnipeg, Manitoba have harvested cattails in the Netley-Libeau Marsh at the south end of Lake Winnipeg. Their interests are to use cattails to capture nitrogen and phosphorus and reduce the eutrophication of Lake Winnipeg but also use it as an energy source followed by land application of the phosphorus-containing ash. The Canadian work was a major stimulus for this study and collaboration continues. In earlier studies we estimated the cattail coverage in the 10 counties of northwest Minnesota and found 95,498 acres of cattails in patches of at least 20 acres. These wetlands commonly produce over 8 tons of biomass per acre so the biomass potential is significant. The prevalent opinion of land managers was that cattails are too abundant for good wildlife habitat, are difficult and expensive to control, and information is needed for their integrated management. Most were encouraged by the prospect of developing cattail biofuel harvests and markets. In a pilot study, we ground cattails with a hammer mill borrowed from Northwest Manufacturing in Red Lake Falls. Pellets were made and tested at the Natural Resource Research Institute, in Duluth. The energy content of pellets was similar to wood, they produced slightly more ash when burned, and did not produce clinkers (a detrimental property sometimes associated with using certain biofuels). At least for northwest Minnesota, cattails do have many characteristics of an "ideal" sustainable energy source (Seth Fore, personal communication); 1. Available in large quantities, 2. Minimal production inputs, 3. Efficient conversion of raw inputs to energy outputs, 4. Distributed geographically, 5. Limited displacement of other goods and services (food vs. fuel), and 5. Small pollution footprint (greenhouse gases, etc...). Questions remain on items 3 and 5. This project will complement other biomass studies in northwest Minnesota and help fill an informational void. An inventory of biofuels from agricultural lands, prairie (native and restored), brushlands, and woodlands is relatively complete for northwest Minnesota that was co-funded by the Northwest Minnesota Foundation, but cattails were not evaluated in that study.

APPLICATIONS AND NEXT STEPS: We know the extent of cattails in northwest Minnesota and that pelletized cattails are an acceptable biofuel. Although cattails can be harvested with conventional farm equipment in a dry fall and in some wetlands, methods must be refined to permit harvesting and processing across a spectrum of conditions (topography, precipitation) to produce a predictable supply of biofuel product to satisfy a new market. Also, the energy content of the final product must be in favorable relationship to the total amount of energy used in harvesting, transporting, and processing (Life Cycle Analysis). Effects of partial cutting of cattails on wildlife in the Delta Marsh at the south end of Lake Manitoba had positive effects on waterfowl but no bird data have been collected in northwest Minnesota. Preliminary data to measure the response of vegetation and wetland wildlife to cattail management were collected in 2014 and set the stage for this project. If the results of this project show positive co-benefits to wildlife and biofuel, it could encourage the development of a niche biofuel industry by demonstrating supply potential. There are no biofuel processing facilities in northwest Minnesota due to an inadequate demand for pellets; you have to demonstrate dependable supply as a part of creating demand. Most pellets are currently coming from Wisconsin plants, which are running at around 50% capacity (Mark Lindquist, MN DNR. Personal communication, April 2013). Such a plant could possibly be located



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2014 Work Plan

in Red Lake Falls at Northwest Manufacturing. They currently produce wood stoves and buy pellets from Wisconsin at \$ 150-200 per ton delivered. Depending on the characteristics, pellets could be sold to Northwest Manufacturing's current stove customers. If pellets could be made at a reasonable price, it would save Northwest Manufacturing and their customers' money, especially in rural setting where there is a reliance on propane. There is also an initiative to develop a biomass torrefaction plant in northwest Minnesota led by American Agri-Energy and the Agricultural Utilization Research Institute (AURI). Such a plant might use a variety of feedstocks; cattails, willow, aspen, and ag residues, but methods of harvest must be demonstrated. These proposed plants could be centrally located between Crookston and Thief River Falls and could process biomass from the Glacial Ridge and Agassiz National Wildlife Refuges, as well as state wildlife management areas and flood control impoundments. Also, a substantial acreage of cattail wetlands are within 30 miles of the University of Minnesota-Crookston campus which currently burns coal in its heating plant that was retrofitted to receive coal by semi-trucks. A feasibility study indicated that existing boilers could accommodate biofuel to supplement coal. The Glacial Ridge NWR is only 10 miles from campus and contains 3,068 acres of shallow, restored wetlands, which are rapidly being overtaken by cattails. The demonstration value of a land grant university partnering with agencies in a biofuel project as described here could have regional and national significance for practical applications.

Major project impacts include:

1. By evaluating the efficiency of cattail harvest methods in a variety of settings, we will be able to helpfully provide co-benefits; enhance wetland wildlife habitat at a reasonable rate, produce and use a novel biofuel resource, and help control an invasive plant.
2. By monitoring the response of vegetation and birds to cattail harvest methods, we will be able to develop and recommend best practices to apply these techniques.
3. By disseminating the results of this project, public land managers, students, industry representatives, and rural communities can be informed of findings; this will enhance Minnesota's wetland wildlife resources, use a renewable biofuel, and possibly stimulate economic development.

C. Spending History:

Funding Source	M.L. 2008 or FY09	M.L. 2009 or FY10	M.L. 2010 or FY11
U of MN CERTS		4,000	
NW Minnesota Foundation			21,570



**Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan**

U of MN, IREE			6,934
Lessard-Sams Outdoor Heritage Council funds for cattail management using equipment and herbicides at Glacial Ridge NWR and Agassiz NWR; ~ 100K.			100,000
TOTAL		4,000	128,504

VIII. ACQUISITION/RESTORATION LIST: NA

IX. VISUAL ELEMENT or MAP(S):

X. ACQUISITION/RESTORATION REQUIREMENTS WORKSHEET: NA

XI. RESEARCH ADDENDUM:

XII. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than December 30, 2014; June 30, 2015; and December 30, 2015: A final report and associated products will be submitted between June 30 and August 15, 2016.

**Environment and Natural Resources Trust Fund
M.L. 2014 Project Budget**



Project Title: Cattail management for wetland wildlife and bioenergy potential.

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 06i

Project Manager: Dan Svedarsky

Organization: Northwest Research and Outreach Center, U of MN

M.L. 2014 ENRTF Appropriation: \$ 74,000

Project Length and Completion Date: 2 years; July 1, 2014 to June 30 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Act 1 Budget	Amount Spent	Act 1 Balance	Act 2 Budget	Amount Spent	Act 2 Balance	Act 3 Budget	Amount Spent	Act 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	<i>Cattail Management and</i>			<i>Biological Monitoring</i>			<i>Outreach Publication</i>				
Personnel (Wages and Benefits)				\$38,000		\$38,000				\$38,000	\$38,000
<i>Vanessa Lane, Research coordinator: \$ 23,000 (66.4%)</i>											
<i>Two Field technicians. 20% FTE for 2 1/2 years. \$</i>											
Professional/Technical/Service Contracts											
Mattracks Inc. Contract to harvest 50 acres of a wetland with track equipped bi-directional tractor. Rent set of tracks to equip baler of large round bales.	\$7,600		\$7,600							\$7,600	\$7,600
Rental of swather, front end loader, and round baler from undetermined implement dealer	\$5,000		\$5,000							\$5,000	\$5,000
Equipment fabrication and modification. A swather will be adapted to be attached to the rented tractor and may require some welding and modification. Tracks will be attached to a rented round baler.	\$6,000		\$6,000							\$6,000	\$6,000
Equipment moving costs. Move Mattracks equipment from Karlstad to flood control impoundment harvest sites. Removal of bales from wetland. Move rented baler and swather to project site and to a machine shop where modifications can be completed.	\$4,000		\$4,000							\$4,000	\$4,000
Equipment/Tools/Supplies Field supplies; notebooks, flagging, stakes, waders, miscellaneous tools.				\$400		\$400				\$400	\$400
Printing (Production setup and formatting, printing of 300 hard copies)							\$5,000		\$5,000	\$5,000	\$5,000
Travel expenses in Minnesota Mileage, lodging, meals to and from study sites, conferences, and coordinating visits with equipment providers.				\$8,000		\$8,000				\$8,000	\$8,000
COLUMN TOTAL	\$22,600		\$22,600	\$46,400		\$46,400	\$5,000		\$5,000	\$74,000	\$74,000



SVEDARSKY VISUAL FOR CATTAIL MANAGEMENT FOR WETLAND WILDLIFE AND BIOENERGY # 163-F