NARRATIVE REPORT

1991

AUDUBON NATIONAL WILDLIFE REFUGE

COLEHARBOR, NORTH DAKOTA

REVIEW AND APPROVALS

AUDUBON NATIONAL WILDLIFE REFUGE
COLEHARBOR, NORTH DAKOTA

ANNUAL NARRATIVE REPORT

Calendar Year 1991

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Regional Office Approval — 5/7/92 — Date

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U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

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INTRODUCTION

Audubon NWR Complex consists of a mixture of fee title lands (Refuges, Waterfowl Production Areas, Wildlife Development Areas), easement interest lands (Refuges and Waterfowl Production Areas) and over-lay lands (Audubon NWR). A summary of these lands is below. Total acreage in the Complex is 140,374 acres in McLean, Ward, Sheridan, Dunn, Grant and Slope Counties, ND.

REFUGES

Audubon NWR	14,738 ac.	(owned by U.S. Army Corps of Engineers)
Lake Nettie NWR	3,055 ac.	(2,421 in fee, 634 easement)
Lake Ilo NWR	4,033 ac.	(3,197 in fee, 836 easement)
White Lake NWR	1,040 ac.	(1,040 in fee)
McLean NWR	760 ac.	(344 in fee, 416 easement)
Stewart Lake NWR	2,230 ac.	(640 in fee, 1,590 in easement)
Hiddenwood NWR	568 ac.	(all easement)
Lost Lake NWR	960 ac.	(all easement)
Lake Otis NWR	320 ac.	(all easement)
Strawberry Lake NWR	585 ac.	(all easement)
Sheyenne Lake NWR	797 ac.	(all easement)
Pretty Rock NWR	800 ac.	(all easement)
Total refuge acreage ..	29,886 ac.	in 12 units

AUDUBON WETLAND MANAGEMENT DISTRICT

McLean County WPAs	4,068	fee title
Ward County WPAs	5,908	fee title
Sheridan County WPAs	7,804	fee title
Total WMD Acreage	17,780	fee title plus 79,446 ac. in wetland easements; 4,042 in grassland easements

AUDUBON GARRISON WETLAND MANAGEMENT DISTRICT

McLean County WDAs	7,434	fee title acres
Sheridan County WDAs	1,786	fee title acres
Total GDWMD Acreage ...	9,220	acres

Audubon NWR is superimposed on the Corps of Engineer's Garrison Dam and Reservoir Project, the second of the main stem Missouri River Pick-Sloan reservoirs. The refuge was established in 1955 as mitigation for wildlife habitat destroyed by the filling of Lake Sakakawea behind Garrison Dam. It is located on the south half of Lake Audubon, which also serves as the main supply reservoir for the Garrison Diversion Irrigation Project. The north half of Lake Audubon is managed by the North Dakota Game and Fish Department as a public use wildlife management area.

The other fee title refuges, all WPA's, easement refuges, and wetland easement areas were acquired through the Service's migratory bird acquisition program. The Wildlife Development Areas were acquired in fee title from the USBR as mitigation for the Garrison Diversion Unit. These lands are restored for Garrison Diversion Unit mitigation and are ultimately turned over to the FWS for ownership and management. The USBR funds the land management each year.

Management objectives of the Complex are in order of priority: 1) waterfowl production, 2) preservation and enhancement of waterfowl migration habitat, 3) management of habitat for migratory non-game birds, 4) management of resident wildlife species and their habitat, 5) environmental education, 6) protection and enhancement of natural ecological communities, and 7) public use compatible with the primary objectives of the areas.

Physiographically, Complex lands east of the Missouri River are divided into three types from west to east: Coteau Slope, Missouri Coteau, and Drift Prairie. Elevations range from 1,700 feet m.s.l. near the Missouri River in southwest McLean County and northeast Sheridan County to 2,200 feet m.s.l. in the highest parts of the Missouri River Coteau, which runs from northwest to southeast through the three counties. The topography of the Coteau Slope falls rapidly to the Missouri River while the Missouri Coteau is characterized by high local relief, numerous wetlands and rolling hills. The Drift Prairie is mostly level to gently rolling. These land forms are the result of glacial activity occurring approximately 10,000 years ago.

Lake Ilo, White Lake, Stewart Lake and Pretty Rock NWR's are located west of the Missouri River in an area not affected by the glacial activity responsible for the topography of the rest of the Complex. The topography is characteristic of western range land with buttes, rolling grasslands and intermittent streams.

Habitat throughout the Complex is typical of the northern Great Plains. Wetlands, native prairie, DNC, and tame grasslands are mixed together in relatively small blocks. Manipulation of the various habitat types is difficult due to this interspersion of small units.

There are approximately 120 islands on the refuge side of Lake Audubon, ranging from a few square feet to 80 acres in size. These islands are very productive for nesting ducks, Canada geese, gulls, terns, phalaropes, godwits, and cormorants. Unfortunately, erosion from wave action is rapidly washing these islands away.

The mix of refuges, WPA's, WDA's, and wetland easements makes management challenging, interesting, and demanding. Working nearly daily with Bureau of Reclamation, North Dakota Game and Fish Department and USFWS-FWE on Garrison Diversion Project lands and issues is a challenging, patience building chore (details of the Garrison Diversion lands are covered in the Audubon WMD Narrative Report). Also the US Army Corps of Engineers requires three annual reports and some routine coordination work.

Engineering Equipment Operator Duane Brenneise has given many year s of dedication and hard work to Audubon NWR. Pete Smith (left), Terry Kostinec (right), and the rest of the crew honored him on National 'Dozer Operator's Day. 91-5-06 DGP

A. HIGHLIGHTS

Over the years, Engineering Equipment Operator Duane Brenneise has built or rehabed virtually everything at this refuge. In recognition, he was presented a cake, card and new dozer (plastic) to celebrated National Bulldozer Operator's Day. Sect. E.1.

Many personnel actions: The Extension Biological Technician job turned over twice. Excellent youth and volunteer workers were hired. Several of the crew received promotions or upgrades to permanent status. Section E. 1.

The third Lake Audubon summer water level reduction (.2' with a total drawdown now at 1.0') negotiated in 1990 was finally implemented by Bureau of Reclamation. Refuge erosion monitoring showed the results as, for the

first time since measurements began in 1986, islands on average showed accretion of .1' and shorelines accreted 2.4'. Section F. 2.

Virtually all natural wetlands were dry. Extensive pumping and syphoning from Lake Audubon flooded about 38 wetlands this spring. Waterfowl brood use was excellent. Section F. 2. and G. 3.

An excellent building contractor completed the office rehabilitation in mid December. Section I.2.

The Garrison Federal Advisory Council, including the Regional Director, toured the Refuge and several WDAs viewing the island protection and other development projects. Staff supervisors from all three Congressional Offices received a boat tour of the island protection project. Garrison WMD Narrative.

Audubon staff conducted two "neighbor's" information meetings on land management at Lake Ilo Refuge. The Ilo Dam Safety EIS received considerable work and was nearly completed. All Congressional Offices were kept well informed. Ilo NWR Narrative

The Bureau of Reclamation designed and issued contracts for a range of experimental protective techniques on 8 additional Lake Audubon islands (6 on Refuge) and continued engineering studies on possible shoreline mitigation measures. Sect I.1.

Last year's record high pheasant population was even larger this year. Two whooping cranes visit Nettie NWR for a day. A study by Northern Prairie Wildlife Research Center found Audubon duck nesting success to be very good and much higher than expected. Coyotes displacing fox seen to be the main cause. Island nesting Canada geese hit record highs on Audubon, Nettie Refuges and several WDAs. Section G. 3.

The 3,450 acre Koenig WDA was transferred to the Service. Garrison WMD Narrative.

Private lands work expanded to involve many other agencies. Audubon WMD Narrative.

A large number of "dirt work" projects were completed on Easement Refuges, WPAs and WDAs ranging from ditch plugs, junk burial, gravel pit closing, wetland creations, stock ponds to nesting island construction. Contractors did some of this work and Duane and crew did the rest. Wetland District Narratives.

B. CLIMATIC CONDITIONS

Mr. Carl Radke officially recorded the weather from his home in Underwood which is about 11 miles south of the refuge. With the large size of the complex, no one station will give an exact picture of the weather on all units but this station does give a close approximation.

Generally, winter was again mild and dry; the severe drought continued until spring. January to March temperatures were very mild with the coldest day being only -15 compared to normal lows of -30. No significant precipitation occurred until April 12 saw 2.46 inches of rain.

Thereafter many heavy rains provided excellent moisture for crops and grass. But they came too late to fill wetlands for waterfowl.

June was very wet with a total of 4.85" of rain and July saw 2.15" of rain.

Summer also saw seasonable temperatures with some days up in the 90's and only two up to 100^{o} in wonderful contrast to 1989 and similar to 1990.

Fall was typically dry and generally mild through November and December. An exception was a major, early blizzard which hit on October 28 and dumped about 15 inches of snow (2.03" of moisture) onto a thick covering of ice. Temperatures dropped below zero most nights until November 7 and wildlife, especially pheasants, were quite stressed. A second, brief cold spell saw -12^{o} on Dec. 3 but temperatures quickly returned to teens and twenties at night for the rest of the year.

Total precipitation for 1990 was 19.86" compared to 17.22" last year and 11.67" in 1989. Average is 15.00". Because it came so late in the spring, wetlands stayed dry all year and waterfowl use dropped accordingly. We hope the drought is over!

In summary: The big weather news was dry wetlands made little or no improvements, winter was so mild as to have been nonexistent, heavy summer rains fell, fall was mild except for one early blizzard and December ended mild and dry.

C. LAND ACQUISITION

1. Fee Title

Land acquisition slowed compared to last year's record accomplishments. One extremely large (3,450 acres) WDA was transferred to the Service from the Bureau of Reclamation as a Garrison Diversion Irrigation Project mitigation tract. Please see the Audubon Garrison Wetland Management District report for more details.

Considerable work was done to buy 400-800 acres as a WPA. The Sheridan County Commissioners approved and if the mortgage holding institutions agree, 1992 may see a new WPA "born." More information is in the Audubon Wetland Management District narrative report.

2. Easements

There is a very large backlog in Ward and McLean Counties of owners desiring easement offers which have received favorable biological field reviews. However, a realty vacancy and assignments of realtors to higher priorities have resulted in minimal action in these counties. Realty was able to clear our backlog in Sheridan County so good progress was made there.

Total perpetual wetland easements purchased this year were 380 acres compared to 432 last year and 955 in 1989. Landowner interest continued very high and a large number of field reviews were done. Hopefully they will be reflected in a strong acquisition total in 1992.

3. Other Nothing to report.

D. PLANNING

1. Master Plan Nothing to report.

2. Management Planning

A number of routine plans were again written: Trapping Plan, Prescribed Burning Plan, Herbicide Reduction Plan, Water Level Management Plan, Hunting and Fishing Plan, Corps of Engineer's Management Plan and others. Special or more unusual plans included a Public Use Plan for Audubon and Nettie Refuges and Objectives Statements for these two plus McLean and Ilo Refuges.

3. Public Participation

The third annual grazer's meeting was held in February in Coleharbor with about 20 ranchers attending along with SCS and NDSU Extension personnel. The objective of the meeting was to exchange ideas on grazing management and, more specifically, to further explain the short duration grazing rotations required of all our cooperators. The meeting went well except that the attendance was low, probably because most of our cooperators have "heard it before."

Pete Smith arranged and conducted two "Neighbor's" informational meetings at Dunn Center to have discussions as to routine management work at Ilo Refuge. Attendance was low with 12 at the first meeting in April and 4 in October. We'll continue these meetings but attempt to schedule times more attractive to the public.

More details are in the Ilo NWR narrative report.

4. Compliance and Environmental Mandates

Quite a bit of time went into the full EIS being written for the Lake Ilo NWR Dam Safety Project. Audubon wrote the endangered and threatened species review of the preferred alternative and commented in detail when the full Draft EIS came out in November. For more details, please see the Lake Ilo Refuge narrative report.

EA's, Corps 404 Permits, Endangered Species Consultations and Archeological applications were done for and clearances received on many projects on refuges, WPAs and WDAs (Wildlife Development Areas) within the Complex. Examples of these projects are construction of nesting islands, wetland creations by small dams and stock pond dugouts. Except at the Rovig WPA where miscommunications occurred, all clearances were received before work was done. The Bismarck FWE office was quite helpful on many of these.

In extremely simple situations, an Environmental Memo to the File was written to document that the Refuge Manager had reviewed the various aspects of the project and any needed clearances received. This one or two page Memo was in place of writing a more lengthy EA.

A major project involved the incompatible uses at Audubon, Hiddenwood and Camp Lake Refuges reported earlier in the nation-wide survey. At Audubon, excessive farming and use of Lake Audubon by the Bureau of Reclamation (BR) for the Garrison Diversion Irrigation Project were two incompatible uses. Farming acreage reductions and changes in methods made in the last three years allowed a declaration that the current farming program was compatible. Bureau use of Lake Audubon is being addressed via the Bismarck FWE Office writing a mitigation plan which will list specific mitigation features to be constructed by BR with a well defined schedule for accomplishments. After the plan is written and accepted by BR and Refuges, BR's use will be declared compatible.

Use of Hiddenwood and Camp Lake Easement Refuges are more unclear and difficult to address. Camp Lake Refuge is virtually surrounded by lakeshore cottages and Hiddenwood has a well developed park complete with meeting buildings. Use of the Refuges for camping, homes, meetings, power boating, water skiing, fishing and such are considered incompatible with operating a waterfowl refuge. Further study makes it unclear weather, as Easement Refuges, fishing and other recreational use was included in the nearly 60

year old easements. It was thought that since these Refuges now have minimal waterfowl value, the best way to address the incompatible uses would be to drop them from the Refuge System via Congressional action. Now it is unclear if this is the most appropriate action and the whole situation is currently under review.

5. Research and Investigation

A number of informal management investigations are being conducted by Refuge Biologist Craig Hultberg and are covered in the Wildlife section.

One formal research project occurred as a Northern Prairie Wildlife Research Center Biologist Marsh Sovoda selected several Refuge, WPA and WDA fields to conduct the second year of her comparison of duck nesting success on fox versus coyote dominated sites. One interesting complication was that she had a difficult time finding purely fox territories. Coyotes are rapidly expanding into lands formerly dominated by fox such as around Headquarters. Marsha and crew conducted four nest drags and nest fate follow-ups.

Her study has one more year but, preliminarily, coyote country seems significantly better for duck nesting. She also found Mayfield duck hatching rates on the Refuge uplands to be well above the 10-15% break even rate; we are awaiting her final report. This was very good news because past dragging, during fox years, seemed to indicate very low duck nesting success on Audubon's uplands.

6. Other Nothing to report

E. ADMINISTRATION

1. Personnel

As part of the full performance ladders in their positions, Garrison Wetland District Manager Jim Lange was promoted from GS-5 to GS-7 and Biological Technician Mike Grabow moved from a GS-6 to a 7. Both of these young men are doing outstanding work for the Complex, are progressing greatly in their career and we're lucky to work with them.

1. 4. 3. 14. 7. 6. 5. 9. 17. 13. 2.
12. 10. Personnel 22. 21. 11. 23

1. David G. Potter, Project Leader, GM-485/13, PFT
2. Peter T. Smith, Supervisory Refuge Operations Specialist, GS-485/12, PFT (Ilo, Stewart Lake and 2 Easement Refuges)
3. Mike Goos, Refuge Operations Specialist, GS-485/9, PFT (Audubon Wetland Management District)
4. H. Craig Hultberg, Refuge Biologist, GS-486/9, PFT
5. James Lange, Refuge Operations Specialist, GS-485/7, PFT (Garrison Wetland Management District)
6. Marilyn Wohlk, Refuge Assistant, GS-303/6, PFT
7. Duane Brenneise, Eng. Equip. Operator, WG-5716/8, PFT
8. Donald Bozovsky, Bio. Tech., GS-404/7, PFT (Ilo, Stewart Lake and 2 Easement Refuges)
9. Mike Grabow, Bio. Tech., GS-404/7, PFT
10. Jackie Jacobson, Clerk/Typist, GS-322/3, PPT
11. Brian Mautz, Bio. Aid, GS-404/4, TFT, 3/26/91 - 11/25/91
12. Terry Kostinec, Bio. Tech., GS-404/5, PFT - Transferred to Browns Park NWR 7/13/91
13. Chris Flann, Bio. Aid., GS-404/3, TFT, 5/19/91 - 8/9/91
14. Craig Middleton, Extension Bio. Tech., GS-404/5, TFT, EOD 5/19/91
15. Pat Moran, Bio. Aid, GS-404/3, TFT, 5/19/19 - 10/4/91
16. Dan Eklund, Extension Bio. Tech., GS-404/5, TFT, 1/27/91 Transferred to Pierre, SD FWE Office 4/20/91
17. Jeremy Schroeder, Volunteer, 5/15/91 - 8/2/91
18. James Ruch, Volunteer, 3/25/91 - 5/17/91
19. Alex Heyman, SCA Volunteer, 9/16/91 - 11/22/91
20. Steve Lorig, SCA Volunteer, 8/26/91 - 11/19/91
21. Lynette Stone, YCC Work Leader
22. Cindy Scheid, YCC
23. Chad Wimer, NDSYETP
24. Ed Lang, SCA Volunteer, Lake Ilo, 4/8/91 - 6/28/91
25. Chris Norberg, NDSYETP, Lake Ilo
26. Wanda Bozovsky, Volunteer

As part of the Region-wide review of all refuge management series positions, Audubon's Refuge Manager position was upgraded to GM-13. Because Pete Smith was assigned supervisory responsibility over all employees, except Dave and Marilyn, and is responsible to be a full "alter ego" to the Refuge Manager, he was designated a full Deputy Refuge Manager and upgraded to a GS-12. Jackie Jacobson displayed keen desire to learn wildlife management and performed excellent field work. She was selected for a PPT clerk-typist position to provide her permanent job status.

The private lands extension position (TFT) was vacant at the start of the year but Dan Eckland filled it in late January. He was off to a quick start but his experience and skills soon led to a PFT job with FWE in South Dakota: so he left after 2.5 months. By the end of May another sharp man, Craig Middleton, entered on duty. Rapid turn-over in the extension biological technician position is a function of a very tough, temporary job at low, GS-5 pay.

Again this year the Complex was blessed with a great group of seasonal temporaries. At Ilo, Pat Moran served as Don's right hand man for the third season. Terry Kostinec was Craig's assistant biologist for a second season before achieving a PFT job as clerk at Browns Park NWR. Jackie Jacobson again assisted Jim with Garrison duties. For a fifth season, Brian Mautz worked with Duane in the shop and on equipment. Chris Flann was back for a second season helping out. Best of all, none were first time employees so all came with extremely valuable experience with our operation so were doubly effective.

2. Youth Programs

Two very good, hard working and intelligent young people helped us out for 12 weeks as YCCers. From Underwood, Lynette Stone returned for a second summer as a work leader. Besides work leading, her computer skills were well used entering biological data for Craig. From Hazen, Cindy Scheid filled the second YCC job and did an excellent job nest dragging the islands, banding, maintenance, weeding the shelterbelt and just generally helping out. She plans to study wildlife in college; we hope to keep bringing her back because she seems to have great potential for the Service.

3. Other

Another federally funded youth employment program, the North Dakota Summer Youth Job Employment Training Program, provided a super, 15 year-old worker, Chad Wimer. He worked on many projects, like the YCCers, including nest dragging, banding and keeping the new shelterbelt planting weeded.

4. Volunteer Programs

Five college age volunteers were recruited and very valuably helped out. Early in April a former volunteer, Jim Ruch, stopped for about 9 weeks to volunteer his labor-which we really appreciated. His main duty was operating the portable pump filling small wetlands from Lake Audubon. A forester, he departed for his paying job cruising timber when the snow melted in Montana. In late April a young man from Canada, Ron Barry, arrived but left abruptly after only 3.5 weeks feeling the job wasn't what he'd envisioned-and to try for a paying position.

The third volunteer of the year arrived in mid May from Indiana after his freshmen year in wildlife studies. Jeremy Schroeder very excellently helped out on many censuses and even became a crew leader on several days of island nest dragging, a very good man. In late August the last two volunteers arrived to fill in behind the others for their 12 week stints. Steve Lorig from Illinois (economics degree from U. of Chicago) and Alex Heyman from California (political science degree) also helped on many things from assisting with wildfire mop-up at Upper Souris, fish spawning at Garrison National Fish Hatchery, signing, nesting structures, running to town for parts, entering data in the computer, correcting nest record cards and marking atlases.

The Student Conservation Association supplied our volunteers for spring and fall when college youth weren't available for us to direct recruit. SCA consistently has done a good job. We only direct recruit to save dollars.

Since we now have housing for these volunteers (a modern, large bunkhouse trailer was permanently setup in 1988), we're able to attract good folks who want to learn and work. And they're invaluable to completing our field work; couldn't do without them. In November, Pete saw to transferring a second of these bunkhouse trailers from a research site to Ilo Refuge so we will be able to have increased volunteer assistance there also.

For the second year in a row, Mike Goos led a group of Washburn Boy Scouts on a day's worth of hand planting shrubs on several newly constructed nesting islands. Jim Lange did the same with some enthusiastic Bismarck Scouts. Several members of the Audubon crew also turned out as volunteers for these and other projects.

Again this year, the Underwood 4-H Club spent part of one meeting building bluebird nesting boxes for the Refuge with materials paid for by the Service. It's a hands-on, hammering project most of the kids really like. One young man became interested and, with his Dad, ran a string of boxes just outside of town; no bluebirds but some tree swallows. Some of these boxes were given away as part of the Extension program.

Underwood 4-H kids really got into nailing together pre-cut bluebird boxes. This was the second year in a row for this project. Materials were paid for by the ND Private Lands Extension Program. 91-03-02 DGP

5. Funding

Sub-Activity	Fiscal Year 1992	1991	1990	1989	1988	1987
Base 1261	216,000	225,000	223,000	223,000	233,000	220,000
1261 Pr.P.	-	20,000	-	-	-	-
1262	106,000	106,000	101,000	124,000	53,000	-
1262 Flex	114,000	188,000	10,000	-	-	-
ARMM's	-	-	-	-	78,000	112,000
6860	6,000	6,000	6,000	6,000	6,000	6,000
8610	7,000	5,739	4,500	8,000	9,700	5,700
9120	7,900	6,600	-	-	-	-
YCC	4,200	3,000	3,000	3,000	3,000	0
1230 N. Am.	-	15,000	-	-	-	-
Extension	30,440	28,400	16,000	-	-	-
1902-05*	107,914	89,662	54,594	25,675	38,600	18,800
1929-29**	3,000	1,000	1,200	2,400	-	-
TOTALS	595,454	694,401	419,675	392,675	423,700	364,500

* GDU land management transfer funds

** GDU planning transfer (allocated from FWE - Bismarck)

6. Safety

Considering the size of the crew and the many young, inexperienced people coming and going over many miles of highway; 1991 was an outstanding, safe year with no accidents or incidents. This compares to four, mostly minor incidents last year which still was a good year for the size of this operation.

Monthly safety meetings were held most months. Pete chaired the safety committee. ATV safe operation training was provided at Devils Lake WMD for Chris; Pete received his at Jamestown. Jerry Wolsky from Arrowwood NWR came down to instruct and certify Brian on the bulldozer and most of the men on the Bobcat loader.

Significant safety projects completed: Securing funding for radon abatement at Ilo, writing an action plan and assembling bids to do the work. Public handicapped accessible restrooms were installed in the newly expanded office and a propane leak detector was planned (scheduled for installation in January 1992) for the existing office furnace.

7. Technical Assistance

As usual, we provided routine assistance to many groups such as the Hatchery, Corps of Engineers, SCS, ASCS, FmHA, Bureau of Reclamation, local schools, Game and Fish Department and other organizations.

8. Other Items

The below training was received or significant meetings attended:

-Don, Dave, Mike, Pete and Craig: 40 hr. & 8 hr. refresher law enforcement
-Mike, Don and Mike Grabow: 16 hr. Extension Techniques Workshop in Bismarck, ND
-Pete, Mike and Dave: Project Leader's meetings in Minot and Bismarck
-Mike Goos and Don: S-390 Fire Behavior in Denver for a week
-Pete and Chris: 4x4 ATV operator safety, a day at Devils Lake WMD & Jamestown
-Jim: 8 hr. "Basic Supervision" in Bismarck
-Jim and Mike Goos: 8 hr. "Performance Evaluations" in Bismarck
-Jim, Mike Goos, Pete, Mike Grabow, Craig, Don: 8 hr. "Team Building" in Bismarck
-Pete and Marilyn: 3 day Administrative Workshop in Denver
-Pete: 16 hr. Handicapped Accessibility Training at Salyer NWR
-Pete, Mike, Dave, Jim, Jackie, Craig, Mike Grabow, Craig Middleton: 8 hr. Aircraft Flight Safety Training in Bismarck in two sessions

F. HABITAT MANAGEMENT

1. General

As in the preceding climate section, winter and early spring moisture was low and minimal wetland recharging occurred. What little water ran in quickly sank into the parched, cracked wetland bottoms. Therefore, wetland habitat was very poor and most wetlands were dry except those pumped or syphoned full from Lake Audubon.

Spring rains fell to the betterment of grass, trees and crops. Therefore, the general conditions of all non-wetland habitats were about average and much better than the past couple of drought ravaged years.

2. Wetlands

Because the Bureau of Reclamation pumps Lake Audubon full for use as a supply pool for the Garrison Diversion Irrigation Project, this wetland never experiences drought conditions. Water elevations are tightly regulated by a multiagency agreement so that all parties' (NDGF, USBR, Refuge, cabin owners, Conservancy District, Corps of Engineers) interests are met.

Water level management followed this agreement closely: The winter draw-down from January to ice out on April 3 took the Lake to 1843.82 due to continuous releases down the McClusky of about 40 cfs. This deep drawdown allowed experimental island stabilization projects to be completed on two islands, as planned.

Pumping began April 3, when only small patches of slush ice remained, and was completed May 3 when 1847.14 was reached. (By agreement, a spring elevation no greater than 1847.2 was to be maintained until June 1 to protect walleye spawning.) From June to Labor Day, the Lake was to be maintained no higher than 1847.0 and fluctuated at or slightly below that elevation all summer.

The after Labor Day drawdown was delayed for the second year by mechanical problems with the water gate in a culvert through the Highway 83 embankment. On October 11 with the Lake at 1846.07, the gate was opened. Lake Audubon dropped rapidly and the gate was closed October 21 at 1843.7. This second winter of greater than normal drawdown was required for experimental island stabilization work on 8 more islands, 6 on Refuge. As of December 31, the Lake had dropped to 1843.57 due to normal releases down the McClusky Canal.

As usual, the extensive Refuge island and shoreline erosion monitoring project was completed. Please refer to section F. 6. "Other Habitats" for this information.

All naturally occurring wetlands were dry soon after the frost seal left the basins this spring. Like last year, a major effort was made to run the 5 syphons to flow water from Lake Audubon into a series of dry basins. One of the volunteers using a floating, portable pump to fill about 15 more basins. At four locations tractor driven 12" and 16" Crisafulli pumps supplied Lake Audubon water to a series of ditched together wetlands. All totalled, about 38 large and small wetlands were artificially filled. Based on observations from a dragging study this spring, duck nesting in grasslands adjacent to these wetlands was very high.

3. Forests

Audubon has no natural forest but cottonwood and willows have grown up around wetlands. This is excellent habitat for various bird and mammal species. However, trees near Lake Audubon are often chewed down by beavers.

As habitat mitigation features, 15 shelterbelts amounting to 31 acres of trees and shrubs were planted years ago and are now mature or over-mature. A program of replacement plantings has been initiated with the first scheduled for spring 1992 adjacent to a private farmstead. The farmer has broken and fallowed the Refuge site and will cultivate the trees after the Refuge purchases and plants them.

In the continuing effort to improve island duck nesting and deter gull nesting; 2,200 shrubs were planted on 3 islands by volunteers from the wildlife class at NDSU-Bottineau. Thanks to excellent rains, we're looking for good survival.

The headquarters shelterbelt planted last year received about 400 replacement trees or shrubs this spring. Last summer's drought took quite a toll.

4. Croplands

Croplands are used mainly to feed waterfowl and lessen depredation problems on private lands adjacent to the refuge. Emphasis is on Canada goose depredations. Fall and spring migrations of waterfowl, and fall migrations of sandhill cranes use these fields extensively.

Over the past few years farming on the refuge took on a new directive towards sustainable agriculture and biodiversity. Where once was a wheat-wheat-fallow rotation is now a diversified multiple crop rotation. Chemicals are used only to control Canada thistle and the crop rotations are controlling the other so-called weed species. At first our cooperators resisted the new techniques and experimentation but now are accepting some of the changes, they're even using some of these new ideas on their own lands.

The goals and objectives of the farming program are to:

1) Plant green browse and grains to lessen Canada goose depredations. Also to produce grains and herbage to feed other migrating birds and resident wildlife.
2) Plant crops that minimize soil disturbances thus minimizing disturbances to ground nesting birds by using no-till operations, winter crops, and minimum tillage.
3) Using crop rotations plus incorporating legumes to build soil fertility, control weeds, enhance water cycle, and increase energy flow.
4) Using chemicals only where needed and as last resorts, substituting mechanical means where applicable.
5) Being economically feasible for the cooperating farmer.

Field A-3-B. Yellow blossomed sweet clover being disked down for green manure and to control Canada thistle from going to seed. We have experienced in the past that clover will compete and set back C. thistle. This also helps to reduce chemicals but seems to be only a temporary cure. Field history: 1988 fallow, 1989 wheat (thistle sprayed), 1990 no-till oats and clover (thistle mowed, mowing did not hurt oat yield), 1991 green manure (thistle cultivated after first hard freeze). I feel at this time to control the C. thistle we need to reduce tillage more, integrate mechanical and maybe chemical to control C. thistle, plant crops that have a dense canopy, and to improve soil fertility. 7-11-91 CH

1991 Farming

	Cooperators (a)	(b)	(c)	(d)		
Crop	Fransen	Nelson	Voth	Wilson	Total	Refuge Share
Alfalfa	20.0		31.9	15.7	67.6	50%
Wheat	5.4	15.3		49.6	116.3	49.4
Wheat/clover			28.4		28.4	
Winter wheat	12.1				12.1	33%
Wheat/winter wheat	14.8	29.6	7.8		52.2	2.5
Clover/winter wheat					10.7	
Sunflowers/clover	15.0				15.0	15.0
Barley		66.4			66.4	34.8
Barley/clover		38.2			38.2	2.3
Oats/clover	9.0			29.0	38.0	18.7
Flax/winter wheat				26.8	26.8	Straw
Clover	35.3		23.6	26.2	85.1	
Fallow			28.6	32.0	60.6	
Totals	157.2	149.5	131.0	179.3	617.4	

(a) Fransen: alfalfa - seeded in 1988. 2/3 of acreage hayed to control Canada thistle in 1991.
sunflowers/clover - 1990 sunflowers good but 1991 clover (field G) mostly died out.
clover - fields B and G used as green manure. Field B was cultivated late in fall to control Canada thistle.

(b) Nelson: barley - last year whet stubble burned down with round-up and barley no-tilled, results good on Canada thistle and barley crop also good.

(c) Voth: alfalfa - seeded in 1990 and in 1991 entire field hayed for C. thistle control.
winter/wheat - owes FWS 16 bushels winter wheat seed

(d) Wilson: clover - field B thin, green manure. Other clover fields hayed.
alfalfa - seeded in 1988, 50% hayed to control Canada thistle.
flax - refuge share was the straw baled for nesting structures
winter/wheat - owes FWS 23 bushels winter wheat seed

No shares on clover if used for hay after a certain date.

Field A-24-A-2. Cooperator hauling clover bales from field. This particular field was reported to the County Weed Board in 1990 for extensive Canada thistle. I was able to convince the weed officer that the C. thistle is only a problem in the field and not in the surrounding grasslands because I wanted to do nothing to the thistle, otherwise the clover would be affected. In 1991 the clover competed with the C. thistle very well to the point where the thistle was not a problem. The clover was hayed after July 4, 1991 before any existing C. thistle went to seed. Field history: 1986 fallow, 1987 wheat (thistle sprayed), 1988 wheat and clover, 1989 cut clover for hay no-tilled winter rye, 1990 rye winter killed flax and clover seeded, 1991 clover for hay. 9-5-91 CH

Field A-3-R. Geese have eaten emerging no-tilled winter wheat. Winter crops are one of our goals to make farming and wildlife compatible on the Refuge. This field was harvested for seed and the seed was planted on several other fields this fall. Hopefully this crop will become a mainstay in our farming operation. Field history: 1987 fallow, 1988 wheat, 1989 wheat and clover, 1990 clover no-till winter wheat, 1991 winter wheat.

Field A-3-R. Sue Mautz (Garrison High School volunteer working on bio-controls on C. thistle for Science Fair Project) standing in winter wheat field of preceding photo. I would say that the geese eating the emerging winter wheat in the spring had some reduction in yield but our objectives were met in supplying green herbage for the geese. Our major complaints the last few years have been spring depredations so winter wheat has some potential. The main reason for not using winter wheat in past years is that the farmers said it would winter kill. But with no-till, winter kill may be lessened according to USDA information. 7-16-91 CH

Ring-necked pheasants in no-till winter wheat. No-till winter wheat provides cover and food for resident wildlife, nesting cover for ground nesting birds, green browse for goose depredations, controls certain weeds, reduces chemical inputs, reduces tillage, and much more. 10-2-91 CH

Field A-3-I. Oats and clover seeded with conventional farming practices. Field history: 1989 fallow, 1990 wheat, 1991 oats and clover. 7-31-91 CH

Field A-5-I. Oats and clover no-tilled. Field history: 1985 fallow, 1986 wheat, 1987 wheat and clover, 1988 clover, 1989 wheat, 1990 wheat, 1991 oats and clover. In comparing this photo with the preceding photo and yield there is very little difference. The big difference is that the no-till field kept more residual on the ground for ground nesting birds. 7-31-91 CH

5. Grasslands

Grasslands on the refuge consist of DNC, tame, native prairie, and go-back. We have always emphasized good grassland management as much as possible. The farming program is used to rotat tame and DNC fields with croplands. The grazing and burning program is used to invigorate and rejuv/n/ate natives, DNC, tame, and go-back, while suppressing certain tame grasses such as brome, Kentucky blue, crested wheatgrass, and certain noxious weeds. Haying is used to remove excess litter and invigorate new plant development by harrowing right after cutting. In 1991 good spring rains were welcomed after 4 years of emergency drought programs for agriculture. Due to the rains our grasslands responded to all types of management very well.

6. Other Habitats

The shoreline and island erosion monitoring initiated in 1984 was reviewed in detail in last year's report; please refer to it for background information. Measurements were again taken in 1991 and showed excellent progress!

	Island Losses (in feet)	Shoreline Losses (in feet)
1984-1986	-10.25 (2 years)	-4.7 (2 years)
1987	-4.7	-2.7
1988	-1.4	-1.6
1989	- .8	-1.0
1990	-2.8	+ .1
1991	+ .1	+2.4

The long term benefits of lowering the lake each winter to minimize ice gouging and modest lowering in the summer to minimize wave erosion are apparent. For the first time, average accretion at some sites exceeded average losses at others. Management of the Lake involves a multiagency team from Bureau of Reclamation, Corps of Engineers, ND Game and Fish Department, Garrison Conservancy District, local cabin owners and the Fish and Wildlife Service all talking, compromising and working together.

7. Grazing

Grazing is used to enhance DNC, native prairie, go-back, tame, virtually all the different kinds of habitats we have. Our grazing program using prescribed methods has been a big plus in our habitat manipulations. Not only does it enhance our grasses, noxious weeds are decreasing. A summary of 1991's grazing consists of the following:

Cooperator	Acres	AUM's	#Units	Fence Building Temp. Elec. Ft.	#Days Grazed
Bill Wilson	118	138.11	6	10500	89
Roger Bauch	270	167.19	8	21410	88
Totals	388	305.3	14	31910	177

In 1990 a 10 year grazing monitoring program was developed. The data collected so far looks promising but a couple more years is needed to make any determinations. Couple of things that stand out is that grazing areas seem to be more diverse in wildlife usage compared to rested areas, and the predator base is a significant factor in overall success.

Old gravel pit in a prescribed grazing system. No gravel had been taken out of it for many years and vegetation was slow to invade. Area first grazed in 1990. See following photo. 10-9-90 CH

Same gravel pit as preceding photo with same number of AUM's one year later. Area was grazed in 1991. 10-3-91 CH

Left side grazed in 1991 and 1992. Right side not grazed. Grazing has opened up wolfberry for a better grass understory to develop. 10-3-91 CH

As more experience is gained in grazing a lot of beliefs or misconceptions are brought to light. Seems like vegetation that was once thought to be unpalatable is palatable during some part of the year. Photo shows Russian Olive trees being impacted by cattle in the grazing unit, right side of photo. 9-11-91 CH

Other woody vegetation such as Poplar or Cottonwood trees can also be impacted by grazing. 9-11-91 CH

8. Haying

Due to the large amounts of hay released during the drought years and the increase in our grazing program haying was reduced in 1991. 10 acres of DNC were hayed for weed control and approximately 40 acres of roadsides. The results from our 1990 haying were excellent on the refuge. The timely summer rains really helped.

The following table summarizes haying activity on Audubon refuge in 1991.

Permittee	Acres DNC	Acres Roadside	Payment/Credit
Randy Nelson	10		Weed control
Bill Wilson		35	% of hay (nesting bales)
Cleo Landiedel		5	Weed control

9. Fire Management

Prescribed burning is a major grassland management tool for renovating decadent grass stands. It's also used to create early green browse for Canada geese to lessen depredations on adjacent private lands. Table below shows our burn activity this year.

1991 Burning Activity

Burn No.	Date	Acres	Type Veg.	Comments
9	3/25	18.9	DNC/Planted Natives	Legumes interseeded
16	3/11	2.0	Natives	Goose Browse (island)
17	3/11	1.1	Natives	Goose Browse (island)
18	3/15	0.7	Natives	Goose Browse (island)
19	3/15	0.8	Natives	Goose Browse (island)

In Burn No. 9 green needle grass was seeded on cultivated land several years ago. The idea then was to establish a stand for harvesting seed for establishing natives in other places. We do not need to seed anymore and now the desire is to establish good nesting sites. We decided to interseed alfalfa, after a burn, to thicken the stand and the results look encouraging.

Back burning green needle field for preparation for interseeding alfalfa. There was 25% or better bare ground, therefore prompting a good catch of alfalfa. 3-25-91 CH

10. Pest Control

Efforts continued in high gear to reduce pesticide use on Service lands. A 3-5 Year Plan was written in 1988 to move toward this goal and has been updated annually; it's on file at headquarters and contains much more details. As Biologist Hultberg said; "By looking through these plans and what has been accomplished, we can pat ourselves on the back, but the bottom line is that Audubon still is dependent on chemical usage to some degree. We can be purists and say that Mother Nature has the answers but we must be realistic and humble to say that we do not know all the answers. We will nevertheless strive to unravel the secrets of our surroundings."

On croplands, we are further intensifying crop rotations, increasing mulch, reducing tillage and spot spraying. On grasslands, we plan to spot spray, mow, hand pull weeds, use livestock impact and prescribed fire. We plan to continue the "bug" program of stem weevils on Canada thistle including monitoring by a local high school girl as a science project. For grasshoppers, the last two year's trials with the protozoan biological control "Nosema" have been very successful and are rapidly becoming accepted by farmers and Weed Boards. These efforts will continue and no spraying was employed in 1991 or is planned on 'hoppers in the future.

We hope to construct an ATV mounted wick applicator to increase chemical effectiveness and decrease volumes applied. Our last stategy is to continue working with and educating County Weed Boards, neighbors and other farmers about new methods and our efforts.

Year	Tot. Acres	Fallowed	Cropped	Est. Sprayed Acres
1986	907.5	298.3	610.2	437.0
1987	813.6	195.2	618.4	510.5
1988	757.2	140.9	611.3	206.5
1989	691.9	48.4	643.5	125.4
1990	702.4	91.5	610.9	150.9*
1991	702.1	88.3	613.8	213.2

This year, acres sprayed increased because we've increased the acres farmed by reducing fallowing and using specialty crops. Also, years of drought have stressed crops, grass and dried wetlands such that Canada thistle has exploded.

11. Water Rights: Nothing to report.

12. Wilderness and Special Areas: Nothing to report.

13. WPA Easement Monitoring: Please see Audubon Wetland Management District 1991 narrative report under separate cover.

G. WILDLIFE

1. Wildlife Diversity

Nature holds in its grasp secrets that "Homo Sapiens" will never unfold. Here the "Painted Lady" butterflies have laid eggs and their larvae are feeding on the dreaded noxious weed Canada thistle. To top "Homo Sapiens" ignorance, this is not natural for this to happen, sayeth the experts; maybe there is something here that should be explored. 6-13-91 CH

"Painted Lady" cocoons on Canada thistle plants. Maybe next year's crop of Canada thistle eater, lets hope so. 6-28-91 CH

2. Endangered and Threatened Species

All sightings are incidental. Bald eagle sightings are incomplete; they are quite common and taken for granted during fall, winter, and spring because they winter along the Missouri River which is close by.

Single bird unless stated otherwise in parenthesis:

Bald eagle on 1/6, 1/17(2), 1/18, 2/2, 2/20, 3/9(2), 3/11(3), 4/2(3), 4/4, 10/25, 11/19, 12/12.

Peregrine falcon on 1/5, 3/16, 4/29, 5/4, 5/14, 11/8, 11/9, 11/22.

Piping plover on 5/22(2), 6/18, 7/8.

Least Tern on 6/1.

3. Waterfowl

Every year seems to be the exception rather than the rule when it comes to monitoring waterfowl populations. In 1991 October snows and early cold weather pushed large populations of waterfowl through the area which normally would of stayed another two to four weeks. Also man got into the act by lowering Lake Audubon in mid-October attracting large numbers of waterfowl to its beaches. Last but not least is the continued drought since 1988 making the area the only place with sufficient water. The below charts are our best guesses.

Waterfowl use-days summary:

Year	Geese	Ducks	Swans	Total UD's
1982	1,237,985	2,229,070	3,970	3,471,025
1983	1,111,370	1,984,880	4,195	3,100,445
1984	730,640	1,460,430	1,975	2,193,045
1985	1,038,705	2,227,650	1,890	3,268,245
1986	1,409,290	1,687,287	2,955	3,099,532
1987	1,496,040	2,370,748	2,930	3,869,718
1988	1,570,842	1,778,061	2,150	3,350,753
1989	1,558,500	1,160,550	2,900	2,721,950
1990	1,714,350	870,412	2,700	2,587,462
1991	1,560,000	1,305,000	2,500	2,867,500

Peak waterfowl numbers during spring and fall migrations:

	1989		1990		1991	
Species	Spring	Fall	Spring	Fall	Spring	Fall
Tundra swans	100	150	75	150	50	125
W-F geese	2000	1250	500	2000	750	2250
Snow geese	5000	5000	3500	7500	2500	5000
Canada geese	15000	25000	1350	41295	17500	40000
Mallard	5000	25000	3500	20000	5000	30000
Gadwall	1000	2000	1000	2000	2500	2000
Pintail	300	500	200	300	500	750
G-w teal	100	200	100	200	600	200
B-w teal	250	500	350	500	200	450
Wigeon	250	250	200	250	250	350
Shoveler	250	250	200	250	1500	750
Wood duck	5	10	5	10	5	15
Redhead	200	200	100	150	400	200
R-n duck	50	75	50	75	250	125
Canvasback	100	150	50	100	100	100
L. scaup	2000	2500	1500	2000	1000	1500
Bufflehead	100	150	50	100	200	300
Ruddy duck	15	25	10	20	60	40

Summary of Canada goose production, actual count method:

	STRUCTURES				ISLANDS						**
Year	Tot No.	No. Used	n(%) Succ	No. Aban.	No. Nests	n(%) Succ	No. Aban.	Other Nests	Tot. Nests	Tot. Succ	Gos. Prod.
1979	40	22	22(100)	0	125	114(98)	2	9	147	136	594
1980	46	19	18(95)	1	157	151(96)	6	-	176	169	676
1981	43	22	21(95)	1	231	209(91)	22	8	261	232	1195
1982	49	41	40(98)	1	173	160(93)	13	8	222	204	908
1983	46	34	32(94)	2				12			
1984	57	45	44(98)	1				13			
1985	58	43	40(93)	3				6			
1986	57	40	40(100)	0	259	233(90)	26	3	302	273	1050
1987	58	53	53(100)	0				-			
1988	57	35	33(94)	2				3			
1989	59	37	35(95)	2	203	180(89)	23	-	240	215	951
1990	59	28	26(93)	2				4			
1991	62	42	41(98)	1	336	316(94)	20	4	382	361	1644

** Gosling production includes a 15% increase for undetected nests multiplied by brood size (1991 brood size was estimated at a 12 year average of 3.96).

*** Islands not surveyed in 1983, 1984, 1985, 1987, 1988, and 1990.

Comparison of duck production by species for 1985 - 1991.

The interpretation of the following duck production estimates should be done with care. No formal format was followed for some of the years data and some of the year's data was extrapolated just from island data. In 1991 721 acres of uplands were dragged and 15 islands searched so the 1991 data is probably the best data we have ever had.

	Estimated Production						
Species	1985	1986	1987	1988	1989	1990	1991
Mallard	5275	4516	976	3728	4705	6037	3202
Gadwall	4630	3000	3836	2217	3000	1809	3212
Pintail	765	845	720	346	342	181	281
G-w Teal	75	75	ne	10	40	50	60
B-w Teal	2105	1000	2704	286	91	145	761
Wigeon	265	152	348	34	54	34	61
Shoveler	200	242	420	203	108	125	359
Wood duck	15	15	ne	3	8	5	10
Redhead	100	112	672	100	20	129	100
Canvasback	50	89	40	24	23	25	25
L. Scaup	4195	2278	4436	1431	551	1024	1290
Ruddy	250	125	212	100	10	10	20
TOTAL	17925	14449	17202	8482	8952	9574	9381

Three large culverts were put out in 1991 to be used as waterfowl nesting structures. Only one was used. These culverts are 5 ft wide, 5 ft high, and weigh 7000 lbs. They stood up well to Lake Audubon's wave action but the dirt settled a foot or more. More dirt will be added for the upcoming nesting season. 4-2-91 CH

Coyote on the Haugeberg area. Our upland waterfowl nesting success in 1991 was probably the best we have ever recorded. This year our data showed a successful nest for every 11.5 acres, preceding years data gave us a successful nest for every 34.5 acres. We are attributing this trend to the increase in our coyote population. 9-5-91 CH

DU28 predator exclosure brood count data:

The refuge maintains three electric predator exclosure fences. The DU28 exclosure was completed and in operation since 1987. The fences were built mainly to increase nest density, but the following data supports good brood use where brood ponds were included inside the fences.

	brood/ducklings				
Species	1987	1988	1989	1990	1991
Mallard	-	9/59	6/43	16/102	21/115
Pintail	-	2/4	-	-	-
B-w Teal	2/7	8/39	1/2	4/29	9/39
Gadwall	4/20	6/21	13/106	8/63	14/96
Wigeon	-	1/4	1/4	-	1/3
L. Scaup	5/34	4/11	3/30	8/72	2/6
Ruddy	-	-	-	-	1/5
unidentified	1/2	2/10	2/2	/2	-
Total	12/63	32/148	26/187	38/268	48/264

Dragging for duck nests was conducted on 15 islands out of the 100+ present on the refuge. To get a better understanding of the nesting activity two samples of 15 islands each are alternated (started in 1989 on second sample) annually.

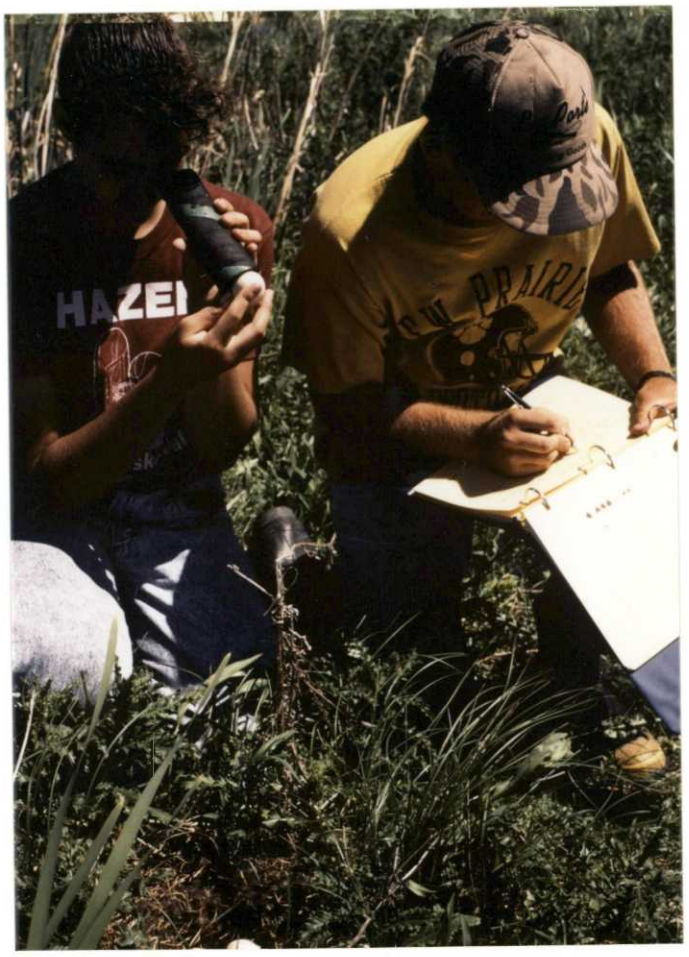
Sample Islands A-O:

	Acres	Total Nests Found	Useable Nest	No. Abandoned	No. Predated	No. Hatched	% Success (Appar)
1978	49.4	176	128	?	2	120	93.8
1980	42.2	214	205	?	29	166	81.0
1984*	41.4	242	225	21	29	171	76.0
1986	39.0	145	141	9	43	89	63.1
1988	37 est.	147	142	2	21	117	82.0
1990	37 est.	171	165	2	10	153	93.0

* Another study was being done on radio trapping birds. This may be the cause for a high rate of abandonment.
Birds found incidentally were also included thus giving a higher number of nests found.
The decrease in acreage is due to erosion of the islands.

Sample Islands 1-15:

	Acres	Total Nests Found	Useable Nests	No. Abandoned	No. Predated	No. Hatched	% Success (Appar)
1989	52.09	180	174	6	40	128	74.0
1991	52.09	217	200	13	29	158	79.0



YCC Cindy Scheid and SCA volunteer Jeremy Schroeder nest dragging. 6-12 DP

To increase waterfowl use on the islands several things are being done to make them more attractive. These include the construction of brood rearing areas, stabilizing the islands from erosion and planting woody cover. The Refuge hosts colonies of gulls which we believe depredate duck nests. To lessen avian depredations woody cover is being planted on the islands because observations of existing nests seem to be related to overhead woody cover.

The following woody cover has been planted on the islands:

1989 750 roses and western snowberry planted on island 135
1990 850 roses and western snowberry planted on island 136
1991 2245 total planted on 15 islands

4. Marsh and Water Birds

Audubon Refuge plays host to colonies of double-crested cormorants. The cormorants first occupied a group of cottonwood trees flooded by Lake Audubon. Then they slowly abandoned the trees and took up residence on the islands associated with gull colonies. Currently three islands are supporting the population.

Summary of double-crested cormorant activity

	1983	1984	1985	1986	1987	1988	1989	1990	1991
Population	450	311	459	510	500	530	150	255	355
# of nests	299	245	360	332	413	342	148	225	316

Sandhill cranes are visitors on the refuge during spring and fall. During the spring migration they normally pass straight through high overhead. During the fall migration they will stop and feed. Approximately 500 cranes stayed on the refuge from late September through the third week of October with a peak of 1000 birds the second week of October.

5. Shorebirds, Gulls, Terns, and Allied Species

Colonial bird activity has been closely monitored for the past several years with the following results:

	ACTIVE NESTS (NO. OF COLONIES)						
Species	1985	1986	1987	1988	1989	1990	1991
Ring-billed & California gull	515(2)	868(5)	892(5)	2397(5)	1287(5)	1187(3)	1561(5)
Common Terns	0	0	82(1)	37(1)	23(1)	73(1)	252(3)

Island habitats are ideal for other shorebirds. Marbled godwits, avocets, spotted sandpipers, Wilson phalaropes, and several other species are attracted to the beaches and seclusion the islands provide.

6. Raptors

Audubon Refuge does not have an organized raptor census but many species of hawks and owls may be seen during migrations in the fall and spring. Besides the bald eagle and peregrine falcon sightings mentioned in the endangered species section the following raptors can also be seen: short-eared owls, great horned owls, burrowing owls, merlins, kestrels, prairie falcons, gyrfalcon, northern harriers, swainson hawks, red-tail hawks, sharp-shinned hawks, broad-wing hawks, ferruginous hawks, coopers hawks, rough-legged hawks, golden eagles, turkey vultures, and others.

7. Other Migratory Birds

The following list includes miscellaneous or unusual sightings on or near the refuge. The list includes great egret, gyrfalcon, goshawk, mountain bluebird, eastern bluebird, merlin, horned grebe, osprey, rufous sided towhee, cinnamon teal, burrowing owl, American redstart, swainson thrush, golden plovers, ruddy turnstones, indigo bunting, and northern orioles. Most of these birds were seen during the spring months. During the fall months early snows and cold weather pushed out many species we would normally see migrating through. Instead resident populations of upland birds were concentrated by grain fields and avian raptors such as cooper's hawk, sharpshinned hawk, rough legged hawk, golden eagles, bald eagles, redtail hawks, peregrine falcons, gyrfalcon, and prairie falcons, all seemed to stay longer and feast on the easy pickings.

An incidental "First Observation Survey" was started in 1988 for Audubon and Lake Nettie Refuges for the spring migration. Also some birds were tallied on this list due to their proximity to the Refuges such as the McClusky Canal and associated Wildlife Development Areas.

Species	1988	1989	1990	1991
D.C. Cormorant	4/8	4/14	4/10	4/4
Short-eared owl	2/14	3/12	4/6	4/3
Northern harrier	2/27	3/26	3/20	3/18
Red-winged blackbird	3/5	3/26	3/17	3/20
Western Meadowlark	3/23	3/24	3/12	3/17
Kestrel	3/21	3/24	4/25	3/27
Red-tail hawk	3/24	3/29	3/21	3/25
Common merganser	1/2	3/25	3/6	3/13
Common goldeneye	3/24	3/10	3/8	2/28
Snow geese	3/15	3/28	3/13	3/19
Killdeer	3/24	3/26	3/30	3/25
Tundra Swan	4/7	4/12	4/2	3/28
B.C. Night Heron	4/21	4/22	4/25	5/1
Pied-billed Grebe	4/8	5/3	4/19	4/20
Great Blue Heron	4/7	4/13	4/16	4/2
White Pelican	4/12	4/2	4/20	4/5
Harris Sparrow	5/1	5/9	5/8	5/6
White-Throated Sparrow	5/1	4/25	4/26	4/30
Green-wing Teal	3/24	4/2	3/12	3/20
Blue-wing Teal	4/4	4/19	4/9	4/7
Gadwall	3/24	3/31	3/13	3/25
Western Grebe	4/21	5/3	5/11	5/7
Marbled Godwit	4/25	4/14	4/18	4/19
Upland Sandpiper	5/7	5/7	5/7	5/8
American Avocet	4/19	4/19	5/1	4/19
House Wren	4/5	5/13	5/15	5/10
Western Kingbird	5/9	5/10	5/10	5/9
Bobolink	5/11	5/14	5/16	5/9
Yellow-rumped Warbler	4/5	5/1	5/3	5/16
Northern Oriole	5/17	5/12	5/15	5/16
Eastern Kingbird	5/13	5/8	5/24	5/10
Purple Martin	4/14	4/28	5/8	5/25
Barn Swallow	4/29	4/27	4/22	4/27
Bufflehead	3/28	4/4	3/30	3/21
Eastern Bluebird	3/31	N/A	4/12	NA
Shoveler	NA	4/6	4/1	4/2
Ring-neck duck	NA	NA	3/17	3/20
Canvasback	NA	NA	3/31	3/25
Redhead Duck	NA	NA	3/17	3/20
Ruddy Duck	NA	4/27	5/7	5/2
American Coot	NA	NA	4/6	4/5
Wigeon	NA	NA	3/21	3/20
Yellow-headed Blackbird	NA	NA	4/11	4/3
Mallard	NA	NA	3/11	3/11
Woodduck	NA	NA	NA	3/21
White-front Goose	NA	NA	NA	3/25

(cont. from following page)

Pintail	NA	NA	NA	3/20
Lesser Scaup	NA	NA	NA	3/20
American Goldfinch	NA	NA	NA	4/24
Greater Yellowlegs	NA	NA	NA	3/28
Sandhill Crane	NA	NA	NA	4/1
Lark Bunting	NA	NA	NA	4/16

Refuge crew members Pete Smith, Craig Hultberg, and four other folks participated in the December 15, Garrison Dam Xmas Bird Count. A total of 42 species comprising 15,676 birds were recorded.

8. Game Mammals

Mammal populations are not formally surveyed. Whitetail deer peak population is estimated at 75 with production of 50. During the gun, bow, and black powder seasons the deer herd topped over 130 animals in one herd with approximately 35 deer elsewhere on the Refuge. With early snow the deer concentrated earlier and the hunters pushed the herds together.

9. Marine Mammals

Nothing to Report

10. Other Resident Wildlife

Sharp-tailed grouse dancing grounds are surveyed every year. The survey tells us not only what the population is doing, it also tells us if our upland grassland management is working. Grouse are believed to be an indicator of healthy grasslands.

Results of sharp-tailed dancing ground counts:

Grouse	1985	1986	1987	1988	1989	1990	1991
# dancing (# of grounds)	14(1)	9(1)	18(2)	37(3)	8(3)	5(1)*	20(3)
total present	14	28	53	53	31	8*	65

* 1990 data is incomplete due to various circumstances

The North Dakota Game and Fish Department's standard survey method for pheasant crow counts was instigated at Audubon during 1987. Results of ring-necked pheasant crow counts are:

Count	1987	1988	1989	1990	1991
1	3.3	7.3	7.1	6.7	7.8
2	4.3	7.0	5.9	5.7	11.0
3	2.7	7.7	4.1	10.1	13.0

We also do an "Upland Game Roadside Count" using North Dakota Game and Fish Department's standard survey method.

	1st Count				2nd Count				3rd Count			
	D	HP	SG	RNP	D	HP	SG	RNP	D	HP	SG	RNP
1987	23	-	-	8	-	-	-	-	17	-	3	-
1988	11	-	-	2	14	-	-	3	2	7	-	22
1989	25	-	-	9	45	-	-	63	47	18	-	7
1990	15	14	13	44	5	13	2	66	11	66	7	18
1991	44	36	2	62	67	45	-	154	63	46	-	105

D = Mourning Dove
HP = Grey Partridge
SG = Sharptail Grouse
RNP = Ring Neck Pheasant

Canada thistle Stem Weevils being released. This is our newest resident wildlife. Hopefully this species will multiply into a good bio control for C. Thistle. 5-16-91 JJ

11. Fishery Resources

The North Dakota Game and Fish Department monitors, stocks and otherwise manages the fishery in Lake Audubon. They coordinate activities occurring within the Refuge but do not coordinate activities which occur on the State managed portion of the Lake. Other than routine, minor testing netting, no fishery management work occurred on the Refuge this year. The Department maintains records on stocking and other work at their headquarters which are available upon request.

Carp continue to cause serious degradation of Lake Audubon. Future, planned Refuge development projects will include carp exclusion or winter-kill capabilities.

12. Wildlife Propagation and Stocking

As usual, Canada geese were trapped and transplanted by Refuge crews. Details are presented in the Marking and Banding section.

13. Surplus Animal Disposal: Nothing to report.

14. Scientific Collections

One prairie falcon was received injured from a citizen and transported for rehabilitation to the Dakota Zoo in Bismarck. It died and is in their freezer awaiting disposition in 1992.

15. Animal Control

Depredations:

Croplands around Lake Audubon have been waterfowl depredations hot spots for 15 years or more. One of Audubon Refuge's major goals, although not an original objective of the area, is to manage and reduce these troubles as much as possible.

Problems occur mostly in the spring as large broods and molting adult Canada geese walk into lakeside, green grain fields and feed. In drought years, clipping the plants may kill them and allow weed increases. In wet years, clipping often retards seed production such that the farmer's harvest is reduced or eliminated in grazed areas.

Depredations complaints this spring were less than usual because of refuge activities and because local farmers have come to understand that other than a listening ear and advice on techniques, we are out of the private lands depredations reduction business. They know that we'll provide them with the phone number of the APHIS office responsible for our area so they can call and request help. Only one local man has failed to understand that the primary responsibility for timely use of propane exploders, flagging and other techniques is the farmer's. This man made a number of contacts with APHIS and the Refuge. However, overall, spring goose depredations "heat" was less this year.

Again this year, the Refuge made special efforts to have green crops or new, green grass areas available for spring goose pastures. Several islands near shore were burned to provide early green feed but use was spotty and light. Short, grazed and hayed areas near shorelines as well as Refuge crop fields did provide significant goose grazing areas.

Fall depredations by ducks and Canada geese occur if wet conditions or other problems delay harvest. Since duck populations have been low and falls have been dry for the last five years, no fall problems or complaints have occurred. The Refuge has continued to work ahead of the problem by leaving crop shares standing at prime feeding areas. Also the established practice of dumping grain in lure fields was continued with 150 bushels of corn put out August 9 at two locations. Use was steady but low as up to 25 geese and 650 ducks fed at these sites. By Sept. 5, all the corn had been eaten.

Predator Management

In addition to many predator exclusion methods (constructed islands, electric fence barriers, elevated nesting structures, nesting bales set in shallow wetlands), direct predator trapping was conducted. As in the Annual Predator Management Plan, force account trapping, permittee trapping and contract trapping was done.

Fall-winter trapping was allowed Refuge-wide but low fur prices continued to make interest nearly zero. One man was found to trap the south two Refuge units; the north unit wasn't trapped for the second year in a row. Lake Nettie Refuge was again trapped by the same dedicated, hard working trapper but no one was interested in trapping McLean, Hiddenwood or the other easement refuges. All trappers made "bare bones" efforts due to little or no profits to be made so the harvest was down:

PREDATOR HARVEST
Special Use Permits - Fall & Winter Trapping Season
Oct. 1990 - Sept. 1991

Unit		Fox	Skunk	Raccoon	Mink	Coyote	Other
Audubon Unit 1, 2		16	4	11	5	0	
Unit 3 *		-	-	-	-	-	
Lake Nettie NWR		-	5	-	-	0	1 Dog (released)
Hiddenwood NWR *		-	-	-	-	-	
McLean NWR *		-	-	-	-	-	
Totals	90-91	16	9	11	5	0	
	89-90	28	15	18	14	0	
	88-89	51	40	58	26	0	
	87-88	49	95	58	2	1	

* No trapping occured this year

Spring control work consisted of a local, skilled trapper hired to remove all mammalian predators from the islands and three electric fence protected peninsulas. A ND Game and Fish Department permit was received authorizing this work. In mid March the trapper checked many of the islands and made some sets (mixtures of leg holds, snares, shooting or conibears, as conditions dictated) by driving his ATV across the ice. This extra, early work and the application of snares very significantly improved his catch. After ice out, he used the Refuge boat to check all islands for predators and trapped those present. (Just by observing the lack of Canada goose nesting one can detect the presence of a fox.) It appears that all islands were cleared of fox, raccoon and skunks this year, probably a first.

After the islands, the trapper checked the three electric fence areas and cleared them of mammalian predators. But again this year there were problems. A gate became open and predators may have accessed the SW Peninsula. A raccoon apparently swam around the DU 28 electric fence, predated at least one duck nest and required two weeks of trapping to catch. Again at DU 28, a fox was observed in the area in June and wasn't caught.

CONTRACT TRAPPER PREDATOR HARVEST: ISLANDS AND PENINSULAS
Audubon's Islands and Three Peninsulas
Contract Trapper - March 12 - May 18

Location	Fox	Skunk	Raccoon	Mink	Coyote	Other
North Peninsula DU-28	4	3	1	1	0	
SE Peninsula	2	1	0	0	0	
SW Peninsula	1	0	1	0	0	
Pancake Island	2	1	1	0	0	
Far East Island	1	1	1	0	0	
Boundary Island	2	7	1	0	0	1 house
Big Island	3	1	1	0		cat
1991 Totals	15	14	6	1	0	
1990 Totals	34	13	11	0	0	

Refuge personnel also ran leg hold and connibear box traps at the electric fences. This catch is as below:

FORCE ACCOUNT PREDATOR HARVEST: ISLANDS AND PENINSULAS

Location	Fox	Skunk	Raccoon	Mink	Coyote	Other
Elec. Fence #1 (Aud)	0	1	0	0	0	0
Elec. Fence #2 "	0	3	2	0	0	0
Elec. Fence #3 "	0	4	3	0	0	0
Elec. Fence #4 "	0	4	1	0	0	0
Elec. Fence #5 "	0	4	1	0	0	1 deer (released)
Audubon Islands	0	0	0	0	0	0
1991 Totals	0	16	7	0	0	
1990 Totals	7	7	3	0	0	

Duck and goose production from the nesting islands and electric fence peninsulas due to this predator control work was excellent. Nest dragging on the T04 Peninsula found a 55% apparent nest success and T05 Peninsula had 68%. (The third peninsula was not dragged due to lack of time.) For more details, please see Section G.3.

16. Marking and Banding

Refuge personnel captured 303 Canada Geese. Of this total 15 birds were released due to bands already present, 3 had bands replaced, 1 died during transplanting, 6 were banded and released at banding site, and 278 birds were banded and transplanted to 10 sites across North Dakota. Due to our efforts in working with sportsmen clubs goose release sites are so abundant we cannot keep up with the demand. Our transplanting program is met with local public approval as a way to reduce goose numbers on Lake Audubon to reduce local crop depredations.

Listed below are the 10 release sites:

Release Site	Adults	Juveniles		Total
		Male	Female	
Lake Ardoch (Pierce Cty)	3	13	12	28
Kelly's Slough (Grand Forks Cty)	2	11	10	23
Florence L. NWR (Burleigh Cty)	8	11	8	27
Sully's Hill NWR (Ramsey Cty)			2	2
Alkali Lake (Pierce Cty)	5	9	13	27
Levi Patzner (Kidder Cty)		9	8	17
Alymer Lake (Pierce Cty)	17	22	15	54
Wolf Lake (Sheridan Cty)	5	11	15	31
Frankhauser L. (Sheridan Cty)	5	12	20	37
Antelope L. (Pierce Cty)	4	16	12	32
	49	114	115	278

A number of neck collared Canada geese were observed passing through the area during the fall migration and the information was reported. Also we had 1 Canada goose band return, 1 snow goose band return, and 1 gadwall band return by hunters which we forwarded to the Banding Laboratory.

With the help of the North Dakota Game and Fish Department we can take geese out by the load. These geese were transported into the Anamoose Sportsmen Club area where the club has provided good sites, structures, and protection, to enhance the giant Canada Goose Restoration Project. 6-27-91 CH

Antelope Lake release site in the Anamoose Sportsmen Club area. This is the third and final year geese will be placed. Already we are getting natural production in the area.

H. PUBLIC USE

1. General

Public use of Audubon NWR consists primarily of ice fishing, firearm deer hunting, auto tour route drives and, lastly, organized tours. Total public use was down this year as walleye fishing was slow nearly all winter and fewer than usual numbers of deer hunters elected to visit. Tour route drivers and organized group visits stayed steady.

The whole story of public involvement and use is no longer just on-Refuge activities. Audubon very actively reached out to sportsmen's clubs, civic clubs and school groups to promote wildlife and land management for the critters. All managers were assigned to and did write a variety of news releases. They gave radio interviews and sometimes stepped in front of the camera to do TV interviews. A total of 43 articles or interviews were done this year and 30 sportsmen or other outdoors types meetings were attended.

During the winter a revised and improved Public Use Plan was written for Audubon and Nettie Refuges. It was approved this spring; now for the staff time and funds to implement the many opportunities available.

ESTIMATED PUBLIC USE-AUDUBON NWR

Output Category	1988 Visits	1988 AH	1989 Visits	1989 AH	1990 Visits	1990 AH	1991 Visits	1991 AH
Interpretation	2,000	2,000	2,000	2,500	1,600	1,600	1,500	1,500
Hunting, Deer gun	250	750	350	1,050	300	1,200	250	1,000
Hunting, Deer bow	60	100	30	90	20	60	15	45
Trapping	215	260	60	180	20	80	20	80
Fishing warmwater (ice)	2,800	11,000	2,500	10,000	2,400	9,600	2,000	8,000
Wildlife Observation								
Foot	120	120	200	200	200	200	50	50
Vehicle	1,000	600	1,200	1,200	1,000	750	1,000	750
Photography	160	160	200	100	150	160	50	50

2. Outdoor Classrooms - Students/Teachers

Reaching out to, instructing and educating students and teachers builds the future for wildlife. It is judged to be of highest priority at Audubon. Unfortunately, it is very time consuming and other job demands require that only about 50% of the need is addressed.

Craig Hultberg continued as the lead man for Projects WET and WILD environmental education activities. He spent two days in Minot assisting with one workshop and taught two additional WET and WILD sessions in other towns. He and Jackie Jacobson also held a day session at the Refuge on aquatics for 27 teachers as a Project WET session.

Pete Smith and Craig designed a program and recruited a Garrison high school girl to work on a long term science fair project involving biological control of weeds. She assembled and studied information and worked with Craig on Canada thistle control via stem weevils, by mowing, cultivation and by spraying. Plans are for her to continue in 1992; a very worthy learning experience.

Craig also taught a wildlife class at the regional 4-H Camp in Washburn again this year. Again as in past years, Dave Potter spoke on wildlife habitat to six bus loads of students during the South McLean SCD 7th Grader's Conservation Tour. Craig and Terry Kostinec did the same for two bus loads of students for the West McLean Conservation Tour.

3. Interpretive Trails/Exhibits

Audubon's 8 mile long auto tour route winds along the shoreline of Lake Audubon starting from an interpretive kiosk near Refuge headquarters. The route has two interpretive signs and eight marker signs keyed to an interpretive pamphlet available at the kiosk. Many people make the drive, especially in the spring on weekend evenings. An estimated 1,000 vehicles made the drive, same as 1990.

4. Hunting

As usual, Audubon opened for gun white-tailed deer hunting under NDGF Department permits for 20 buck and 30 does. Opening at noon, the season ran from November 8-24, 1991 with 20 buck and 14 doe permits actually issued. Apparently there was a lack of demand for the doe permits.

A blizzard limited turnout for the opener and use continued low all season. All permit holders are requested to report their kills but rarely is a report received and only one came in this year. Based on incidental observations during patrols, an estimated 8 male and 8 female or fawn deer were taken compared to 18 last year. Total hunter visits were estimated at 250 compared to 300 last year.

After the gun hunt, Audubon opened to a late archery and muzzleloader hunt. Again, use was very low this year with an estimated 15 visits and 3 deer taken.

Waterfowl hunting is not permitted on the Refuge but the zigzag boundary provides many miles of frontage and excellent private lands goose hunting. Pursuing the Giant Canada Goose is very popular and hundreds hunt geese in the area every weekend. Most private lands are posted closed or leased but some land is available for free-lance hunters. Many people hunt from dug-in shooting blinds while others lay out in large decoy spreads, both with high quality results. Unfortunately, some areas feature fence line "sky busting" hunters which bag geese but cripple more, especially when illegal, over-the-boundary-line shooting occurs.

5. Fishing

All creel surveys and other fishing management work is conducted by the NDGF Department. Specific fishermen information is on file in their Riverdale office.

Audubon is open only to ice fishing. This year anglers experienced spotty but generally slow fishing success. One short spell in early December saw good catches of small, 1-2 pound walleyes. But generally, fishing use was down this year to an estimated 2,000 visits compared to 2,400 last year.

6. Trapping:

Audubon has no recreational trapping; please see Section G.15 for management trapping information.

7. Wildlife Observation

The auto tour route provides nearly all wildlife observation use of the Refuge. Many local people enjoy the views, especially on a calm, quiet spring evening on weekends. Additional visits occur as travelers on US Highway 83 stop in to see what "The Audubon Society" has here. Estimated use for 1991 was 1,000 visitors, the same as last year.

Very few people walk, hike or do wildlife photography on Audubon. As in the new Public Use Plan, there are many opportunities to improve and enhance these opportunities. When funding is achieved, these improvements will be pursued.

8. Law Enforcement

Fishing and hunting use decreased this year, especially hunting not immediately adjacent to the Refuge fence. Also, the number of problems or violations showing up was down. Because of this, the hours invested in patrolling by Refuge Officers was scaled back and the man-hours used on higher priority work.

Beyond the usual number of warnings, especially to juveniles, only 3 citations were written this year compared to 11 last year:

Violation	Officer	Cases	Fine
hunt (pheasants) in closed area (Lake Nettie NWR)	Hultberg	2	$100 each
shoot antlered deer with antlerless permit (Audubon NWR)	Hultberg	1	$ 75
hunt (pheasants) with unplugged gun and no license in possession (next to Coal Coulee WDA)	Potter	1	unknown-State

Craig Hultberg had a Refuge deer hunter tell him he'd accidentally shot a 4X5 buck when he only had an antlerless permit. Craig issued the standard $100 citation, the hunter appeared and the judge reduced the fine to $75-no problem for us.

Dave Potter assembled paperwork and travelled to Bismarck to appear on a $35 trespass case from 1990. (They'd had trouble getting the man to respond.) The man plead "not guilty" saying his moral obligation to attempt to retrieve game was superior to his obligation not to go into the closed area. He, his son and dog were over one hundred yards into the closed area looking for a goose which had sailed out there somewhere from over an adjacent hill. The man was found guilty. The Court agreed with the Government's recommendation that the $35 bail not be increased.

9. Other Public Use: Nothing to report.

I. EQUIPMENT AND FACILITIES

1. New Construction

A big change occurred this year when the west and southwest sides of the office were built onto to provide an entrance foyer, large conference room, a visitor reception-interpretive area, three offices, a storage room and public handicapped restrooms. The previous two-room office was built about 1958 and had been expanded over the years into two adjoining garage stalls. The results were a cramped, uncoordinated series of rooms. Also, the office was upgraded by installation of a sheet rock partition wall between the office and garage sections. The existing office propane furnace was fitted with a gas leak sensor and alarm.

Built in 1958 and twice expanded, the old office was jam packed by the current crew. It also lacked public restrooms, interpretive and conference areas. 91-5-28 DGP

By the end of December, the headquarters expansion was nearly complete and provided much needed office and public use space. In the "before" photo, the lawn area was pretty much what became new office space. MG

The building was budgeted at $175K, bid at $119K and work change orders put it at about $125K. An excellent contractor from Minot began in September and by year's end was 99% finished, under a completion deadline of mid February 1992. Needless to say, everyone was very pleased by the fast, quality work and by the bright, new, additional working space.

Various construction (and rehabilitation) projects were accomplished by contract or force account on WPAs, WDAs and Ilo Refuge. Please refer, respectively, to the Audubon Wetland Management District Narrative Report, the Audubon Garrison WMD Report or the Ilo Refuge Narrative Report.

2. Rehabilitation

As a start on studies to determine the most cost effective and environmentally acceptable means of stopping erosion on selected nesting islands, the Bureau of Reclamation contracted for experimental treatments on two islands this winter. One island on the State managed side of the Lake received steel wire (gabion) baskets filled with rock to form breakwaters out front of the shoreline. After one year, some good soil accretion was noted behind the baskets (which unfortunately was flushed out by the required, atypical, rapid draw-down of the Lake this winter.) Interestingly, the end of one gabion basket was pushed in six feet by, its assumed, wind driven slush ice remaining when the Lake was pumped up this spring.

The second experimentally treated island was on the Refuge and received an armoring band of riprap placed on fill material (required by the vertical slopes) and over a filter fabric layer. So far, this treatment has held up well.

Contractors crossed the ice with heavy equipment and placed riprap on Island 55 to protect it from further erosion. To deal with the island's vertical banks, fill dirt was hauled in, sloped and packed. 91-1-22 DGP

At the end of the year, Bureau contractors were stockpiling large rock for placement in February 1992 on six other Refuge islands to receive various different experimental treatments. Two State side islands will also be treated so a total of 10 islands will be under study when these 8 islands are completed. Three to five years of monitoring will be conducted before large scale island protection begins based on success and failures from these 10 prototype islands.

Bureau contractors have also been surveying, soil sampling and performing other studies as to best locations and designs for mitigation measures to be built on the Refuge. These measures will be to replace habitat destroyed when Lake Audubon was raised 13 feet in 1975 for the Garrison Diversion Irrigation Project. Construction may start in early 1993 on several dikes and pump stations to separate bays from the Lake and convert them to waterfowl brood marshes as a means of replacing marsh acreage destroyed in 1975. Mitigation for upland and island habitat losses was in early planning stages also.

3. Major Maintenance

Again this year, Duane and Brian and their various assistants did an excellent job of servicing and repairing vehicles, outboard motors, boats, mowers, ATVs and other equipment such that there were no disruptions in field work. No major repairs were required. The ancient, 35 year old D-7 dozer was fixed up, went to the Rovig WPA and worked it's heart out. We surely hope 1992 will see a replacement unit ordered!

4. Equipment Utilization and Replacement

As additions to our fleet, two Chevy S-10s arrived. The 4X4 went to Mike Goos, the Wetland District Manager, and the 4X2 to Don at Ilo Refuge.

Other equipment was purchased as below. Fire funding paid for many of these items.

- Dell 386 computer
- Fujitsu color printer
- Hewlett Packard Laser Printer
- 25 h.p. outboard motor
- outlet hose for 16" pump
- Floating pump
- Vehicle winch (Ilo)
- electric shop winch system (Ilo)
- 500 gal. water tank & trailer
- floating pump (Ilo)

5. Communications

An enforcement radio and one Refuge frequency radio were purchased. Now all four Refuge Officers have law enforcement radios and all trucks have Refuge radios. Because of the office expansion, 3 new Merlin BIS-10 phones, one multi-functional receptionist's phone and a fancy (expensive) switch device were purchased and installed. The Regional Office purchased Audubon a FAX machine and Audubon purchased one for Ilo Refuge.

6. Energy Conservation

By converting one of the big trucks to a diesel model and using mostly compact pickups, our fleet miles-per-gallon average continued to increase. However, total gallons of gasoline used was high again this year reflecting the increased driving required in private lands work. Diesel use was also up due to major wetland creations and building debris burial on several WPAs plus extra wetland pumping required by the drought. Heating (electricity) fuel was up because of the new office construction heaters being run for heat, to dry drywall and cure cement.

Energy Type	1991	1990	1989	1988	1987
Electricity (kwh)	24,724	27,975	20,414	22,632	50,187
Heating Fuel (Gal)	-	-	329	228	241
Diesel Fuel (Gal)	1,505	991	1,173	590	568
Gasoline	7,527	10,125	6,157	6,313	5,671
Propane (Gal)	3,160	3,745	2,100	-	-

7. Other Nothing to report

J. OTHER ITEMS

1. Cooperative Programs

Nothing to report other than that managing Audubon is a real cooperative deal involving the Corps of Engineers, Game and Fish Department, local cabin owners, neighboring farmers and the Bureau of Reclamation!

2. Other Economic Uses

Nothing to report.

3. Items of Interest

It's all in the text.

4. Credits

Dave: sections A-E and I-K. Jim: Easement Refuges, Nettie NWR and Garrison Wetland Management District reports, under separate cover. Pete: F 1-3, 6, 10-13, G 11-15, H 1-9. Mike Grabow: F 8. Mike Goos: Wetland Management District report under separate cover. Craig: remainder of the Audubon NWR report. Don: Ilo NWR and the three Satellite NWR's report, under separate cover.

. . . And, we all thank Marilyn for final typing, photos, assembling and all the other essential administrative support for all efforts.

K. FEEDBACK

No complaints. There was too much progress made on too many fronts to focus on a few glitches or missed opportunities. Seemed like there were darn few of them anyway!

The one RO office I mentioned in last year's feedback, CGS, changed when Brian Ostenson entered on duty. Brian gave us darn good help this year and won the North Dakota Project Leader's and a Regionl Office Award as a result. Many others in RO support offices were there when needed. Such as Engineering (Mark Cornyn, Ken Fox) and CGS (Margie Rosenquist) who worked long and hard on details of our office expansion. Water Rights Specialist Cheryl Williss helped us sort out various water permit processes and Management Analyst Max Peace bailed us out many times! Our Thanks!!

A major blessing was that we experienced no permanent and only two temporary crew member transfers. Everyone was well experienced and highly motivated to get quality jobs done. Their many accomplishments on Refuges, WPAs, WDAs and private lands are chronicled in three separate 1991 narrative reports. And to top it off, not one accident this year. We are pleased with a number of very positive personnel actions and the possibilities of more in 1992. A truly fine year by a great group of people. Bring on 1992!

LAKE NETTIE NATIONAL WILDLIFE REFUGE

Turtle Lake, North Dakota

ANNUAL NARRATIVE REPORT

Calendar Year 1991

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM
Audubon NWR Complex

INTRODUCTION

Lake Nettie NWR was originally established in 1935 as an easement refuge in response to the severe drought of that period. The easement provided for wetland protection, the right to flood, maintain and manage Lake Nettie proper for waterfowl and other wildlife, and prohibited hunting or otherwise taking wildlife. The original easement covers 1,799.4 acres. In 1962 the Migratory Bird Conservation Commission (MBCC) approved acquisition of 3,300 acres at Lake Nettie, excluding 448 acres within the meander line of Lake Nettie itself. Since 1962; 2,421 acres have been purchased within the MBCC approved boundary. There are 632 acres still under easement within the original 1935 easement boundary.

Lake Nettie NWR is located in west central North Dakota approximately six miles northwest of Turtle Lake and five miles east of Lake Audubon. Physiographically, Lake Nettie is within the Missouri Coteau which resulted from glaciation occurring 10,000 years ago. The topography is relatively flat with gently rolling hills. Elevations range from a low of 1837 m.s.l. at Lake Nettie to a high of 1870 m.s.l. in Section 16. Table 1 shows the habitat acres by type.

Habitat Inventory, Lake Nettie NWR

Habitat Type	Fee Title Acres	Fee Title %	Easement Acres
*emergent, wetland, temporarily flooded fresh (Type I)	21.9	0.91	3.4
Emergent wetland saturated fresh (Type II)	564.2	23.30	0
Emergent wetland, semipermanently flooded, fresh (Type III)	46.0	1.90	16.4
Emergent wetland, permanently flooded, fresh (Type V)	331.1	13.67	39.4
Aquatic bed, permanently flooded, fresh (Type V)	298.4	12.33	448.0
Mixed shrub/tree swamp, fresh (Type VI & VII)	7.0	0.29	0
Stream, intermittent, emergent wetland	16.4	0.68	0
TOTAL Wetland Acres	1,285.0	53.08	507.1
Native grassland	563.1	23.26	5.2
Planted dense nesting cover	360.6	14.90	0
Tame grassland (seeded/go-back)	113.0	4.67	2.6
Cropland	85.0	3.51	117.1
Trees	5.0	0.21	0.3
Brush	2.6	0.11	0
Road/trails	6.4	0.26	0
TOTAL Upland Acres	1,135.7	46.92	125.2
TOTAL Refuge habitat Acres	2,420.7	100.00	632.3

* Wetland classification from "Classification of Wetlands and Deepwater Habitats of the United States", Cowardin, et.al FWS/OBS-79/31.1979.

INTRODUCTION

TABLE OF CONTENTS

A. HIGHLIGHTS

- Canada goose production ties all time record high on Nettie Refuge this year.
- Two whooping cranes were sighted on the refuge in October.
- Piping plover pair again returned to Lake Nettie to nest.

B. CLIMATIC CONDITIONS

See Audubon NWR Narrative Report.

C. LAND ACQUISITION

Nothing to Report.

E. ADMINISTRATION

See Audubon NWR Narrative Report.

F. HABITAT MANAGEMENT

1. Wetlands

During 1991 the water levels at Lake Nettie and Mud Lake remained low. There was virtually no spring run-off this year. Water levels did not vary much between spring and fall. In April the water level on Lake Nettie was 1837.29 msl. and by October 1837.39 msl. Mud Lake began the year at 1836.87 msl and then decreased to 1836.83 msl by freeze-up. In the early 1980's high water in this area was the source of much controversy. Now Lake Nettie has dropped enough that the island is a peninsula and Mud Lake is mostly dry.

For the second year Audubon had to erect a predator fence on a narrow peninsula to separate an island from the mainland on Lake Nettie because of low water. However, one smart raccoon swam the ends and predated at least two goose nests before a major, emergency trapping effort by Mike Grabow caught him. No other predation was observed.

There were 32 Canada goose nests, six mallard nests, five redhead nests, four scaup nests, two gadwall nests, two pintail nests, one marbled godwit nest and one piping plover nest located. The island was searched twice, once on May 18 and again on June 18, 1991.

Water gauge readings (m.s.l.) on Lake Nettie and Mud Lake, Lake Nettie NWR.

Month	Lake Nettie	Mud Lake
April	1837.29	1836.87
May	1837.77	1837.33
June	1837.91	1837.31
July	1837.99	1837.73
August	1837.61	1837.15
September	1837.49	1836.95
October	1837.39	1836.83

2. Grasslands

Grassland conditions improved over 1990 due to some timely spring and summer rains. There was no seeding of tame grass or DNC done on Lake Nettie this year.

3. Cropland

As part of our Canada goose depredation program, 27.0 acres were planted to wheat by cooperator V. Edinger. Twenty-five percent of the crop was also left standing as a winter food plot. Fifty-seven acres were fallowed this year with an oat cover crop.

4. Grazing

Three short duration grazing systems were utilized on Lake Nettie NWR during 1991. The following table summarizes the grazing information.

Cooperator	Acres	AUM's	Dates	Payment/ Credit	Objectives	Results
A. Klain	5.0	55.0	9/6-9/26	Fence Cons/ Cash	Wetland litter removal/Grass-land Management	Good
L. Forland	100.0	37.0	6/16-7/27	Fence Cons/ Cash	Wetland litter removal/Grass-land Management	Good
B. Fylling	337.0	156.0	5/27-10/19	Fence Cons/ Cash	Wetland litter removal/Grass-land Management	Good

5. Haying

No haying occurred on Lake Nettie NWR during 1991.

G. WILDLIFE

1. Endangered Species

Refuge staff reported a pair of piping plovers near the electric predator fence twice during the month of May. On June 18, a piping plover nest was located (four eggs) just inside the predator fence. The nest was later determined to have been successful.

Two whooping cranes were sighted on the Refuge on October 15. Although follow-up visits were made, the birds were only confirmed using the refuge for one day. Two immature bald eagles were also sighted on the Refuge on October 26.

2. Waterfowl

Estimated duck production on Nettie Refuge made a come-back from 1990. Low water levels concentrated nesting waterfowl on the refuge. The refuge is also a coyote dominated area which has improved nesting success and, ultimately, recruitment compared to fox areas.

	1986	1987	1988	1989	1990	1991
Mallard	53	18	34	97	13	59
Gadwall	38	118	4	115	82	325
Wigeon	28	6	4	18	1	33
B-winged teal	53	44	58	284	17	135
Shoveler	50	10	15	80	40	43
Pintail	48	12	12	80	7	19
Redhead	25	198	20	80	1	6
Canvasback	18	4	14	18	0	0
L. scaup	392	227	140	44	40	65
Ruddy	40	12	12	44	3	30
Wood duck	-	-	3	3	-	-
Totals	745	649	316	863	204	715

In 1986 Ducks Unlimited built 18 nesting islands in Mud Lake. As part of the agreement, annual production surveys are conducted. Mud Lake was dry during spring 1991 so no survey was necessary. Below is a summary of waterfowl success on artificial islands.

	1987	1988	1989	1990	1991
Total Duck Nests	20	33	7	-	-
Total Goose Nests	4	7	2	-	-
Hatched Duck Nests	37%	61%	12%	-	-
Hatched Goose Nests	100%	71%	*	-	-

*Undetermined
-wetland dry

Canada goose production this year tied the highest recorded level over the last nine years. Thirty-two goose nests were recorded on the one island in Lake Nettie. The following table shows known nests on the refuge.

	STRUCTURES		ISLANDS (artificial and natural)		
Year	Total No.	No. Used	No. Nests	Total Nests	Est. Production
1983	8	7	6	15	66
1984	15	7	3	10	31
1985	13	9	5	14	42
1986	15	5	16	21	69
1987	12	4	14	26	96
1988	11	5	17	28	84
1989	13	4	33	37	142
1990	13	2	28	30	120
1991	13	4	32	36	142

Fall migration peaked in mid-October with nearly 4000 Canada geese, 125 snow geese and 3000 other duck species.

3. Marsh and Water Birds

Eared grebes and black-crowned night herons are our two most prominent colonial nesters. Although usually abundant in number it can be difficult to locate the nesting colony. In 1991 due to low water and the resulting lack of emergent nesting habitat, no herons were observed nesting. There were 95 eared grebes observed nesting on the refuge.

Nesting Colony Survey

Species	1986	1987	1988	1989	1990	1991
Eared grebe	350	3	614	0	39	95
Black-crowned Night-heron	0	160	88	0	0	0

Sandhill cranes are commonly seen during migration. The first cranes observed on Nettie last fall were 75 on September 19. Numbers peaked on the refuge during mid-October at approximately 1,000 cranes.

4. Shorebirds, Gulls, Terns and Allied Species

Common terns, Forster's terns, black terns and western grebes have all been documented as nesters on the refuge. No formal survey was conducted but little nesting activity occurred by these species on the refuge in 1991.

5. Game Mammals

Very few deer were seen during spring and summer activities and little hunting pressure occurred in November. There were two deer harvested with an estimated 25 people hunting the refuge. Twenty deer are estimated to have wintered on the Refuge in 91-92.

6. Other Resident Wildlife

Two new sharptail grouse dancing grounds were discovered on the refuge this year bringing the total up to four. Counts were conducted in 1991 with the following results.

	1986	1987	1988	1989	1990	1991
Dancing males	12	22	35	25	28	43
Total	14	30	53	45	34	102

7. Animal Control

Trapping has been done on the Mud Lake DU islands, Lake Nettie island and the surrounding uplands to increase waterfowl production. Spring trapping is done force account and fall/winter trapping is done by a permittee trapper. The permittee trapper is encouraged to remove all predators, not just the valuable species.

Permittee Trapping.

	Fox	Skunk	Raccoon
3/1/89-4/12/89	0	5	10
11/6/89-12/20/89	1	2	1
11/90 - 12/90	0	5	0
1/91 - 3/91	0	8	0

Force account trapping was done on the Lake Nettie island but not on the Mud Lake islands because of low water. Box traps (220 conibear) were set and baited with fish. Four traps were set on the Lake Nettie island and checked approximately every 7 days. Animals taken included the following:

Force account island trapping.

	Skunk	Raccoon
4/89-7/89	1	16
4/90-6/90	10	6
5/91-7/91	1	1

8. Disease Prevention and Control

In 1991 the refuge was checked for botulism because of the 1987 outbreak. To our relief no outbreak occurred this year.

H. PUBLIC USE

The only public use on the refuge is deer hunting. Firearm and bow hunting are permitted and an estimated 25 hunters visited the refuge during both seasons. Two deer were taken during the firearms season and no deer were known to have been taken during the archery season.

I. EQUIPMENT AND FACILITIES

1. Other

Nothing to report.