



Glacial Ridge National Wildlife Refuge

Erskine, Minnesota Annual Narrative Fiscal Year 2005







Refuge Supervisor Date

Regional Chief, NWRS

Date

*Cover photo of Western Prairie Fringed Orchid by Becky Ekstein and Title Page photo of Western Meadowlark by Juancarlos Giese

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Refuge Background Information

The Glacial Ridge National Wildlife Refuge was officially established on October 25, 2004. The catalyst for the establishment and the restoration of the Glacial Ridge area was a partnership of 30 non-profit organizations, universities, governments and other agencies. Located approximately 10 miles east of Crookston along U.S. Highway 2 in Polk County, Minnesota, this unique landscape was carved with wind and water over 12,000 years ago from the fluctuating water levels of glacial Lake Agassiz. The variety of prairie grasslands and wetlands that formed provided the ingredients for a very diverse and continentally important biological community- Tallgrass Prairie. The Glacial Ridge NWR will be the center point for the restoration of this fragile ecosystem, as less than one percent of native tallgrass prairie remains in Minnesota.

The approved acquisition boundary of 35,750 acres includes approximately 5,000 acres of non-cultivated native prairie. Future habitat restoration potential includes approximately 18,000 acres of upland prairie and 12,000 acres of wetland. These habitats are important breeding areas for waterfowl, sandhill cranes, shorebirds, greater prairie chickens, many grassland nesting songbirds and a host of mammals. The remnant native prairie area, combined with restored grasslands and wetlands, provides an ideal setting for interpretation of the historical and future importance of this once massive ecosystem.



Among the first flowers to bloom in the springthe Pasque Flower shines as a symbol of the Tallgrass prairie habitat Photo by Christine Reiss

Currently, the Refuge owns 3-parcel of land totally approximately 2,300 acres. Within the approved boundary there are 1,696 acres of



A field of Prairie Smoke sways in the wind running over the Glacial Ridge NWR Photo by Christine Reiss

State Wildlife Management Areas, 560 acres of State Land managed as a Scientific and Natural Area, 345 acres owned by the Red Lake Watershed District, 660 acres owned by The Nature Conservancy managed as a Scientific and Natural Area, 24,000 owned by The Nature Conservancy representing the old Tilden Farm/Crookston Cattle Company and nearly 7,500 acres other private ownership. Also present are township, county, state and federal road rightof-ways, Minnesota Northern railroad right-ofway, Burlington Northern-Santa Fe railroad rightof-way, and several gravel easements.

In January 2001, a draft Environmental Assessment (EA) and an Interim Comprehensive Conservation Plan was developed and approved. The EA addressed future management of the Refuge and defined the following goals:

- Strive to maintain diversity and increase abundance of waterfowl and other migratory bird species dependent on prairie wetland and grassland habitats.
- Conserve, manage, and restore the diversity and viability of native fish, wildlife and plant populations associated with tallgrass prairie and prairie wetlands.
- Work in partnership with others to restore or enhance native tallgrass prairie, prairie wetlands and unique plant communities.
- Restore, enhance, and protect water quality and quantity that approaches natural hydrologic functions.
- Provide for compatible wildlife-dependent recreational uses by the public, emphasizing increased public understanding of the northern tallgrass prairie ecosystem and the mission of the National Wildlife Refuge System.

The Glacial Ridge National Wildlife Refuge was created under the legal authority of the Migratory Bird Conservation Act (MBCA), Feb. 18, 1929, 16 U.S.C. 715d and the Emergency Wetland Resources Act of 1986, 16 U.S.C. 3901b. The MBCA created the Migratory Bird Conservation Commission and authorized the acquisition of lands from funds appropriated by Congress, and later, from funds generated by the sale of Federal Duck Stamps.

Since 2001, The Nature Conservancy and the Natural Resources and Conservation Service have made great strives in the restoration of both wetland and upland acres. Their efforts are the anchor point in the recovery of this imperiled ecosystem. As lands are transferred to the



Once brought to the brink of extinction, the Greater Prairie Chicken now thrives on the lands within the Glacial Ridge NWR Photo by Christine Reiss

Refuge, management efforts can concentrate on maintenance of these restored habitats. The University of Minnesota – Crookston, University of North Dakota and North Dakota State University are all contributing to the success of the project with the gathering of baseline data which includes wildlife and plant response, and abiotic conditions as weather and hydrology. This refuge was established as a partnership and will focus on partnerships with all current and future management.





Highlights

- The Glacial Ridge National Wildlife Refuge was dedicated on October 24, 2005, making it the 545th addition to the National Wildlife Refuge System.
- A multi-year study by USFWS SCEP student Jessica Larson concentrated on Amphibian reproductive rates in restored wetlands within the Glacial Ridge Project NWR approved acquisition boundary. *See section 1a, p.1*
- A study by University of Crookston student and Refuge volunteer Nate Emery identified secretive marsh birds on the Glacial Ridge Project and compared their occurrence among wetlands, as well as identifying upland bird communities, at different stages of tallgrass prairie and wetland restoration. See section 1a, p.2
- Research by Talylor Janke, University of North Dakota graduate student, compared the vegetative patterns between restored wetlands and natural wetlands within the boundaries of the proposed boundary of the Glacial Ridge NWR See section 1a, p.4
- Various studies by Paul Kucera and Phil Gerla, from the University of North Dakota are seeking information on how the precipitation falling within the boundaries of the Glacial Ridge National Wildlife Refuge are effecting groundwater and surface water hydrology, as well as the water retention abilities of tallgrass prairie habitats. See section 1b, p.6
- Over 40 people were able to participate in a guided Glacial Ridge NWR bus tour given by Refuge Manager Dave Bennett and TNC employee Jason Ekstein during the 2005 Detroit Lakes Festival of Birds. See section 8b, p.9
- The official Glacial Ridge NWR hunting plan was formatted to facilitate a lawful hunt on the Refuge for the fall 2005 season. The hunt plan proposed to open a portion of the 2,300-acre, and future 35,750-acre, Glacial Ridge National Wildlife Refuge to hunting of deer, greater prairie chicken, sharp-tailed grouse, and migratory birds. See section 8a. p8

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Climate Data

The closest weather station with historical reference is located near the University of Minnesota in Crookston, Minnesota. Weather data has been collected at this station since 1890. Although the collection point is 35 miles west of the Refuge, it provides excellent regional trend data.

The total precipitation for calendar year 2004 was 28.12 inches, a year that could be considered normal except for May. May's weather included 13 days with measurable precipitation and a 24-hour rainfall of 2.00 inches. The following tables represent weather patterns as they relate to calendar year 2004.

Table 1. Calendar year 2004 monthly weather	r totals.
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Month	High	Low	04 Deceie	03 Dressin	02 Densir	114 Yr.	03 Same fail
	1 emp	Temp	(inches)	(inches)	(inches)	Avg.	Snowiali (inches)
	(Г)	(F)	(menes)	(menes)	(menes)	(inches)	(menes)
January	30	-35	0.36	0.15	0.03	0.46	16.5
February	40	-32	0.08	0.24	0.07	0.54	3.8
March	57	-5	0.76	0.86	0.49	0.74	7.5
April	83	20	0.43	0.75	1.26	1.41	0
May	81	23	8.02	3.41	1.90	2.52	0
June	87	36	1.39	5.05	6.55	3.86	0
July	88	44	3.87	2.78	3.90	3.07	0
August	84	34	4.82	1.12	9.20	3.07	0
September	90	32	4.13	3.67	1.48	2.20	0
October	80	26	3.23	1.48	1.25	1.61	0
November	57	4	0.15	0.32	0.16	0.86	1.5
December	42	-16	0.88	0.63	0.41	0.56	13.2
Totals		•	28.12	20.46	26.70	20.78	42.5
			inches	inches	inches	inches	inches

Table 2. Days of sun.

Sky Condition	Cloudy Days	Partly Cloudy	Sunny Days
2003	136	38	191
2004	140	44	182

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1. Monitoring and Studies

1a. Surveys and Censuses

A refuge monitoring program has not yet been set up. The following studies were conducted as either master grad studies or undergrad work through the University of Minnesota – Crookston and University of North Dakota.

Amphibian Reproduction in Restored Wetland Habitat in Northwestern Minnesota - Progress Report Field Season 2005

JESSICA A. LARSON

Graduate Student in Biology, University of North Dakota, Grand Forks, North Dakota; Research Technician, Northwest Research and Outreach Center, University of Minnesota, Crookston; Biological Technician, U. S. Fish and Wildlife Service

Loss and fragmentation of the tallgrass prairie region is not only a loss of vegetation, but also a loss of habitat for associated animal species. Amphibians are unique in their need for both aquatic breeding and upland terrestrial habitats. Restoration efforts to restore these prairie wetlands are slowly bringing back the wetland complex needed for amphibian breeding. The 24,142- acre Glacial Ridge Project is located in the tallgrass prairie region of northwestern Minnesota. This Project is being restored back to the native vegetation intermixed with restored wetlands. The large extensive restoration of this area brings about the question of what is the impact on the native



USFWS SCEP and Graduate student Jessica Larson identifying larval stages of prairie amphibian species

species. Amphibians are biological indicators of an environment, so looking at their re-



A tree frog metamorph located during field trials of SCEP students' Jessica Larson's Amphibian Research

colonization abilities and reproductive success in these restored wetlands is one measure of the effectiveness of certain restoration practices. This reports on the first field season in the summer of 2005, with the second field season to be the summer of 2006. The study period ran from 4 April 2005, with the start of frogs calling, until 28 July 2005 when the last wetland was surveyed for tree frog metamorphs, with 55 wetlands surveyed in total. Surveys used for amphibian presence include adult calling surveys, and visual surveys for egg masses, larvae, and metamorphs. In total, 7 species used the study area: Wood Frog (Rana sylvatica), Western Chorus Frog (Pseudacris triseriata), Northern Leopard Frog (Rana pipiens), Canadian Toad (Bufo hemiophrys), Cope's Gray Tree Frog (Hyla chrysoscelis), Gray Tree Frog (Hyla versicolor), and Tiger Salamander (Ambystoma tigrinum). The northern leopard frog, Canadian toad, and western chorus frogs were the most abundant in all stages, while wood frogs were less evident in later stages. Tree frog species were in few wetlands, while tiger salamanders were even fewer. Records on land management practices and wetland characteristics were also taken. This Progress Report reports initial data to allow refinement for the 2006 field.

Surveys of secretive marsh birds, prairie songbirds, and nests of upland birds on the Glacial Ridge Complex, 2005

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The Nature Conservancy's (TNC) Glacial Ridge Project is the largest tallgrass prairie and wetland restoration project in North America. Restoration of this agriculturally-dominated landscape was initiated in 2000 with TNC's purchase of over 24,000 acres. Restoration began immediately with the cooperation and funding of several agencies and programs including the Wetland Reserve Program administered

by the Natural Resource Conservation Service (NRCS), and the U.S. Fish and Wildlife Service (USFWS). Final composition will include over 8,000 acres in restored wetlands and over



UMC graduate and Refuge Volunteer Nate Emery, along with DU engineering technician Mike Becker checking vegetation density within the Glacial Ridge NWR

16,000 acres in restored tallgrass prairie. In 2004 TNC transferred ownership of 2000 acres to the USFWS as the first restored parcels of the new Glacial Ridge National Wildlife Refuge (NWR). TNC plans to continue to restore the landscape and transfer ownership to the USFWS over the next decade. The resulting Glacial Ridge Complex encompasses nearly 35,000 acres and includes TNC property, recently transferred parcels of Glacial Ridge NWR, adjoining state wildlife management areas, and scientific and natural areas.

The management of natural resources and the development of planning documents for the Glacial Ridge NWR require an inventory of biological resources. Vegetative composition



will change markedly as the landscape is restored to pre-settlement vegetation. Presumably, wildlife composition will dramatically change as well, paralleling the vegetative changes. Therefore, our objectives were to inventory avian communities during the initial restoration of grasslands and wetlands and provide a baseline for comparison of future inventories. Therefore,

- 1) We identified secretive marsh birds on the property and compared their occurrence among wetlands of different restoration age.
- 2) We identified upland bird communities at different restoration ages, and
- 3) We identified several grassland birds nesting on the Glacial Ridge Complex.

RESULTS and DISCUSSION



A marbled Godwit chick hatched from a nest located within the approved acquisition boundary of the Glacial Ridge NWR

We conducted 177 surveys for secretive marsh birds and detected 170 individuals; 87 soras (51%, n= 170), 28 Virginia rails (16%), 24 piedbilled grebes (14%), 23 American bitterns (14%), 7 yellow rails (4%), and 1 least bittern (<1%, Table 2). The number of individuals detected was greatest during the active callbroadcast period (n=93), and least during the initial passive 5-minute period (n=17). Each species of marsh bird responded more frequently to recorded calls of other species than to calls of its own species (Table 3). Individuals responded to the call of its own species between 21% (yellow rail) and 32% (sora) of the time. Marsh birds responded at a

wide range of distances, from as close as 10 m to as far as 600 m (Table 4). Forty-four (26%, n = 170) were within 50 m when they responded. Yellow rails, soras, and Virginia rails all were detected less than 100 m from the observer. In contrast, the average detection distance for American bitterns was over 225 m, and nearly 25% of the detections were over 300 m (Table 5).

We detected over half of the marsh birds (58%) in the 2004 restorations, yet those restorations comprised only 32% of the wetlands surveyed (Table 6). We believe this is because of the nature of many of the 2004 restorations. Most were not fully altered or drained and contained remnant wetland vegetation. Once wetland hydrology was restored, this vegetation quickly established itself in the basins and provided marsh bird habitat much quicker than a wetland restored from a fully-altered condition.

We observed 999 individual birds representing 52 species during 512 minutes of point counts (Table 7). The most abundant species included savannah sparrow, grasshopper sparrow, bobolink, cliff swallow, red-winged blackbird, western meadowlark, brown-headed cowbird, American goldfinch, clay-colored sparrow, and sedge wren, respectively. These species were of no surprise in the tallgrass prairie dominated landscape. Several species exhibited abundances that would be predicted by their overall habitat associations. For example,

savannah sparrow abundance was higher in plots that had 2-3 years of growth, but they were least abundant in the 2006 restorations (Table 8, Table 9). Similarly, brown-headed cowbirds were most abundant in the more shrubby 2006 restoration, and less than half as abundant in recent restorations (2001-2004; Table 8). We detected most birds during the first 3-minute listening period (Table 10). Wilson's phalarope, a state threatened species, and Nelson's sharp-tailed sparrow, yellow rail, marbled godwit, and greater prairie-chicken, all state species of concern, were all found within point count radii. Interestingly, dickcissels were recorded on the Glacial Ridge Complex for the first time and seemed to part of an irruption farther north than usually expected.

We found 27 nests of 17 species by actively cable-dragging as well as through opportunistic observation (Table 11). The most frequent nests found were of blue-winged teal (4), greater prairie-chicken (3), killdeer (3), and upland sandpipers (3).

SUMMARY

Marsh birds readily colonized restored wetlands, especially those where wetland vegetation was present prior to the restoration (e.g., most 2004 restorations). These marsh bird abundances were established with standardized protocols and should offer a baseline for comparisons to future abundances. Future secretive marsh bird and upland point counts will need to incorporate additional points that incorporate additional planned restoration efforts.

Preliminary results of this study were presented at the 2005 Midwest Fish and Wildlife Conference (Emery et al. 2005).



UMC graduate Nate Emery illustrating callback survey techniques for secretive marsh birds to an assemblage of FWS, NRCS, DU and TNC conservation professionals *Photo by John Loegering*

Vegetation Re-establishment of Restored Wetlands in Northwestern Minnesota - Progress Report Field Season 2005

TYLER P. JANKE

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Over the last several decades, the importance of wetlands to ecosystems and society has been increasingly recognized. Do to this recognition, many wetlands have been voluntarily restored. Although wetland restorations have been taking place for more than a decade, detailed scientific study of the vegetation of these habitats has generally been limited. Of the few studies that have examined restored wetland vegetation, most suggest that the vegetation

of restorations is different from the vegetation of natural wetlands. One possible limitation to past restored wetland vegetation studies is the sole use of reference wetlands as a gauge of vegetative recovery. Since prairie wetlands commonly exhibit cyclic vegetation patterns, information collected from reference wetlands provides only a snapshot of current ecological conditions and cannot account for all relevant ecological dimensions that determine species composition. One approach that would allow spatial and temporal aspects of vegetation dynamics entry into reference data is the use of species pools. A species pool is a set of species which are potentially capable of coexisting in a certain community. By defining the local species pool of a given area, it may be possible to develop a list of reference species that represent the saturated community of that area. In order to test whether or not the use of

species pools could allow restoration ecologists a more accurate methodology for evaluating restoration success, a study comparing the vegetative similarity of restorations to reference wetlands and restorations to a local species pool is being conducted. For the 2005 field season, the vegetation of 15 wetlands was sampled including 5 restorations completed in 2004, 5 restorations completed in 2002, and 5 reference wetlands. In total, 208 plant species were identified during the 2005 field season. Specifically, 126 species were

recorded from all 2004 restorations; 120 species were recorded from all 2002 restorations while 148 species were recorded from all reference wetlands. The vegetative similarity



(l-r) Graduate student Tyler Janke, Mike Douglas, and Dan Pazdernic identifying plant species within native prairie vegetation plots on converted agricultural fields within the approved acquisition boundary of the Glacial Ridge NWR

between restored wetlands and reference wetlands was calculated using Sörensen's Index of Similarity (SIS). Initial calculations show that 2004 restorations display a SIS of 58.4% while 2002 restorations display a SIS of 60.4%. Once completed, SIS calculations will also be conducted between restored wetlands and the local species pool. Additional data are also presented which detail in the presence of non-native species and floristic quality for all wetlands studied.

1b. Studies and Investigations

The precipitation and hydrology-soil-and vegetation studies on Glacial Ridge.

Paul Kucera, of the Department of Atmospheric Sciences at the University of North Dakota, has been studying precipitation affects out on Glacial Ridge. The ultimate goal of this study is to increase the knowledge of Glacial Ridge's hydrological cycle through long-term monitoring and high-resolution observations of precipitation through both warm and cold

seasons. The warm season looks at rainfall on the property in both a spatial and temporal distribution with the aid of a weather station on site. The cold season will monitor snow cover retention abilities of native prairie grass and wetlands with the use of a snow evolution model. Both seasons will be monitored for their input into Glacial Ridge's water budget through snow melt and falling precipitation.

Phil Gerlas, of The Nature Conservancy and the University of North Dakota, has been studying different aspects of hydrology, soil, and vegetation. His study is divided among six different projects. By looking at soil moisture under native prairie plots versus poorer vegetation plots this portion of his study would show how native grass cover affects soil water storage on beach ridges. The water levels on the Tintah beach ridge are being monitored to demonstrate the affects of prairie restoration on hydrology by the recharge zones of fens. The third project looks at a water table's response to filling in a cattailed dugout with groundwater piezometers. A shallow natural breach in Judicial Ditch #72 was studied to determine the age, origin, and any recent use of the breach by the ditch. The fifth project monitors the groundwater levels and runoff in Judicial Ditch #66 coming off of the Bradshaw Gravel Pit. This water is believed to be cold and mineralized, which ultimately altered the system which poses concern for any restorations in the area. The sixth and final project looks at estimating evapotranspiration from Landsat remote sensing imagery.

Both of these studies are laying out ground work to better manage Glacial Ridge in the future. These studies also aid in the restoration processes being conducted on site presently. Water Monitoring well placement is mapped within appendix 5.

2. Habitat Restoration

2a. Wetland Restoration: On-Refuge

Restoring the hydrology of land that had previously been drained for agricultural purposes, and also provide nesting and feeding habitat for waterfowl, migratory birds, and all other species of prairie wildlife is one of the highest priorities of the Glacial Ridge Project. Through The Nature Conservancy, the NRCS Wetland Reserve Program has provided funding and technical support for the restoration of 81 wetlands within the Glacial Ridge NWR approved acquisition boundary. During FY 2005, 3 wetlands, comprising over 35 acres of prairie potholes, were restored back to their original state. Wetland restoration projects are delineated in Appendix 3.

2b. Upland Restoration: On-Refuge

All upland restoration and conversion from agricultural land to pre-settlement habitats was accomplished prior to conversion to USFWS property.

2c. Wetland Restoration: Off-Refuge

3. Habitat Management

3a. Manage Water Levels

3b. Graze/Mow/Hay

All mowing activities are associated with invasive weed control and are reported under section 3g.

3c. Farming

3d. Forest Management

3f. Prescribed Burning

Prescribed fire is used to rejuvenate prairie restoration sites, reduce fuels, and recycle nutrients in wetlands. Management of the fire program is directly tied to the fire management team located at the Detroit Lakes Wetland Management District.

3g. Control Pest Plants

4. Fish and Wildlife Management

4a. Provide Nest Structures

4b. Predator and Exotic Control

5. Coordination Activities

5a. Interagency Coordination

The Nature Conservancy (TNC)

Refuge Operations Specialist Juancarlos Giese and Maintenance Worker Jay Ciucci assisted the TNC's Glacial Ridge Project staff in conducting two prescribed burns of TNC property within the proposed boundary of the Glacial Ridge NWR totaling over 600 acres.



Locations of the three prescribed burns conducted within the approved acquisition boundary of the Glacial Ridge NWR in FY 2005.



ROS Juancarlos Giese conducting a prescribed burn for prairie rejuvenation within the approved acquisition boundary of the Glacial Ridge NWR. Photo by Agassiz NWR Burn Crew member Scott Swanson



Natural Resource Conservation Service

Rydell NWR staff assisted the Natural Resources and Conservation Service with an Earth Day event at The Nature Conservancy's Glacial Ridge Project office on April 22. Over 150 people attended and, along with setting up a booth demonstrating mammals of the prairie to area elementary school children, the staff also insured that Puddles would be there.



Rydell and Glacial Ridge NWR Manager Dave Bennett describing the finer points of Bluebird house construction. Photo by Jay Cuicci

5b. Tribal Coordination

5c. Cooperative/Friends Organizations

6. Resource Protection

6a. Law Enforcement

Detroit Lakes WMD Law Enforcement Officer Brent Taylor handled law enforcement issues for the Refuge in FY-2005.

Table 11. Legal incidences.

Date	Violation	# of People	Outcome
8//05 Ducks shot out of season -left on Refuge		unknown	Notification to LE officer Taylor

6b. Wildfire Preparedness

8. Public Education and Recreation

8a. Provide Visitor Services

Managed Deer Hunts



During FY 2005 the Glacial Ridge NWR hunting plan was formatted to facilitate a lawful hunt on the Refuge for the fall 2005 season. The hunt plan proposed to open a portion of the 2,300-acre, and future 35,750-acre, Glacial Ridge National Wildlife Refuge to hunting of deer, greater prairie chicken, sharp-tailed grouse, and migratory birds. Migratory birds would include waterfowl, mourning doves, common snipe, woodcock, and rails. Approximately 25% of the Refuge will be utilized for non-consumptive public use and the facilitation of special hunts for youth and people with disabilities. Goals for the hunts include: provide the public with safe and enjoyable hunts that are compatible with the Refuge purpose, provide quality hunts that minimize conflicts with other public use, provide opportunities for people with disabilities, and ensure hunts are consistent with State of Minnesota rules and regulations, and the 1997 Refuge Improvement Act.

Hunting opportunities are open to all members of the general public following state and federal regulations and seasons. Maps designating appropriate hunting zones for specific species, as well as approved access points, can be requested from the Rydell NWR headquarters, and are also posted at The Nature Conservancy's Glacial Ridge project office and at designated parking areas throughout the Refuge.

At present, the Service will not require Refuge-specific hunt permits, charge fees or limit the number of hunters. Approximately 25% of the refuge will be utilized for non-consumptive public use and the facilitation of special hunts for youth and people with disabilities. Minnesota DNR will be notified of all policies and refuge-specific regulations, including possible future amendments in the hunt plan

8b. Outreach

Environmental Education

The 2005 Detroit Lakes Festival of Birds held on May 20 brought out over 40 visitors to the Glacial Ridge and Rydell National Wildlife Refuges. The day started at 6:45am with a Bus tour given by TNC-restoration ecologist Jason Ekstein and Refuge Manager Dave Bennett. Festival members were guided through over 10 miles of native and restored tallgrass prairie and wetlands, seeking birds and learning about the transition of restoration throughout the Glacial Ridge project and the benefits to the surrounding community as well as the local flora and fauna.

9. Planning and Administration

9a. Comprehensive Conservation Planning

The Glacial Ridge NWR Interim CCP was approved by the Regional Office September 28, 2001.

9b. General Administration

Land Acquisition

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On July 1, 2005, a general introduction letter was sent to private landowners within the approved acquisition boundary for the Glacial Ridge NWR. The letter also indicated that Service would be willing to provide an appraisal for any and all willing sellers. From July to September 30, seven landowners identified themselves as desiring an appraisal for their lands, totaling a potential purchase of 3416 acres.

Equipment and Facilities

The Glacial Ridge National Wildlife Refuge is currently administered by funding and staff from the Rydell National Wildlife Refuge.





THE NATURE CONSERVANCY IN THE NORTHERN PRAIRIES Partnership and Preservation: The Glacial Ridge Project

Cranes (@Nebraska Game & Parks Commission)

The Landscape

Created by the forces of wind and water more than 12,000 years ago, the Agassiz Beach Ridges of northwestern Minnesota mark the eastern edge of an ancient glacial lake. The ridges form a biologically diverse landscape of wet and dry prairies, and this unique mixture of grasslands and wetlands provides habitats especially suited for prairie nesting birds and other animals.

Less than one percent of Minnesota's native prairie remains unplowed and unpaved, and the few prairies that do survive often exist in isolated patches. Within the Agassiz Beach Ridges landscape, many remnant prairies are clustered in a patchwork around the Glacial Ridge project. And though 17,000 acres here have been altered by agriculture and gravel mining, the sheer size of the project and the small patches of native prairie that survive, make Glacial Ridge an exceptional restoration opportunity.



Prairie Smoke (@Christine Hura/TNC)

he largest prairie and wetland restoration project in the United States now forms the heart of the 35,000-acre Glacial Ridge National Wildlife Refuge. Established in October 2004, the core of the refuge is The Nature Conservancy's 24,000acre Glacial Ridge property in northwestern Minnesota.

Here at Glacial Ridge, the Conservancy and its partners are working on what many believe to be an important achievement for the future of modern conservation – the restoration and preservation of large-scale natural areas.

Restoration Works

The Conservancy and its partners are transforming Glacial Ridge's landscape of fields and ditches, and giving the land a chance to heal itself. Since June 2001, when restoration began, land stewards, partners and volunteers have replanted more than 8,000 acres in native prairie grasses, restored more than 80 wetlands, and filled in eight miles of ditches.

The Landscape

At Glacial Ridge, the Conservancy works closely with the Natural Resources Conservation Service which manages the Wetlands Reserve Program. A voluntary program that helps landowners protect, restore and enhance natural habitats on their property, the Wetlands Reserve Program is the premiere wetland conservation program for private land. The Conservancy expects to enroll another 1,050 acres in the Wetlands Reserve. Program in early October 2006.

More than 12,000 acres have been enrolled in the Wetlands Reserve Program and neighboring landowners have added to the project area by enrolling an additional 3,500 acres.



Swans (@Rebecca Ekstein/U.S. Fish and Wildlife Service)

By the time this project is complete, Glacial Ridge will support more than 16,000 acres of native and restored tallgrass prairie and more than 8,000 acres of restored wetlands – from wet meadows to open water marshes. The land will again flow with grama and bluestem grasses, and spring will arrive with the song of booming prairie chickens. The restored wetlands and marshes echo with the cries of sandhill cranes, marbled godwits and northern harriers.

Glacial Ridge is a vital anchor within a patchwork of preserves and wildlife areas that protect some of the best of Minnesota's remaining tallgrass prairie. Because of its size and location, Glacial Ridge will ultimately serve as a hub connecting other natural areas, including 11 state wildlife management areas, two scientific and natural areas, three waterfowl production areas, and the Conservancy's existing Pembina Trail Preserve.



Western Prairie Fringed Orchid (@Christine Hura/TNC)

A Future and a Hope



Pasque Flowers (©Christine Hura/TNC)

A Future and a Hope

Glacial Ridge is becoming an integral part of neighboring communities, and enjoys the active support of local counties and the city of Crookston. The benefits of the restoration – the ecological and hydrological improvements are contributing to economic activities as well.

Surrounding agricultural lands are being enrolled into perpetual conservation easements for the benefit of farms and the surrounding communities. Many local farmers are cultivating prairie plants and selling the seed for the restoration activities at Glacial Ridge. Two new wells on the property are enabling the city of Crookston to secure a water supply, and the potential for nature-based tourism is providing new growth areas for the local economy.





Green Herons (©Rebecca Ekstein/U.S. Fish and Wildlife Service)

Green Winged Teal (@Carrol Henderson/DNR Nongame Wildlife Program)

Partners

At Glacial Ridge, as at the majority of Conservancy projects, partnership is the key ingredient for success. Today, more than 30 non-profits, governments, universities and other agencies play important parts in the restoration and preservation of Glacial Ridge.

- Bush Foundation
- · City of Crookston
- · City of Red Lake Falls
- · Concordia College of Moorhead
- · Crookston Chamber of Commerce
- · Crookston Convention and Visitors Bureau
- Ducks Unlimited
- · East Polk Soil and Water Conservation District
- · Environment and Natural Resources Trust Fund
- · Legislative Commission of Minnesota Resources
- Minnesota Department of Natural Resources
- Minnesota Pollution Control Agency
- Nature Northwest
- North American Wetlands Conservation Council
- · North Dakota State University
- Northwest Minnesota Foundation
- Northwest Regional Sustainable Development Partnership
- Pembina Trail Resource Conservation and Development
- Polk County
- · Red Lake County
- · Red Lake River Corridor Group
- Red Lake River Watershed District
- Red River Flood Damage Reduction Work Group
- Sandhill River Watershed District
- South Dakota State University

- University of Minnesota, Crookston
- · University of North Dakota
- USDA Natural Resources Conservation Service
- U.S. Environmental Protection Agency
- · U.S. Fish and Wildlife Service
- U.S. Geological Survey
- · West Polk Soil and Water Conservation District

Established in 1951, The Nature Conservancy is a private, international, non-profit conservation organization. Our mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.

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nature.org/minnesota

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C-LINE #62028 NOT GLARE TOPPER



Glacial Ridge NWR Wetland Restorations



Glacial Ridge NWR

C-LINE #62028

Approved Acquisition Boundary





Appendix 4- Expected distribution of plant communities as a result of restoration activities within the vicinity of the Nature Conservancy's Glacial Ridge Project, including the lands within the Glacial Ridge NWR approved Acquisition Boundary.



Appendix 5- Location of surface water (triangular) and groundwater (circles) monitoring stations at Glacial Ridge (data courtesy of USGS, Mounds View, Minnesota)

Photos by Brian Peterson | Star Tribune

JEWEL on the prairie





Between two strands of big bluestem grass, droplets of dew clung to the delicate thread of a spider web before the morning breeze began to blow.

ike a string of pearls on the northwestern Minnesota prairie, Glacial IRidge National Wildlife Refuge the nation's newest wildlife refuge — connects 11 state and federal wildlife areas to form a 35,000-acre prairie wonderland near Crookston.

Established just a year ago, Glacial Ridge is home to things big and small — from orchids and prairie grasses to moose, wolves, waterfowl, prairie chickens and songbirds.

Beach ridges formed from Glacial Lake Agassiz, vegetated with true tallgrass prairie is the heart and soul of the refuge. Much of the area is undergoing a transformation. The impetus for the refuge was the purchase five years ago of 24,000 acres by The Nature Conservancy.

About 17,000 acres was farmed, and those lands are being restored as tallgrass prairie and wetlands — the largest prairie-wetland reconstruction project in the country. So far, about 8,000 acres have been restored. It will take several more years to complete the restoration. About 2,500 have been turned over to the U.S. Fish and Wildlife ! and the rest will follow as it is restored.

The agency is developing a management plan for refuge. Meanwhile, the property is open to the public recreational activities, including hiking, hunting, fis snowshoeing, cross-country skiing — and photogra

This photo essay is just a glimpse into the beauty this natural landscape.

For more information, see www.nature.org. Brian Peterson i brianp@startribune.com.

The Rough Blazing Star Is a plant of the native tallgrass prairie and a major nectar source for fall migrating monarch butterfiles. Unlike many other floral spikes, its flowers bloom from top to bottom.





Big bluestem is one of the more important and beautiful grasse of the tall grass prairie. Its tall slender stem is green much of the summer, then turns blue-purple as it matures.

The sunset seen through the diverse plants of the talkrase

EDUCATION AND THE OUTDOORS

A hotbed for learning



Brad Dokken, Herald staff

A leopard frog tadpole begins to sprout legs as it undergoes the metamorphosis from a tadpole to an adult frog. Frogs and other amphibians are **important players in** natural ecosystems because they are an "indicator" species of an area's biological health.

Glacial Ridge prairie, wetland restoration project proves to be fertile grounds for student research

by Brad Dokken lerald Staff Writer

LACIAL RIDGE NATIONAL VILDLIFE REFUGE, Minn. -- Jesica Larson says she was scared of rogs as a child. That's what her mom tells her, at

Basi

These days, Larson's batrachohobia --- or fear of frogs and other mphibians — is long gone. Good hing, too, because the UND gradute student in biology literally is vading in them this summer. And Larson says that's fine by

ler "My parents raised me camping, iking and fishing, and I don't like itting behind a desk all day long,"

he Dassel, Minn., native said. As part of a two-year study at Gla-ial Ridge, Larson, 22, and assistant hannon Rasinski, 25, are studying he relationship between amphiloins and restored wetlands. For 10 to 2 hours a day, Larson and Rasinki, a natural resources student at he University of Minnesota-Crookson, wade through wetlands, many f which were drained and farmed ust a few years ago, looking for

igns of frogs and toads. First, it was nighttime "calling" urveys to listen for breeding activy. Then, it was searching for egg nasses. Now, Larson says, they're unting for tadpoles that will trans-orm into the toads and frogs formag the core of the survey. They also ake water samples to test for disolved oxygen and other indicators f wetland quality.

Eventually, Larson says her re-earch might shed light on what inds of water and wetland condions are most conducive to frogs nd toads. For now, it's hard to say, he says, because the research is so

"Once we do the (water quality) ests and compare it to what we're eeing, then I think we'll really be





able to tell the difference," she said. Amphibians might lack the glam-our of fish or ducks, but the re-search is important, Larson says, because frogs and toads are an "indicator" species of an area's biological health.

"They play a big role in the food pyramid," she said. "They play a big role in the biomass of the environment'

Natural laboratory

Glacial Ridge in Polk County is proving to be a fertile setting for student research projects because it represents perhaps the largest prairie and wetland restoration in North America. Known locally as Tilden Farms, much of the area's 24,000 acres had been drained and tilled for agriculture in the late

GLACIAL RIDGE; RESEARCH AT A GLANCE

and around the basin and with sur-Here's a look at some of the rounding uplands chemically treated leaving exposed soil, had chorus frogs and wood frogs calling, as well as signs of tadpole success

Even with cold snaps in the spring, some of which produced ice most wetlands have been successful at producing tadpoles of one or more species.

 Source: Jessica Larson, **UND** grad student

Vegetation

Most natural wetlands are very diverse, with some displaying nearly 30 identifiable species by mid-June.

Several plant species common to natural wetlands are becoming established in year-old restored wetlands.

Several species of orchids, including the small white lady slipper, a species of special concern in Minnesota, are abundant in several natural wetlands on the Glacial Ridge property.

Source: Tyler Janke, **UND** grad student

Birds

III Trumpeter swans, a threatened species, are present in small numbers, with two potential nesting pairs.

Brad Dokken, Herald staff

▲ Jessica Larson, a biology graduate student at UND, uses a net to scoop up the bottom contents of a wetland in the Glacial Ridge project in Polk County. Larson is studying the relationship between amphibians and restored wetlands on the Glacial Ridge property, and she uses the net to catch tadpoles, frogs and toads.

 Jessica Larson (left) measures a tadpole while Shannon Rasinsky, a student at the University of Minnesota-Crookston, records the information. Rasinsky is assisting Larson with a project to monitor amphibian life at Glacial Ridge.

□ More outdoors --- 6-7C

1970s before The Nature Conservancy bought the land in 2000.

That set the stage for a massive restoration effort involving TNC and partners such as the Natural Resources Conservation Service and the U.S. Fish and Wildlife Service. TNC enrolled about 17,000 acres

in the NRCS-administered Wetland

RESEARCH: See Page 7C

There are low numbers of Wilson's phalarope nests in Minnesota, but there is one confirmed and two probables on the property.

- Other bird observations:
- ✓ Nelson's sharp-tailed sparrow. ✓ Two short-eared owls.
- VYellow rails.
- Marbled godwits, scarce throughout Minnesota, are common on the property.
- Greater prairie chickens. Two male and one female dickcissel — a grassland bird that resembles the meadowlark --- were

observed June 15, the first such sightings on Glacial Ridge property. - Source: Nathan Emery, UMC

indings from student researchers vorking at the Glacial Ridge rairie and wetland restoration ite in Polk County:

Imphibians

III In comparison to studies in astern North Dakota, wood frogs, horus frogs and northern leopard rogs were calling earlier in the Glaial Ridge study area this spring.

Wetlands that were dry for reeks, but were filled by recent ains, attracted calling male frogs nd toads.

A wetland that was chemically reated for cattails, burned both in

RESEARCH/

Continued from Page 8C

Reserve Program and last fall donated nearly 2,000 acres to the U.S. Fish and Wildlife Service as the first chunk of the Glacial Ridge National Wildlife Refuge. Much work remains, but the turnaround in the landscape is readily apparent.

According to Dan Svedarsky, natural resources professor at the University of Minnesota-Crookston, the research possibilities at Glacial Ridge and adjacent public lands are as diverse as the area's rejuvenated prairie and potholes.

"We've watched the waxing and the waning of the landscape out there," Svedarsky said. "It was pretty diverse to begin with, then it got simplified. Now, it's going back the other way, and for it to be 10 miles away (from Crookston) is really cool. We use this as a recruiting angle for students in the resource program."

Svedarsky, who has graduate appointments at both UMC and UND, is overseeing much of the research now under way at Glacial Ridge. Besides Larson's amphibian work, research projects to monitor vegetation and birds are in progress this summer.

Tadpoles and toads

Larson and Rasinsky were back in the marsh on a recent Tuesday hunting for tadpoles, frogs and toads. Dragging their nets along the mucky bottom of a small wetland, they scooped up the contents and sorted through the biological soup of algae, bugs and other critters looking for tadpoles.

Slogging through the water, Larson said she became interested in studying amphibians after doing a report on abnormal frogs in high school. Rasinsky, of Grand Forks, says she hadn't spent much time around frogs and toads before this research project came along.

"At first, I was a little apprehensive because I had no idea what we were doing," Rasinsky said. "Now, I absolutely love it."

The sounds of marsh wrens and black birds filled the air this overcast morning, nearly drowning out the constant hum of mosquitoes. Those familiar with such things would have picked out the upland sandpiper, a bird that winters in the pampas of Argentina, circling overhead.

Then Larson saw it in her net, the first wood frog she's caught all summer. They should have shown up in late May.

"Sweet," she said. "Tm excited for the day."





Brad Dokken, Herald staff

Hunt for plants

Out of sight but just as busy with their own discoveries, UND graduate student Tyler Janke, 23, and his two UMC assistants, Dan Pazdernik, 21, and Michael Douglas, 24, were walking the prairie, looking at plants and recording all of the species they observed.

Prairie restoration also is part of the Glacial Ridge project, and Janke's research involves monitoring the numerous flora. Some, such as big bluestem grass and the brilliant orange prairie lily, are easy to identify. Others, Janke says, require close examination under a microscope.

"That's the challenge of it," he said. "If I knew what everything was, there wouldn't be the fun of discovery."

As with the restoration work at Glacial Ridge, partnerships make the research possible, Svedarsky says. Larson, for example, is working on amphibians through the Fish and Wildlife Service's Student Career Experience Program, while Rasinski, her assistant, is a trainee through the NRCS. Janke is conducting the plant project through

Brad Dokken, Herald staff

▲ Dan Svedarsky (left), natural resources professor at the University of Minnesota-Crookston, helps UND graduate student Tyler Janke identify a plant on the Glacial Ridge property in Polk County.

 Jessica Larson, a UND graduate student studying amphibians, holds a Canadian toad from Glacial Ridge.

UMC's Northwest Research and Outreach Center, and his two assistants are trainees for NRCS.

"I always enjoy these partnership programs," Svedarsky said.

According to Svedarsky, other players in the long list of partners include the U.S. Geological Survey, UND, the Minnesota Department of Natural Resources, the Northwest Regional Sustainable Partnership, the Northwest Minnesota Foundation and Ducks Unlimited.

"It really has the potential to be a world-class not only restoration project, but a field training site for students as well," Svedarsky said.

Every two weeks, the student researchers get together and share what they've learned in their respective projects. From a faculty standpoint, Svedarsky says, the sessions are refreshing.

"It keeps some of us older dogs younger, working with these good young people," he said.

And despite the mosquitoes, heat and incessant rain, Larson says she enjoys the time she spends hunting for tadpoles. And frogs. And toads. "You do a lot of thinking, and you get

to see a lot of thinking, and you get to see a lot of things other people don't," Larson said. "After awhile, you just lose yourself. You really get time to think."

Dokken reports on the outdoors. Reach him at (701) 780-1148; (800) 477-6572, ext. 148; or bdokken@gfherald.com.

Rydell And Glacial Ridge NWR's Staff

(L-R) Jay Ciucci-Maintenance Worker, Juancarlos Giese- ROS, Becky Ekstein-Admin Tech, Dave Bennett-Refuge Manager, Bob Hiltner-Maintenance Mechanic, Jessica Larson- SCEP, Joe Bailey- Volunteer of the Year