

2010 Project Abstract

For the Period Ending June 30, 2012

PROJECT TITLE: Demonstrating Sustainable Energy Practices at Residential Environmental Learning Centers (RELCs) – Audubon Center of the North Woods (7d-2)

PROJECT MANAGER: Bryan Wood

AFFILIATION: Audubon Center of the North Woods

MAILING ADDRESS: 54165 Audubon Drive (shipping), P.O. Box 530 (mailing)

CITY/STATE/ZIP: Sandstone, MN 55072

PHONE: 320-245-2648

E-MAIL: bwood@audubon-center.org

WEBSITE: www.audubon-center.org

FUNDING SOURCE: Environment and Natural Resources Trust Fund

APPROPRIATION AMOUNT: \$206,000

Overall Project Outcome and Results

As part of the coalition of Minnesota's residential environmental learning centers Today's Leaders for a Sustainable Tomorrow (TLFAST), the Audubon Center of the North Woods has made reducing our carbon footprint, through energy conservation, efficiency and renewable technologies, a top priority. We aim to serve as a sustainable energy demonstration site by modeling responsible energy usage and through energy offering energy curriculum for the nearly 10,000 participants that visit us every year. Through funding from the Environment and Natural Resources Trust Fund (ENRTF), we have been able to make strides in both of these directions. With our ENRTF grant, we hired an architecture and engineering firm to design the envelope improvements and solar hot water systems that would benefit several of our campus buildings. We contracted with local builders and installers to: 1) Improve the envelopes of our two largest buildings, the Dining Hall and Crosby Dormitory, through blown cellulose insulation, foam sealing air penetrations and weather stripping exterior doors 2) Insulate the walls and roof as well as re-side and re-shingle our 100+ year old Wildlife Barn 3) insulate Nationally Historic Registered Schwyzer Lodge through blown cellulose insulation in the crawl spaces and attic, as well as vapor-line and foam-seal the open air basement 4) Install a solar hot water system at our Dining Hall for hot water use in our kitchen and dining hall restrooms 5) install a solar hot water system at Crosby Dormitory for hot water use of showers and sinks in the dormitory rooms. Through these energy improvements we anticipate savings 259,570 lbs. of carbon annually from reduction in propane and electricity usage. As part of TLFAST, we have helped to create 22 energy lessons to engage and inform students about energy issues and topics to be taught at the Audubon Center and outreach programs.

Project Results Use and Dissemination

Information about this project is disseminated through the TLFAST collective website at http://earthsensealliance.org/e_energy.php. We have written about this project in our past two Audubon Center of the North Woods newsletters, and have been leading energy tours for local groups for the past several months, highlighting the outcomes of the ENRTF grant. In the spring of 2011, we contacted our 80+ participating K-12 schools about the opportunity to pilot test the energy curriculum developed and had several schools participate. Information about the completed energy lessons has been sent to all participating schools as options for their on-site or outreach programs.

**Environment and Natural Resources Trust Fund (ENRTF)
2010 Work Program Final Report**

Date of Report: 10/17/2011
Date of Next Progress Report: Final Report
Date of Work Program Approval:
Project Completion Date: 6/30/2012

I. PROJECT TITLE: Demonstrating Sustainable Energy Practices at Residential Environmental Learning Centers (RELCs) – Audubon Center of the North Woods (7d-2)

Project Manager: Bryan Wood
Affiliation: MN Coalition of Residential Environmental Learning Centers
Mailing Address: Audubon Center of the North Woods, PO Box 530
City / State / Zip: Sandstone, MN 55072
Telephone Number: Work: 320-245-2648 Cell: 320-290-8246
E-mail Address: bwood@audubon-center.org
Fax Number: 320-245-5272
Web Site Address: www.audubon-center.org

Location: City of Sandstone in Pine County, MN

Total ENRTF Project Budget:	ENRTF Appropriation	\$206,000
	Minus Amount Spent:	<u>\$206,000</u>
	Equal Balance:	\$0

Legal Citation: M.L. 2010, Chp. 362, Sec. 2, Subd. 7d2

Appropriation Language:

\$1,500,000 is from the trust fund to the commissioner of natural resources for agreements as follows: \$206,000 with Audubon Center of the North Woods; \$212,000 with Deep Portage Learning Center; \$350,000 with Eagle Bluff Environmental Learning Center; \$258,000 with Laurentian Environmental Learning Center; \$240,000 with Long Lake Conservation Center; and \$234,000 with Wolf Ridge Environmental Learning Center to implement renewable energy, energy efficiency, and energy conservation practices at the facilities. Efforts will include dissemination of related energy education.

II and III. FINAL PROJECT SUMMARY:

As part of the coalition of Minnesota's residential environmental learning centers Today's Leaders for a Sustainable Tomorrow (TLFAST), the Audubon Center of the North Woods has made reducing our carbon footprint, through energy conservation, efficiency and renewable technologies, a top priority. We aim to serve as a sustainable energy demonstration site by modeling responsible energy usage and through energy offering energy curriculum for the nearly 10,000 participants that visit us every year. Through funding from the Environment and Natural Resources Trust Fund (ENRTF), we have been able to make strides in both of these directions. With our ENRTF grant, we hired an architecture and engineering firm to design the envelope improvements and

solar hot water systems that would benefit several of our campus buildings. We contracted with local builders and installers to: 1) Improve the envelopes of our two largest buildings, the Dining Hall and Crosby Dormitory, through blown cellulose insulation, foam sealing air penetrations and weather stripping exterior doors 2) Insulate the walls and roof as well as re-side and re-shingle our 100+ year old Wildlife Barn 3) insulate Nationally Historic Registered Schwyzer Lodge through blown cellulose insulation in the crawl spaces and attic, as well as vapor-line and foam-seal the open air basement 4) Install a solar hot water system at our Dining Hall for hot water use in our kitchen and dining hall restrooms 5) install a solar hot water system at Crosby Dormitory for hot water use of showers and sinks in the dormitory rooms. Through these energy improvements we anticipate savings 259,570 lbs. of carbon annually from reduction in propane and electricity usage. As part of TLFAST, we have helped to create 22 energy lessons to engage and inform students about energy issues and topics to be taught at the Audubon Center and outreach programs.

IV. OUTLINE OF PROJECT RESULTS:

RESULT/ACTIVITY 1: Implementation of carbon and energy reduction systems for education and demonstration purposes at Audubon Center of the North Woods. Budget \$206,000. Completion Date June 30, 2012.

Description: Established in 1971, the Audubon Center of the North Woods is an RELC located in east-central Minnesota near the town of Sandstone. We have over 4,000 k-12 and college students participate in our programs each year and have over 8,000 total users a year which includes adult and community programs ranging from adventure education, to ecology classes, to cultural and crafts, to energy and sustainability.

Overall, the McKinstry, Inc. report for the Audubon Center of the North Woods showed that all six of our campus buildings need envelope improvements to both conserve energy and improve energy efficiency. Our buildings range in age from 11 to 100+ years in age and major savings in energy can be realized through better insulation and reestablishment of continuous air barriers in these buildings. Because of their positioning, four of the buildings are excellent candidates for solar hot water applications. Upgrades of our existing geothermal heating will make this technology which heats the main Dining Hall and Dormitory more efficient. Heating upgrades at three of the buildings will also make them more energy efficient.

The targets of our Environment and Natural Resources Trust Fund work plan are to:

- 1) Work with a professional architecture/engineering firm to create a plan for the envelope improvements and domestic solar hot water installation
- 2) Improve the envelope barriers of the Dining Hall/Office building, Crosby Dormitory, and Schwyzer and Lowry Lodge. Our plans are to dramatically increase the envelope barrier protection to a continuous air barrier on these buildings through better insulation in the walls, crawl space and attic, as well as high efficiency windows and doors to keep heat or air conditioning from being lost

to the outside. These envelope improvements will greatly lower the amount of energy we need to use by holding inside temperature and keeping the outside temperature from coming in.

3) Convert our propane heated water system into solar hot water technology through the installation of solar hot-water panels at the Dining Hall/Office and Crosby Dormitory. The Audubon Center's Dining Hall serves meals for hundreds of participants a day, and our dormitory has 14 rooms that house 114 people total. Each dorm room has two 2 sinks, a toilet and shower. Through the installation of solar hot water technology we will be able to significantly lower our propane use.

The reasons these improvements were chosen from the McKinstry report is because they: 1) have the ability to reduce the Audubon Center of the North Woods' carbon production considerably while improving efficiency, 2) utilize a renewable energy source (solar), and 3) serve as visible demonstrations for educating users on the benefits of energy conservation and efficiency, and renewable energy.

Summary Budget Information for Result/Activity 1:

ENRTF Budget:	\$206,000
Amount Spent:	\$206,000
Balance:	\$0

Deliverable/Outcome	Completion Date	Budget	Budget Balance	Estimated Carbon Reduction (#s)
1-1 Professional Architecture and Engineering Services to create plan for energy improvements	09/31/10	\$25,000	+\$517	0
1-2 Install Envelope & Improvements into Crosby Dormitory, Dining Hall, Schwyzer and Lowry Lodge	12/31/10	\$116,000	-\$517	192,338
1-3 Install Domestic Solar Hot-Water for use in Dining Hall and Crosby Dormitory	12/31/10	\$65,000	\$0	67,232

Result Completion Date: *June 31, 2012*

Final Report Summary: 10/17/2011

1-1 The design of envelope improvements for all buildings was completed in March by LHB and bids were put out publicly with all envelope improvement bids awarded at

end of April. The design of the solar hot water system was completed in January, put out for bid in February, and a contract awarded at the end of February. The process of the design went well and we were happy with LHB, their timeliness and thoroughness in completing the specs. They were also willing to incorporate bidder's ideas and send out addendums. Some of our initial bids came back way out of our budget, and we sent them back out again for bid, receiving more favorable quotes. This worked well and allowed us to stay within budget for the improvements. There is a remaining \$517 balance which we are cancelling out by using an additional \$517 in the envelope improvements budget. This outcome is now complete.

- 1-2 The insulation improvements of Crosby Dormitory and the Dining Hall by Honeywell Envelope Systems were completed in May which included blowing in 16" of cellulose insulation in the attics and crawl spaces of both buildings, sealing off air intrusions with foam, and adding weather stripping to all the exterior doors. These improvements are already making a bid difference for comfort and energy savings in both buildings. Schwyzer Lodge insulation improvements were completed by Expert Insulation in May, with cellulose insulation blown into attics and crawl spaces, and the open air basement vapor barrier lined and foam sealed. Wildlife Barn wall insulation and siding improvements were completed by Lipe Bros in July through a vapor barrier attached to existing siding, 3 inch Styrofoam sheets screwed on over the existing siding, and new corrugated siding boards attached for the exterior. The barn is much more energy efficient now with the new siding. Work on this project because the wetness of June prevented workers from getting their machinery through the ground to the Barn. Insulated roof improvement for the Wildlife Barn was completed by Northern Extremes Roofing in July as well. A similar process to the barn siding was done, where old shingles were removed, a vapor barrier applied, 3 inch Styrofoam sheets applied, oriented strand board and then new shingles applied. The finished outcome looks and functions very well. This project was also delayed by the wet conditions of June and the inability for workers to get their machinery to the Barn. There was a cost share from the U.S. Department of Energy for \$50,100 for this Result. We applied the remaining \$517 from Result 1-1 to this budget to zero out the overall budget. This outcome is now complete.
- 1-3 The installation of the solar hot water system improvement was completed by Energy Concepts in June with 20 panels on Crosby Dormitory and 7 panels on the Dining Hall. We have had several malfunctions with the system from faulting electronic parts, to incorrect settings causing overheating, and a lack of an initial heat dump system in the original bid. There has been constant tweaking of the settings, new replacement computer parts ordered and installed, and a cost add of a heat dump. The first couple months saw the systems usually needing adjustment every week or two. It seems like problems have been addressed and we are now functioning well with both the dorm and dining hall systems. The systems are very efficient when working properly and produce greatly for hot water. There was a cost share of \$60,000 from the U.S. Department of Energy on this Result. This outcome is now complete.

V. TOTAL ENRTF PROJECT BUDGET:

Contracts: Professional/technical assistance for a design/implementation team \$25,000. The professional contractors will be determined through a competitive bid process.

Supplies: \$0

Capital Improvements: Conservation: Envelope Improvements: \$116,000
 (Estimate of cost: 60% Materials, 40% Installation)
 Renewable: Solar Hot Water \$65,000
 (Estimate of cost: 60% Materials, 40% Installation)

TOTAL ENRTF PROJECT BUDGET: \$206,000

Explanation of Capital Expenditures Greater Than \$3,500: The capital improvements indicated above that are made with these funds are fixed capital assets and will remain in place and will continue to be used for the same program through its useful life.

VI. PROJECT STRATEGY:

A. Project Partners: Audubon Center, Sandstone; Deep Portage, Walker; Eagle Bluff, Lanesboro; Laurentian, Britt; Long Lake, McGregor; and Wolf Ridge, Finland, MN.

B. Project Impact and Long-term Strategy: The RELCs sustainable energy campaign has two phases or main goals. Phase 1 is to retrofit our campuses using conservation, efficiency, and renewable resources to reduce the overall RELC project carbon emissions by 80% and lower energy costs. The ENRTF funds will be used to implement one quarter of the Phase 1 goal and sets the stage for our Phase 2 educational programs. The Audubon Center of the North Woods will continue to seek funds until all of the Phase 1 work identified in the McKinstry report is completed.

Phase 2 is to create and implement education efforts that compliment the building improvements done in Phase 1, thus using the campuses as models for sustainable retrofitting and practical carbon-neutral lifestyles. The Audubon Center currently uses a 3.7 KB wind turbine, two 4x10 ft. solar hot-water panels, a 208 volt 3-phase geothermal heating system and a 7,680 watt solar array to provide electricity, heat and air conditioning to the Crosby Dormitory and Dining Hall. The ENRTF funds will allow us to expand our renewable energy use by introducing more solar hot-water technology to the campus, and also significantly increase the energy conservation and efficiency of five of our buildings.

C. Other Funds Proposed to be Spent during the Project Period:

Item	Overall RELC Project	Audubon Center of the North Woods
C1: 2009 Federal Allocation– 5 Northern Centers, pending	\$1,500,000	\$300,000
C2: Continue Project Development – Butler Family	\$30,000	\$5,000

Foundation		
C3: In-kind Staff	\$30,000	\$5,000

D. Spending History:

Item	Overall RELC Project	Audubon Center of the North Woods
D1: Bush Foundation – McKinstry Study	\$176,000	\$29,300
D2: Butler Family Foundation – Project Development	\$30,000	\$5,000

VII. DISSEMINATION:

Overall RELC Project: Information about this project will be disseminated through a collaborative website that will be available to the public for learning about the process and successes of each individual centers projects. The project will also be discussed in all future New Energy Resource Advisor (ERA) training seminars to be held on-site at each center.

The Energy Resource Advisor (ERA) certificate, developed by Winona State University, is a new curriculum designed to accelerate public understanding of energy efficiency, clean energy, carbon emissions, resource conservation, green technologies, and green jobs. This curriculum is the *first of its kind in Minnesota*. It is a non-credit, continuing education course for adults 18 years of age and older, *using online instructional technology combined with applied, field experience at one of the six RELCs*.

Participants in this class will learn about: a) the basic components of an energy audit, b) small-scale renewable energy including site suitability, system sizing, and financial incentives that are available, c) alternative building and transportation options, d) ways to “green up” the home or business, and e) the field of emerging “green” jobs.

After completing this course, the successful participant may serve as an energy resource advisor and “green” consultant in the community and workplace.

The Audubon Center of the North Woods –The Audubon Center of the North Woods will include project information on our website, in our newsletter, and through articles/press releases in local paper and electronic media. As stated earlier, we will also incorporate these efficiency and renewable energy applications into our two energy lesson plans that educate our users about energy conservation and renewable energy options applicable to their home, communities, and schools. Information about the energy improvements and technologies will be woven into every school stay, so even if that school does not participate in an energy class, they will learn about the technology through other times and activities with ACNW staff.

Final Report Progress

The collective web site is up and running, http://earthsensealliance.org/e_energy.php. The six centers have collaboratively developed 22 units of curriculum for use by each center. These curricula integrate the use of the demonstrated sustainable energy

practices at each of the centers. These lessons were pilot tested in all six centers this past spring, adjustments made over the summer, and are now all available for groups.

VIII. REPORTING REQUIREMENTS: Periodic work program progress reports will be submitted not later than 1/15/2011, 7/15/2011, and 1/15/2012. A final work program report and associated products will be submitted between June 30 and August 1, 2012 as requested by the LCCMR.

Attachment A: Final Budget Detail for 2010 Projects					
Project Title: Demonstrating Sustainable Energy Practices at Residential Environmental Learning Centers (RELCs) – Audubon Center of the North Woods (7d-2)					
Project Manager Name: Bryan Wood					
Trust Fund Appropriation: \$ 206,000					
2010 Trust Fund Budget	<u>Result 1 Budget:</u>	Amount Spent (date)	Balance (date)	TOTAL BUDGET	TOTAL BALANCE
			10/17/2011		
BUDGET ITEM					
Contracts					
Professional/technical- <i>Architectural/Engineering Firm to create plan for envelope and solar hot water installation.</i>	25,000	24,483	517	24,483	517
Other contracts					
Capital equipment over \$3,500 (list specific items)					
Conservation- <i>Envelope Improvements to Dining Hall, Crosby Dormitory, Schywzer Lodge, Lowry</i>	116,000	116,517	-517	116,517	-517
Renewables- <i>Solar Domestic Hot Water for Dining Hall and Crosby Dormitory. 60% materials,</i>	65,000	65,000	0	65,000	0
COLUMN TOTAL	\$206,000	\$206,000	\$0	\$206,000	\$0