DeSoto National Wildlife Refuge
Annual Narrative Report

Missouri Valley, Iowa
Fiscal Year 1999

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Introduction

DeSoto National Wildlife Refuge is found south of US Highway 30 midway between the farming communities of Blair, Nebraska and Missouri Valley, Iowa. The refuge is situated astride the Missouri River, 20 miles north of Omaha, Nebraska. It lies in Harrison and Pottawattamie Counties, Iowa and Washington County, Nebraska.

The U.S. Fish and Wildlife Service established the refuge in 1958 to preserve habitats for migratory waterfowl. The Migratory Bird Conservation Act and Migratory Bird Stamp Act authorized acquisition. It serves as a seasonal resting area for up to one-half-million waterfowl, primarily lesser snow geese and mallards.

This 7,823-acre refuge lies in the wide, fertile plain of the Missouri River Valley on former river meanders. Cottonwood bottom lands characterize portions of the refuge. Approximately 2,000 acres are biologically managed as croplands and cool- and warm-season native grasses have been reestablished on more than 1,500 acres to provide additional biological diversity.

The focal point for both man and wildlife is a former oxbow of the Missouri river - the 788-acre DeSoto Lake. Recreational demand for its use has remained high since refuge establishment in 1958. The refuge provided active recreation throughout its early history, including fishing, picnicking, boating, waterskiing and swimming. Approximately 16-million-dollars worth of facilities accommodated public demand of 500,000 visitors annually. In the 1980s, management emphasis was redirected toward a more balanced program between man and wildlife, emphasizing wildlife-dependent recreation.

The 1968 excavation of the steamboat *Bertrand*, which sank in 1865 on what is now the refuge, adds a major historical emphasis to the refuge program. The 200,000 artifacts in the Bertrand Collection provide a most significant assemblage of Civil War-era artifacts; a time capsule of regional and national historical significance.

In 1981, the DeSoto Visitor Center was opened. The visitor center is the permanent home of the Bertrand Collection. The five-million-dollar, 26,000-square-foot building contains exhibits interpreting the importance of the *Bertrand* and the historical development and ecological change that occurred within the Missouri River Basin. Besides environmentally-controlled artifact storage and museum exhibit areas, the building houses a laboratory for artifact treatment, a collection records area, and reference library.

The Visitor Center also provides exhibits depicting the natural history of the area and its wildlife. Viewing galleries overlooking DeSoto Lake provide excellent opportunities to observe waterfowl and bald eagles during the spring and fall migration periods. A variety of audiovisual equipment provides effective interpretation to an average of 160,000 visitors who pass through the center each year.

Monitoring and Studies

1a Surveys and Censuses

Wildlife - The fall migration began with the arrival of 275 white pelicans in mid October. Duck numbers climbed slowly throughout October and November, reaching a peak of 50,000 on December 2. The snow geese began arriving in early November, building to 150,000 on the refuge by November 12. Snow geese numbers peaked on December 2, with 630,000 geese. The weather held throughout most of December, more than 200,000 geese could still be seen by Christmas. Duck use days were 1,595,583, below the five-year average of 3,683,736. Snow goose use days totaled 18,358,569, above the five-year average of 11,029,546. Total waterfowl use days was 19,954,152. As in the past, the snow geese migrated back north through the area in late February and early March.

Snow geese are one of the most important tourist attractions in the Omaha, NE metro area. Second only to the Henry Doorly Zoo.

The Audubon Society held the annual Christmas Bird Count on January 2. The weather was foul and only eight volunteers participated. However, counted 66 species were recorded. This was the 20th consecutive count for DeSoto. In an effort to also cover Boyer Chute Refuge, they will move the count circle south to include both refuges starting next year. They held the annual Spring Bird Count on May 1, observing a total of 85 species.

An aerial deer count was done on February 24. A total of 295 white-tailed deer were counted.

This last year was notable for rare and unusual bird sightings:

- Twenty-five Sandhill cranes were observed on the refuge on November 11. Also, local birders reported sighting cranes throughout the area. The day before, a tremendous wind storm came through the area and had literally blown the cranes east from their traditional migration routes.

- On November 18, four tundra swan cygnets were observed on the refuge. Then, on December 2, two more were sighted.

- Bald eagles returned to the refuge in early February with numbers ranging from 30 to 50 during the month. In early March, 145 were counted, setting a record for the refuge.

- The morning of April 9 brought one of the most unusual sights to DeSoto. A local farmer called inquiring about the identification of six large white birds in one of his crop fields. They were whooping cranes. The birds fed, danced, and rested in the center of a very large agricultural field for three days. During this same time two adults and one young were observed in Page County, IA. This was 5 percent of the world's whooping crane population. Quite amazing and a great show for the local public.

Fishery - The annual formal fish survey was conducted from May 18 through 20. Electro-shocking, netting, and scale sampling was conducted by the Columbia Fishery Resource Project Leader Jim Milligan, his biological technician, and DeSoto staff. Weather conditions and only one boat limited the extent of sampling and thus the quality of the data. However, with this information and the informal creel surveys conducted each year, we have a good idea of the fishery resource.

Crappie, both white and black, are abundant in most age classes, with some 10"-12" in length. The flooding conditions of the last four to five years and artificial structures (trees and pallets) have all benefitted the growth rate of these highly prized fish. Largemouth bass numbers are still out of balance and the numbers of 15"+ legal fish is not what refuge staff or most anglers want. However, the last two years of formal surveys suggested the largemouth bass fishery may be improving. The surveys suggest some two-year age class bass are surviving the winter.

Both channel and flathead catfish numbers and weights have increased over the last several years based upon informal creel surveys. Bluegill/Green Sunfish continue to be prevalent, but small. Carp and buffalofish are abundant, with the carp running much smaller in weight than the buffalofish. Northern pike are still found infrequently throughout the lake. White bass are occasionally observed in creel surveys and in commercial fishing nets.

Finally, the rough fish population continues to increase and threaten the overall quality of DeSoto Lake's sport fishery. Gizzard shad numbers continue to dominate the lake's biomass, and some are large enough that several have been caught in commercial fishing nets. Winter kill, due to low dissolved oxygen and water levels, may have contributed to the loss of 100+ carp in Bullhead Pond on February 10.

Some of the most note worthy events were:

- During most of February, common mergansers were observed herding thousands of gizzard shad along the shoreline near the Visitor Center viewing gallery and feeding heavily upon the schooled mass.

- Commercial fisherman Jesse James on May 12 netted a 65-pound paddlefish. This may be one of the original paddlefish stocked as fry in the lake after renovation in 1985.

- A massive rainfall event on August 12 in west central Iowa and east-central Nebraska producing local accumulations as much as 10-12" in less than 12 hours, caused wide spread flooding. DeSoto Lake level rose approximately 6 feet above normal operating level of 994.5 feet msl within seven days.

This 65 lb. paddlefish is now mounted and displayed at the refuge Visitor Center.

Geographic Information System - The refuge biologist began digitally mapping the refuge this year. Downloaded GPS data and on-screen digitizing using U.S. Geological Survey digital orthophoto quarter quadrangles as base maps. To date, basic vegetation covers, some aquatic and wildlife resources, facilities, utilities, roads and prescribed burn units have been mapped and attributed. The University of Minnesota was contracted to finish basic mapping of the refuge in preparation for Comprehensive Conservation Planning process.

1b Studies and Investigations

Comparative Responses of Avian Communities to Prescribed Burning and Mowing in Tallgrass Prairie Habitat Fragments at DeSoto NWR, IA. Fred Van Dyke and Sarah Bowdish, Northwestern College, Orange City, IA.

Recent losses and fragmentation of tallgrass prairie habitat to agriculture and urban development have led to corresponding declines in species of plants and birds associated with such communities. Mowing and burning are alternative management strategies for conserving and rejuvenating prairies. We compared responses of plant and bird communities on four mowed sites, four burned sites, and four untreated sites on tallgrass prairies from May-July 1998 and 1999. Mowed sites had less total plant coverage (36.2%) than burned sites (73.8%) or untreated sites (68.6%), but only 1 species of plant, *Sorghastrum nutans*, differed in abundance between treatments. The diversity of communities of plants and birds was independent of treatment. Forty-six percent of site-specific variation in plant diversity was explained by variation in the amount of edge associated with a site and 48% of variation in diversity of bird species associated with edges was explained by variation in a site's ratio of edge to area. Both mowing and burning deterred encroachment by woody vegetation, but burning appeared to stimulate greater short-term primary productivity of the site and higher habitat quality. Overall, community diversity of plants and birds appeared less sensitive to management techniques than to the size and shape of the managed area. Without acquisitions of larger and less fragmented blocks of prairie habitat, management techniques alone appear insufficient to produce long-term increases in the diversity or abundance of grassland plants and birds.

Evaluation of Propane Cannons and Electronic Guards as Frightening Devices to Reduce Deer Damage to Corn on DeSoto National Wildlife Refuge. Jason Gilsdorf and Scott Hygnstrom, University of Nebraska-Lincoln, Lincoln, NE and Kurt VerCauteren, USDA/APHIS National Wildlife Research Center, Ft. Collins, CO.

White-tailed deer (*Odocoileus virginianus*) populations are increasing in many areas across the nation, enhancing the need for effective control methods. Hunting is widely used as a means to control deer densities but public demand for nonlethal alternative methods is high. Agricultural crops in areas with high deer densities often sustain high levels of damage. DeSoto National Wildlife Refuge (DNWR) is a mixed agricultural/woodland landscape with deer densities ranging from 30-60 per square mile. Propane cannons and electronic guards were tested on DNWR in an attempt to reduce deer damage during the silking-tasseling stage of corn growth. In previous research a substantial increase in deer damage to corn was observed during this time. The devices were applied for 18 nights, beginning July 13, 1999. Test fields were divided into groups of three, each with a different treatment. One field contained propane cannons, the other contained electronic guards and the third field served as a control with no treatment. Frightening devices placed on the corners of fields to maximize their visual and auditory effectiveness. Track counts were conducted once a week around the perimeters of each field to determine the number of deer intrusions. Researchers also assessed the amount of deer damage in each field by inspecting randomly located, variable-sized sample plots in late July. In addition, more than one thousand five hundred radio locations and one thousand visual observations were collected of 13 radio-collared deer near the treatment fields from May 29, 1999, to present. These data will be used to generate individual home ranges for periods before, during, and after implementation of the frightening devices. Analysis of data collected on crop loss, field incursions, and home ranges to determine the effectiveness of the frightening devices is not complete. Initial analysis suggests that propane canons and electronic guards were ineffective for reducing deer damage in corn. Field research on frightening devices at DNWR will continue through the summer of 2000. This study is a continuation of deer research initiated at DNWR by Scott Hygnstrom and Kurt VerCauteren in 1999. This research will continue adding to our database on deer locations, movements, home range and habitat selection, which will lead to an increased understanding of deer. This information will improve management of this important resource in the Missouri River valley.

1c Climatic Data

Table 1c.1 *FY 1999 Precipitation and Temperature Summary*

Month	Precipitation (inches)*		Average Temperature(of)	
	1998-99	Average**	Maximum	Minimum
October	2.84	2.67	70	47
November	1.78	1.62	55	35
December	0.02	1.25	50	26
January	1.02	0.93	33	17
February	0.91	0.79	48	27
March	0.76	2.33	53	29
April	5.03	3.1	66	40
May	3.58	4.3	74	53
June	6.01	4.38	78	60
July	2.13	3.84	88	69
August	7.68	3.33	82	62
September	3.79	3.26	79	52
Total	35.16	31.8		

*Includes snowfall **30-year average

Seasons' Highlights

Temperature - High temperature for the year was 100° F on July 30. The low temperature for the year was -15° F on January 5. Temperatures throughout the year were normal except October, December, and February which were 14° - 15° F higher than normal. Summer humidity, as usual, was oppressive. A killing frost (28° F or less) had not occurred by the end of October. Normally a killing frost occurs within the first two weeks of October.

Rainfall - The year experienced slightly above normal rainfall (e.g., 110% of normal). Rainfall was essentially normal until a single rainfall event on August 12. The official weather station in Blair, NE, reported 6.27 inches. However, several reporting stations in Harrison Co., IA and surrounding counties reported rainfall amounts of ten to twelve inches. Unfortunately, the refuge weather station was not functional during this period. The refuge experienced wide spread flooding from this event. Flooding was every bit as much as in 1993, except it did not occur because of high river flow. All flooding was the result of local rainfall and runoff from the local drainage area. Water ponded in places where it never had before. DeSoto Lake level rose six feet within seven days after the event flooding parking lots, boat ramps and hiking trails. Also, the high lake level impeded runoff from within the refuge. This produced flood damage in refuge grasslands and crop fields.

Habitat Restoration

2a Wetland Restoration (Off Refuge)

DeSoto's funding allocation for the Private Lands (Partners for Fish & Wildlife) program totaled $13,000 for FY 1999. Several partnerships with private and government organizations have helped considerably to restore, enhance, and protect wetland and upland habitat within DeSoto's 18-county Private Lands Management District. The more active partners include Ducks Unlimited, Pheasants Forever, Golden Hills Resource Conservation and Development, the Natural Resource Conservation Service, and the Iowa Department of Natural Resources.

During the year, ten wetland projects, in four different counties were completed, totaling 60 acres. There were three wetland projects each in Woodbury, Carroll, and Harrison counties and one in Pottawattamie County.

Some of the noteworthy projects were:

- The Coulthard Farms habitat project, in Harrison County, was a joint effort with the Iowa Department of Natural Resources and the landowner.

- The Shagbark Hills wetland project, in Woodbury County, was cost-shared with the Woodbury County Conservation Board and Ducks Unlimited.

- The Walnut Wetland project, in Pottawattamie County, was a five-year project that included several agencies, local government, and area schools. The Natural Resource Conservation Service and the City of Walnut were the primary organizers along with area landowners. This project consisted of ponding approximately two acres of water and protection of another two acres of upland, within the city limits of Walnut, Iowa. This enhanced riparian area will provide an outdoor classroom environment suitable for school groups and the entire community. This Open Spaces Project was initiated by Walnut High School students who raised money, convinced landowners and local officials of the project's value, designed project ideas and implemented it. The Fish & Wildlife Service was instrumental in offering technical assistance with the overall design, convincing local authorities of the value of the project and with cost-sharing.

Nearly every habitat project accomplished through the Private Lands program is in coordination with one or several other organizations. See Section 5a for more information on Interagency Coordination.

2b Upland Restoration: On-refuge

Table 2b.1 *Summary of Grassland Planting*

Location	Acres	Grass Mix	Comments
Center Island	16.1	Sandy Warm-Season	Cropland reversion; Spring new seeding
North side of Refuge along Hwy 30, east of owl barn	30.0	Wet Warm-Season	Cropland reversion; Dormant new seeding
Center Island - Former Food Plot	4.0	Mesic Warm-Season	Spring interseeding
Center Island - Former Food Plot	7.0	Mesic Warm-Season	Spring interseeding
Total = 57.1			

A total of 57.1 acres of warm-season grass seed was planted in late December 1998 and May 1999. Planting dates for dormant seeding were December 14 and 15. Spring planting occurred on May 19, 20 and 26. Except for the fields that were interseeded, mechanical tillage was used to prepare the seedbeds and control emerged vegetation. Sites were maintained after that with periodic mowing. Interseeding sites were mowed closely to the soil surface, planted and maintained with an aggressive mowing program throughout the summer. Rainfall was adequate, not excessive, as it had been in previous years except for one record-setting rainfall. Ten to twelve inches of rain fell in less than ten hours on August 12th, flooding low-lying areas and drowning spots within fields planted earlier in the growing season. Some replanting is anticipated in the next couple of years largely due to this singular act of nature.

Table 2b.2 *Grass Seed Mixes Planted*

Grass Seed Mix	Species	Cultivar	Seeding Rate (lbs. PLS / acre)
Sandy Warm-Season	Sand lovegrass	NE 27	1.0
	Sand bluestem	Goldstrike	6.0
	Switchgrass	Trailblazer	2.0
	Sideoats grama	Trailway	1.0
Mesic Warm-Season	Big bluestem	Pawnee	2.0
	Little bluestem	Camper	2.5
	Indiangrass	Oto	2.0
	Switchgrass	Blackwell	1.5
	Needlegrass	none preferred	1.0
	Virginia wildrye	O'ma'ha	0.5
Wet Warm-Season	Big bluestem	Pawnee	2.5
	Indiangrass	Oto	2.5
	Switchgrass	Trailblazer	2.0
	Virginia wildrye	O'ma'ha	1.0
	Tall wheatgrass	Alkar	1.0

2b Upland Restoration: Off-Refuge

Five upland sites were planted to native grasses totaling 298 acres. The largest site was the 200-acre Woodbury County Conservation Board's Owego Wetland site. This upland project will complement a 10-acre wetland complex that is being cost-shared by the Woodbury County Conservation Board.

One former FmHA easement, the former Bruck easement in Harrison County, is now owned by two landowners, Lehrman and Stamp. Mr. Lehrman is not happy with the current easement which he assumed when he purchased the land from FmHA. Mr. Lehrman doesn't want to honor the easement signs, remove trash from the easement, or allow the federal government access on his property. This is the first FmHA easement in which there has been a significant conflict with the landowner. The refuge is communicating with Mr. Lehrman through written correspondence.

Habitat Management

3a Water Level Management

The station's permanent wetlands did not require any spring pumping and very limited fall pumping was required. Two units required only 15 hours of pumping.

Botos pond was disced in October to reduce undesirable plant species. This unit will be drained and disced at least for another year to control vegetation, in particular cattails.

3b Moist Soil Management

The new Northeast moist soil unit was pumped for 60 hours in October. The unit continues to be a hotspot for migrating ducks. We have also observed that the deer are especially attracted to the unit during the summer.

The old Southeast moist soil unit has substantial damage to its levees. The unit needs draining before repairs can be made. Unfortunately, the unit drains into Brown's ditch which has been too high, because of beaver activity, limiting its ability to drain. Once the unit is drained and dry, restoration of the levees can begin.

3c Graze/Mow/Hay

The refuge has contracted with a local farmer for harvesting alfalfa. This is the first year of a three-year cash rent contract issued through competitive bidding. Refuge specific harvest practices were used on 123.7 acres of alfalfa and 53.7 acres of smooth bromegrass. The most important practices for wildlife are limiting harvest to two cuttings annually, between July 15 and September 10, and no insecticide use. Delayed harvest dates are necessary to avoid disturbing nesting birds. Total cash rent was $6,599.10.

3d Farming

Cooperative Farming - Seven local farmers tended 1,988.6 acres of refuge cropland using a two-thirds/one-third crop-share lease. The cropland provided food and loafing areas for migrating waterfowl, food, cover and edge for other species. Crops produced and acres in production are summarized in table 3d.1.

Table 3d.1. *Crop Grown and Acres Planted*

Crop	Biological Crop Rotation		Conventional Crop Rotation 2-Year	Acres x Crop
	3-Year	6-Year		
Corn	506.3	36.2	46.9	589.4
Soybeans	539.0	33.3	64.2	636.5
Sweet Clover/Small Grain	591.6	----	----	591.6
Milo	47.4	----	----	47.4
Alfalfa	----	123.7	----	123.7
Acres x Crop Rotation	1684.3	193.2	111.1	
Total Crop Acres	1988.6			

The 1999 crop season was as difficult as 1998. However, the seasons were as different as night and day. Rainfall in 1998 was 200% of normal during the growing season (i.e., May through August); 30.57 inches compared to 15.76 inches. Water stood in locations where never before and remained for much of the summer. This year, rainfall was close to the long-term average for most of the growing season. However, on August 12 a ten to twelve-inch rainfall event caused wide spread flooding. Soybeans and sweet clover were affected to a greater extent than corn, but all crops suffered yield losses. In spite of the late severe weather, average corn yields were 20 bushels (121.0 bushels per acre) above the 5-year average of 101.1 bushels per acre. Soybeans yielded 31.6 bushels per acre, which is below the 37.0 bushels per acre five-year average.

Crop Scouting - This year was the second year for the integrated pest management scouting program for agricultural crops. It is managed day-to-day by a local commercial scouting service, including field scout supervision, with oversight by the refuge biologist. The cost is shared by the refuge and cooperative farmers. Details of this program are explained in Appendix A - Contract Specifications for Scouting Cropland at DeSoto NWR.

Excess Grain - The refuge stores approximately 1,000 bushels of corn for potential depredation or disease management problems per existing management plans. Any grain in excess of management plan needs is used to attract waterfowl to the vicinity of the visitor center during fall migration and for filling the Visitor Center's bird feeders. When spring arrives, any held-over grain is used to reimburse cooperative farmers for early season custom work provided to the refuge or transferred to other field stations.

Under the current cropland management plan, the refuge's entire share of soybeans and some corn is harvested and the money is used to reimburse cooperators (per Iowa State University Extension Publication FM-1698 "1999 Iowa Custom Rate Survey") for refuge farming activities such as seedbed preparation for grassland planting. Any excess remaining after reimbursing cooperative farmers is transferred to other field stations. In 1999, cooperative farmers were reimbursed $14,931.88. Remaining grain monies was transferred to the stations listed in Table 3b.2.

Table 3b.2. *Inter-elevator Grain Transfers to USFWS Field Stations*

Field Stations	$ Amount
Region 3	
Shiawassee	3,000.00
Swan Lake	10,0000.00
Tamarac	999.99
Necedah	700.00
Region 5	
Erie	10,000.00
Blackwater	7,500.00
Great Swamp	1,000.00
Region 6	
Kulm WMD	3,272.92
Fort Niobrara/Valentine	7,000.56
National Elk	14,347.60
Medicine Lake	3,500.02
Total	$61,321.10

Some grain was left in fields as standing crop to limit use by waterfowl, provide food through the winter bottleneck for resident wildlife and afford cover for hunters per the new snow goose hunting program.

Sweet Clover Field Trials - Field trials established in 1995 to evaluate one-year sweet clover's value as a nitrogen source for a corn crop the following year were continued this year. The experimental design has been a paired-comparison testing whether or not corn following one-year sweet clover would respond to an application of nitrogen fertilizer. The late-spring soil nitrate test is used to determine the potential for a response to nitrogen fertilizer. A test level of 21-25 ppm nitrate or greater indicates a corn crop would not respond to the application of additional nitrogen fertilizer. Also, a late-season corn leaf rating protocol that assesses nitrogen deficiency symptoms was used to determine differences between corn with sweet clover as its only nitrogen source, and sweet clover plus 80 lbs. N per acre (1996), 50 lbs. N per acre (1997), or 70 lbs. N per acre (1999). The leaf rating provides a relative estimate of nitrogen deficiency. It is useful for comparing treatments with different nitrogen rates. It was used in these trials as a tool to determine whether or not corn responded to supplemental nitrogen, and to verify results from the late-spring soil nitrate test.

The 1995 sweet clover "green manure" crop did, on average, provide sufficient nitrogen for optimum corn production in 1996. However, the 1996, 1997 and 1998 sweet clover crop, on average, did not provide adequate nitrogen for optimum corn production in 1997, 1998 and 1999, respectively (Table 3d.3). Soil nitrate samples were not collected in 1998 because of heavy rainfall during the required mid-June sampling period.

Based on this research, consistently attaining optimum corn yields is not likely using sweet clover as the sole source for nitrogen fertilization. Over the four-year period (1996-1999) only in 1996 did the previous year's sweet clover supply enough nitrogen for optimum corn yields. The following 3 years the corn crop was deficient in nitrogen. Using Iowa State University Extension Service recommendations (Nitrogen Fertilizer Recommendations for Corn in Iowa, ISUE Publication Pm-1714) for determining nitrogen fertilization rates, sweet clover will require approximately 70 lbs. of nitrogen per acre supplemental fertilization to attain optimum corn yields.

Table 3d.3. *Comparison of Corn Following Sweet Clover Only and Sweet Clover Fertilized with 50-80 lbs. Nitrogen per Acre*

	Average Soil Nitrate Test from Corn following Sweet Clover Only	Visual Leaf Rating Average Difference Between Corn following Sweet Clover plus 50-80 lbs. N/acre and Sweet Clover Only	Number of Fields
1996	31.7 ppm	0.0	6
1997	14.1 ppm	0.7*	6
1998	-----	0.8*	6
1999	19.0 ppm	0.7*	5

*Statistically significant, LSD=0.10

3f Fire Management

The weather cooperated in March and 95 acres of cool-season grasslands were prescribed burned. Seven native grass units, totaling 88 acres, were burned in mid-May. Woody vegetation continues to be a problem, especially in the native warm-season grasslands.

A new 1,100 gallon metal tank was designed and ordered from J.L. Houston Company for $1,898.00. This will replace the old tank on the military 6x6 truck, which began to rust out.

3g Plant Pest Control

Exotic plant species, which often aggressively invade new habitats, are of particular concern and are receiving more management attention. The Department of Interior has published a list of plant species considered to be exotic, invasive or a nuisance species.

The following plant species on the Interior's "hit list" have been observed at DeSoto NWR:

- Clover, yellow sweet (*Melilotus officinalis*) - A biennial routinely planted as a single-year green manure crop in the refuge's biological crop rotation. Also, it was planted as a nurse crop (i.e., a nitrogen source) with newly seeded warm-season grasses until 1994. If it is allowed to produce seed, it can be a significant problem since the seed can remain viable in the soil profile for decades.

- Reed canary grass (*Phalaris arundinacea*) - Common floral under story component in riparian corridors along the Missouri River.

- Smooth bromegrass (*Bromus inermis*) - Refuge personnel routinely planted it to establish permanent ground cover in the early history of the refuge. It has been planted in more recent history as a living firebreak. Currently, there are several fields in the refuge being managed as cool-season grass habitat.

- Purple loosestrife (*Lythrum salicaria*) - It was first observed in 1998 in a former river chute on the refuge near the Missouri River. This chute is frequently flooded during moderate to high water levels. Scattered individual plants have been observed throughout this area and hand weeded in both 1998 and 1999. Infestations are likely coming from established sites upstream.

- Common reed (*Phragmites australis*) - This has been present within the refuge in small isolated sites along drainage ditches and DeSoto shoreline for many years. Annual application of glyphosate has steadily reduced the infestation level.

- Musk thistle (*Carduus nutans*) - This weed is the most common invasive species on the refuge. There are several widely scattered infestations. Some infestations are significant.

The musk thistle seed head weevil was released in 1996. Its establishment and population level has been monitored ever since. The number of seed heads infested with this insect has steadily increased over the years. However, musk thistle population has not yet been affected.

- Velvet leaf (*Abutilon theophrasti*) - This is a very common species in cropland habitats and disturbed sites. It is rarely observed in well-established permanent vegetation.

Other plant pest species observed on the refuge, but in isolated sites and very low population levels are: Autumn-olive (*Elaeagnus umbellata*), Canada thistle (*Cirsium arvense*), Cats claw vine (*Macfadyena unguis-cati*), Cotoneaster (*Cotoneaster* sp.), Crown vetch (*Coronilla varia*), Dame's rocket (*Hesperis matronalis*), Tall fescue (*Festuca elatior*), Henbit (*Lamium amplexicaule*), Common mullein (*Verbascum thapsus*), Multiflora rose (*Rosa multiflora*) and Tree of Heaven (*Ailanthus altissima*).

Other species of concern are Chinese elm (*Ulmus parviflora*), Roughleaf dogwood (*Cornus drummondi*), and Smooth sumac (*Rhus glabra*). Chinese elm is an exotic while Roughleaf dogwood and Smooth sumac are native species. All three species, particularly Roughleaf dogwood, are encroaching on grasslands throughout the refuge.

Weed management activity carried out on the refuge is listed by type of treatment, target species, and acres treated in Table 3g.1 (below).

Table 3g.2. *Weed Management Completed in FY99.*

Unit	Treatment	Target Species	Acres
DeSoto Lake	glyphosate	Phragmites	5
Moist Soil Units	glyphosate	Phragmites	<1
Grasslands	mowing	Roughleaf dogwood, Chinese elm	154.3
Refuge boundary	mowing	woody vegetation	15.4

Fish and Wildlife Management

4b Disease Monitoring

Resident wildlife populations were monitored throughout the year with no disease outbreaks observed. Waterfowl populations, especially snow geese, were watched for signs of disease but nothing was observed.

4d Nest Structures

Screech owls continue to be the main occupants of the 61 wood duck boxes on the refuge. When the boxes were checked, 33 had an owl or signs of owl use. Wood ducks used only three boxes and laid 24 eggs. Twenty-one of these eggs hatched for an 87% hatch success. With the massive amount of dead and dying cottonwoods it appears the ducks prefer to use natural cavities.

Coordination Activities

5a Interagency Coordination

The Project Leader and refuge staff from the biology program, Private Lands program, and public use program interacted and coordinated activities with many different federal, state, county and local governments and non-governmental organizations. High profile examples include pooling grant monies with Ducks Unlimited, USDA Natural Resources Conservation Service (NRCS), and IA Department of Natural Resources to restore wildlife habitat throughout the 18-county Private Lands program service area; coordinate the refuge's law enforcement program with Harrison and Washington Co. Sheriffs Departments; developing the Marquardt Pond Environmental Learning Site for youth fishing clinics with volunteers and a corporate donor; coordinating land acquisition and habitat restoration with USFWS Region 6 Realty, Papio-Missouri Natural Resources District, NRCS Wetland Reserve Program, U.S. Army Corp of Engineers and local landowners; updating NE legislators and the NE Game & Parks Commission on USFWS programs and emerging issues; collaborating with researchers from nearby colleges and universities to study grassland-dependent bird species response to grassland management practices and DeSoto Lake water quality; and working with local farmers to manage the refuge's unique cropland program.

5c Private Lands Activities

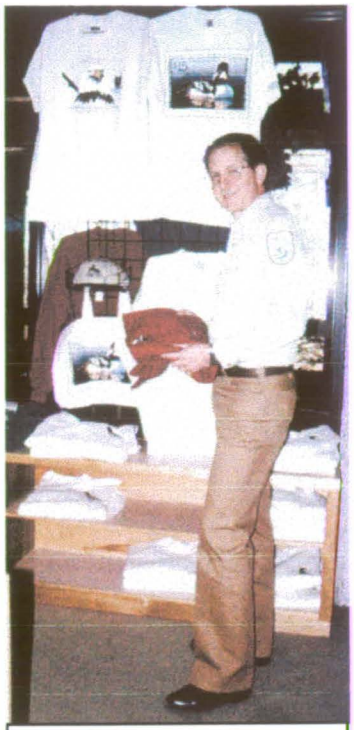
Outreach efforts to assist private landowners with habitat improvement and wildlife issues continued to expand again this year. During the year, landowners, County Conservation Boards, the Natural Resource Conservation Service, the Golden Hills Resource Conservation and Development, and the Loess Hills Alliance were all provided with site evaluations, technical assistance, restoration and/or enhancement efforts. Eight of the eighteen counties in the coordination area received assistance during the year. Refer to sections 2a Wetland Restoration and 2b Upland Restoration for information regarding specific projects.

Considerable time was spent with the Loess Hills Alliance. This newly formed organization was established to protect the natural and cultural resources of the Loess Hills, while ensuring economic viability. The Alliance is well organized and has already received grants totaling more than one million dollars. Four committees have formed under the alliance umbrella: Protection, Information and Education, Economic and Development, and the Stewardship Committee in which the Private Lands Coordinator represents the USFWS. Some of the programs the Stewardship committee has initiated include: fire ecology workshops, intern programs, fire caches throughout the Loess Hills for landowner/intern use, cedar tree removal, involvement with the Iowa State University Extension Master Conservationist program, and establishing a directory of programs and contacts for landowners who need technical and financial assistance to protect their Loess Hills property.

5d Cooperating Associations

The Midwest Interpretive Association (MIA) has completed its eighteenth year of operation. Bruce Barkley, the association's business manager, a non-government employee, operates a $174,000 business from the DeSoto Visitor Center. Along with DeSoto, the Association also administers outlets at Mingo, Squaw Creek, Swan Lake, Horicon, and Lewis and Clark Lake, which is a facility of the U.S. Army Corps of Engineers, near Yankton, South Dakota. Total sales increased 154 percent this year compared to last year's receipts. Revenue received from the sale of educational books, artwork, photographs, T-shirts, postcards, and posters at the DeSoto Visitor Center totaled $79,200.51. Visitors also gave $27,654.14 in donations. MIA sales activities are itemized in Table 5e.1 (below).

MIA also printed more than 10,000 fall auto-tour leaflets, sponsored a Refuge open house, donated posters for the refuge's fishing clinic, and provided ribbons for the student art show valued at $2,524.28. The business manager also contributes to the refuge's operational programs such as computer operations and interpretive programs. Contributed assistance to all MIA outlets totaled an additional $4,620.00.



New larger sales area dramatically helped MIA sales.

Table 5e.1. *MIA Sales activity for FY 99.*

Outlet	Gross Sales	% of MIA Sales	Monetary Contributions
DeSoto	$106,854.65	61.26	$2,524.28
Mingo	7,079.77	4.06	1,633.88
Squaw Creek	14,963.13	8.58	2,027.28
Swan Lake	3,063.32	1.76	0
Horicon	17,309.91	9.92	1,467.61
Lewis and Clark Lake	25,159.14	14.42	4,376.55
Total	$174,429.92	100.0	$12,029.60

The Association received a $25,000 anonymous donation to be used for Phase II of the Visitor Center's exhibit renovation, which is contracted to Wilderness Graphics. This donation, and other funds, will be used to offset the refuge's expense for this renovation.

Resource Protection

6a Law Enforcement

Refuge Officers at DeSoto had an active year with Law Enforcement incidents. In April, Officer Taylor located a Shitzu dog at the south recreation area, which led to the arrest of two felony fugitives from Wisconsin.

- During the summer, Officers Cooper and Ellis recovered a drowning victim from the Missouri river just south of DeSoto. The victim had been in the river for more than three days.

- Officer VanRiper responded to a vehicle that had gone into DeSoto lake. The vehicle belonged to a lady who was reading the electric meters on the refuge, when her vehicle rolled into the lake, still running, without the driver. A diving team was needed for the recovery of the vehicle.

- A stolen boat and trailer, from Council Bluffs, IA, were recovered from DeSoto lake. The thieves tried to sink the 28-foot cabin cruiser but where unsuccessful. On the west side, a stolen, striped Pontiac Grand Prix was recovered.

  Officers Taylor and Ellis assisted Swan Lake NWR with their annual Eagle Days event, which went very smoothly.

Another invasive species to add to our long list.

- Officer Taylor assisted Fergus Falls WMD Officers Edwards and Raitz with the opening of the Minnesota waterfowl season. Officer Edwards had assisted DeSoto officers earlier in July with general law enforcement.

The following are the number of law enforcement incidents that occurred on DeSoto NWR for the 1999 calendar year:

- 77 violation notices issued
- 56 written warnings
- 314 verbal warnings
- 7 state arrests
- 6 assists to county and state officers

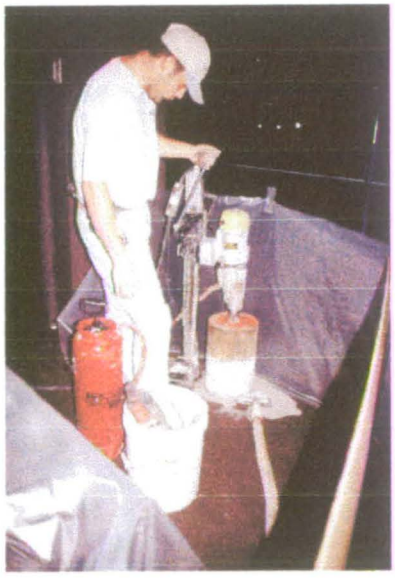
A total of 447 law enforcement incidents occurred with nine of them being felonious and twelve involving drugs.

6b Permits and Economic Use Management

Nine Special Use Permits (SUP) were issued during the year: four were for commercial fishing activities, one for bee keeping, one for beaver removal, one for a Canadian film crew, and two for research activities. The research SUP's were for the third and final year of the grassland bird study conducted by staff from Northwestern College and continuation of the deer telemetry study by the University of Nebraska-Lincoln.

6f Cultural Resource Management

A major portion of the year was dominated by planning, organizing, and implementing the protection of the objects in the cargo storage area at the Visitor Center. Removal of the old Trane HVAC units from the Cargo Storage Areas and the installation of new return air ductwork for the Liebert HVAC systems necessitated this extraordinary precaution. Omaha Concrete Sawing used a wet saw to cut 19 holes through the 8" concrete floor. Contractor Tom Sain, Omaha, NE, was hired to assist with the removal and storage of 6500+ objects on display and later returned to help with reinstallation. An effort was made to minimize the amount of time the cargo gallery would be "empty" for visitors. From start to finish, the disturbance to viewing was limited to three weeks, with only one week where no viewing was possible.



Rerouting HVAC duct work required cutting holes in the Visitor Center's 8" concrete floor.

Installation of the new HVAC system also required relocating most of the Bertrand decking and other wood and metal stored in the crawlspace. After lengthy discussions, it was decided to keep the wood in the visitor center crawlspace. Finding other suitable places to stack the wood was not an easy task. Many

of the refuge staff and volunteers pitched in, once again, to help move the huge stack of long decking wood and heavy metal pieces that were "in the way."

Highlights of the year are:

- The new Liebert HVAC units were started up February 9, 1999. Present at the final walk-through inspection on 2/25/1999 were: John Mullins, FWS regional office; Gerry Mohl, FWS regional office; George Gage, DeSoto project leader; Sarah Tuttle, Bertrand Museum curator; and Rick Blackledge, Waldinger Corp. project manager.

- Publication of *Ironstone Treasures Aboard the Steamboat Bertrand,* by Leslie Peterson, a past curator with the collection. The text is the keynote address to the White Ironstone China Association's 1999 Annual Conference which featured the *Bertrand's* ironstone.

- The nearby Harrison County Historical Village was damaged in a tornado on May 16. Museum staff visited the site the next morning to offer assistance and returned again in the afternoon with emergency supplies to protect their collections. At the refuge's offer of assistance, we were asked to care for two wet textiles which were too large to treat on-site. Refuge museum staff assists periodically as the recovery process continues.

Research requests - The museum staff responded to 70 information requests from researchers in 21 different states. Topics of interest included: suspenders, hairpins, John Deere plows, footwear, men's textiles, rubber slickers, howitzer shot, shackles, and glass bottle colors, among others.

The museum staff assisted 5 individuals or couples in using the museum's resource files. Topics of interest included: whiteware ironstone (Janice and Ron Stork, IN), general research for MA thesis (Lori Guilmartin, TX), buffalo fur leggings and boots (Larry and Doris Belitz, SD), touch-screen kiosk (Roie Black, NE), general research for book (Jerry Petsche).

Loans - The museum handled 11 loan requests for objects and/or images from the collection.

- Image loans included: 102 35mm slides, 4 videos, and 35 photographic prints sent to researchers interested in plows, textiles, images for a text book and e-zine article, whiteware and fish bones.

- Object loans included: Faunal material (codfish and mammal bones) for analysis and description to the McClung Museum, University of Tennessee, Knoxville, TN; Prof. Walter E. Klippel, Department of Anthropology, head researcher.

- Mystic Seaport Museum, Inc., already approved for an object loan, requested a one year postponement due to construction delays in their exhibit gallery. The new target date is April, 2000.

Conservation- Volunteers, staff and a contractor treated a total of 8,865 objects this year (430 wooden handles, barrel staves, and powder kegs; 7,408 ceramic and metal buttons; 869 pipes, pipe stems and match safes (6 drawers); 6 food stuff (nuts); 60 panes glass; 62 metal disks, and 30 bottles of foodstuffs). Most treatments were storage upgrades: removing acidified storage materials or stopping abrasion damage by individually bagging objects.

- All narrative reports on station were taken apart and rebound with archival bindings and the photographs were interleaved with acid free tissue.

- Two quilts received from the Harrison County Historical Village were dried, vacuumed, and relabeled after being soaked in a tornado.

- Dr. Larrie Stone performed his yearly examination of the foodstuffs, finding 30 objects that needed treatment. Twenty-six were remanded to his custody at the Dana College biology laboratory, Blair, NE, for more extensive evaluation. He characterized this year's results as having "no surprises," the collection being relatively stable.

Backlog Cataloging - With the new museum technician in place, progress on backlog cataloging has once again resumed. Twenty-one catalog numbers of food stuff (nuts) were newly cataloged and a template of the catalog card was created on the computer. Forty-one cards which had been written but not typed were entered into the computer and printed.

Special tours / appearances - Eight tours were given by museum staff for groups specifically interested in the *Bertrand.* Groups included the Midwest Archeological Center, National Park Service (Lincoln, NE), Creighton University (Omaha, NE), Iowa Library Association, Boy Scout Troop 331 (Omaha, NE), Siouxland Heritage Museums (Sioux Falls, SD), private archaeologists (Oregon), Colonial Williamsburg Foundation (Williamsburg, MD), and the Ford Conservation Center (Omaha, NE).

As part of a training course on museum collections management and conservation, the curator was asked to participate in a panel discussion at the Midwest Archeological Center sponsored by the National Park Service in Lincoln, NE. The class had toured the Bertrand Museum exhibits, conservation laboratory, and library the previous day.

Training - Museum staff received training on Re:discovery, a new collections management software program which will be used by the three FWS museums.

Problems - The walk-in cooler, which stores sensitive *Bertrand* cargo objects, broke down three times during the year. Each failure was caused by a different problem. Cooler repairs were expensive, especially since they sometimes included emergency weekend trips.

The new Liebert units, which control the environment in the cargo storage areas, are causing problems. Both the temperature and relative humidity are not within standards and there were several false high temperature alarms. Additionally, the condenser units, which are installed in the crawlspace, produce an enormous amount of heat and substantially raise the temperature of the space. Whereas the crawlspace was a reasonably favorable environment to store the wood and metal before, due to the increased heat, it no longer is. Although the job was accepted following the mandatory walk-though inspection, there are several deficiencies that remain to be corrected by Waldinger, Corp., the general contractor.

At least 80 mice were caught in the visitor center. A serious problem developed in the multi-purpose room with 26 mice caught in October alone. The Freeman volunteers worked diligently to find and block the entryways in that area with apparent success.

The conservation laboratory was found to be out-of-compliance following a Regional Office safety inspection. Some infractions, such as the blocked electrical panel and non-compliant carrying containers, have been corrected. Others will take more time to remedy.

Public Education and Recreation

7a Provide visitor services

Visitation - Despite high lake water during the summer that limited public access to some parking lots, boat ramps and walking trails, refuge visitation was about the same as the previous fiscal year (256,245 vs. 255,064). The 10-year average is 294,888 visitors per year.

The 1998 fall snow goose migration was on time despite concern the waterfowl might bypass us. November is normally the busiest month of the year. Last year's visits to the refuge in November totaled 37,640. This year there were 41,976 visits. A 12% increase compared to 1998. Sunday, November 23 was the peak day last year with 3,582 people. This year we peaked with 3,805 visitors Sunday, November 22. The three-day Thanksgiving weekend attracted 8,875 visitors, helped by the presence of 600,000 geese.

Summer visitation, Memorial Day through Labor Day, totaled 81,967 people. There were 5,493 people on Memorial Day weekend, 2,382 on the July Fourth weekend, and 4,050 on Labor Day Weekend. This was a 10% decrease from last summer.

The visitor center hosted 122,064 people this fiscal year. A 10% increase from last year. This was the first full year of visitor center operation after the exhibit remodeling in August 1998. The ten-year average for visitor center use is 134,071 visits.

Table 7a.1 *F.Y. 1999 Visitor Activity Comparisons*

Activity	Activity Units[1]	Activity Hours
Interpretation	472,396	240,930
Environmental Education	8,227	24,927
Consumptive Wildlife Recreation	10,777	31,079
Non-Consumptive Recreation	218,502	148,662
Non-Wildlife Recreation	4,478	2,237
Total Activity Hours		447,835

[1]Activity Units = Number of visitors X the number of activities a visitor is involved in during a single visit.

Interpretation - DeSoto Visitor Center contains exhibits on cultural history, natural history, wildlife, conservation and Service-oriented displays. Two galleries feature displays about the Steamboat *Bertrand*, which sank in 1865, and the effects of westward expansion on the habitat and wildlife of the Missouri River Basin. Another gallery contains a new life-size diorama depicting Missouri River wetlands, woodlands, and grasslands as they would have appeared to Lewis and Clark in 1804.

- The refuge enjoyed the outcome of rehabilitating some of the interpretation facilities. Wilderness Graphics, Inc., Tallahassee, Florida, solved many of these interpretive needs in the visitor center, the refuge, and particularly at the new Boyer Chute National Wildlife Refuge. The new information desk, three life-size dioramas, and a sixfold increase in the sales area was popular with visitors and well worth the temporary inconveniences during construction.

The three-minute steamboat excavation video is viewed on a 21-inch monitor in a 'shipping crate' in the Cargo Viewing Gallery. The VCR and monitor generally work well in the 'crate'. We also show a four-minute video of DeSoto's wildlife, produced by volunteer Bob Horton, who has captured hundreds of hours of DeSoto's wildlife on tape. Both visitor-activated videos are popular, but tapes and machines need regular maintenance when they are viewed 15-20 times a day throughout the year. Upgrading these to laser-disk is planned for the future.

Wilderness Graphics, Inc., Tallahassee, Florida, created three dioramas as part of the Visitor Center's Phase I interpretative program rehabilitation.

The Labelle 8-track audio interpretive systems, which operate 22 telephone handsets were converted to solid-state chips. After 15 years, tapes were wearing out and the Labelle players were developing irreparable buzzing problems. The improvement is terrific. This upgrade to solid-state technology by Wilderness Graphics was part of the visitor center rehabilitation.

Our two orientation films "Seeds of Change" and "Off the Beaten Path" are generally shown hourly during the week, and on the half hour on weekends and during heavy-use periods. We also regularly show "America's National Wildlife System: Where Wildlife Comes First." A total of 18,193 people viewed these introductory films, in addition to all school groups. Our special weekend wildlife films were viewed by 2,774 people.

Table 7a.2 1999 Visitor Center Exhibits and Activities	
January 6-19	Federal Junior Duck Stamp Exhibit
February 7-28	Stan Buman Photography Exhibit
March 7-24	Student Wildlife Art Exhibit
April 3-28	Loess Hills Exhibit
April 18-24	National Wildlife Week
June 5-Aug 30	Lewis and Clark: Up the Missouri river
July 1-31	Outdoor Writers Association Exhibit
September 11-19	Prairie Appreciation Week

DeSoto Visitor Center hosted a variety of temporary special exhibits.

- The annual Student Wildlife Art Show is held during March. This year was the 16th annual showing. There were 179 works, from 45 classes in 18 Iowa and Nebraska schools (K-12) in the exhibit. Award ribbons were provided, and all participants received a personalized parchment certificate. Judges were Milt Heinrich (Blair, NE), Tom Walker (Harlan, IA), and Russell Christensen (Neola, IA). More than 8,000 visitors enjoyed the exhibit in the center's multipurpose room.

- An exhibit of the Loess Hills was featured from April 3-28. DeSoto NWR resides near the western Iowa Loess Hills, a landform of geological significance.

- A Lewis and Clark exhibit was featured from June 5 to August 30. The Lewis and Clark expedition passed through the area in 1804 and camped on the refuge in the area of Lakeview Drive.

- Prairie Appreciation Week featured an exhibit of native grasses the week of September 11-19. This program teaches the students the historical importance of prairies. Five classes, 133 students, participated in the on site environmental education program and field walk. Most of the educational presentations are by the DeSoto NWR volunteers.

- Framed computerized photography of DeSoto Refuge by Kent Peters of Blair, NE, was exhibited from October 1-31.

Other Interpretive Programs - The refuge continues to attract an impressive variety of foreign visitors. They came from India, Iran, Ecuador and 52 other nations. Our registration book also records people from all 50 states, and Puerto Rico. Tours were given to 25 German exchange

students in July and 20 Japanese exchange students in August.

Staff presented talks and programs to a variety of groups other than students. A total of 163 organized groups and bus tours, containing 4,890 persons, visited the refuge. Programs on endangered species, wetlands, grassland management and prescribed burning, wildlife management, low-input sustainable crop production and the steamboat *Bertrand* were provided.

The Weekend Wildlife Film Series was enjoyed by 2,774 visitors throughout the year. Many of the same local folks come each Saturday or Sunday to enjoy a film. Each feature is shown three times, both Saturday and Sunday. The series included special programs for Earth Day, Prairie Appreciation Week, and Lewis and Clark weekends. Weekend films are discontinued in November because of high public visitation and crowded parking lots during the peak waterfowl migration.

Entrance Fees - This was the 12th year of entrance fee collection. Convenient self-registration stations are near both entrances to the refuge, and another is in the visitor center. The daily fee is $3 per vehicle. Our annual refuge pass sells for $10. Commercial vehicles pay $20 daily, or $30 if more than 21 people are aboard. Compliance appears quite good and no special effort is made to enforce it other than in conjunction with another violation.

Table 7a.3 *Fiscal Year Entrance Fee Data*

Year	Refuge Cost	Receipts	Permits Issued	Refuge Visits
1988	$19,483	$60,534	30,267	382,003
1989	$23,039	$61,750	30,876	386,030
1990	$20,145	$56,087	28,044	390,929
1991	$23,590	$48,684	24,342	371,139
1992	$26,167	$54,317	27,159	313,584
1993	$46,070	$64,137	18,689	297,475
1994	$35,751	$76,398	20,888	302,727
1995	$35,000	$85,832	25,730	309,288
1996	$35,000	$90,367	24,275	270,998
1997	$35,000	$72,126	18,490	237,531
1998	$35,000	$70,990	18,006	255,064
1999	$35,000	$79,895	19,310	256,245

Entrance fees collected were up 13 percent this year to $79,895 from $70,990 in 1998. We also sold 7 percent more permits. Because of the fee demonstration program, the refuge keeps all but the $14,715 Duck Stamp sales. However, it costs an estimated $35,828 to administer our entry fee program.

Table 7a.4 1999 Entrance Fee Permits

TYPE OF PERMIT	NUMBER	RECEIPTS
Single Visit ($3)	17,249	$52,355
Groups/Commercial ($20 & $30)	48	$1,645
Golden Eagle Passports ($50)	38	$1,900
Golden Age Passports ($10)	350	$3,500
Golden Access Passports (NC)	66	NA
Federal Duck Stamp ($15)	981	$14,715
Refuge Pass ($10)	578	$5,780
Total	19,310	$79895

Public Information - The staff responded to 16,300 public inquiries. This includes 15,708 telephone responses, and 618 written responses. Twenty-three news releases were sent to news media in Iowa and Nebraska, as well as major Kansas, Missouri, and South Dakota media resources. Our mailing list consists of 225 television, radio, and newspapers; this covers most of the media markets in our two-state area. Special information was provided to the Omaha World Herald, Blair Enterprise, Missouri Valley Times News, Des Moines Register, Council Bluff's Nonpareil, and Lincoln Journal-Star newspapers. Thirteen interviews were granted to newspapers and nine to TV/radio representatives. Topics included goose migration, art show, fishing, auto-tour, the Bertrand Collection, and our special exhibits.

Students - The refuge is active with students and classes especially in spring and fall. A total of 8,226 students (475 classes) visited and were involved in environmental education programs. Teachers supervised many of their own classes at the refuge, and borrowed films, slides shows, and videos to use back in their classrooms.

Our busiest months were May and November with 1,708 students (91 classes) and 3,029 (174 classes) respectively. In the fall, most students come to learn about "Birds in Migration" and "Prairie Appreciation Week". Overall, most of our classes work on the "Artifacts and Lifestyles" cultural resources packet provided by the refuge during their spring visit. As part of a full two-day environmental education program on the refuge, the four, fifth-grade classes from Blair's

Arbor School received instruction in canoeing and cooking breakfast over an outdoor grill.

About a dozen college classes used the refuge this year, including Creighton College, Clarkson College, Drake University, Dordt College, Westmar College, the University of Nebraska, Iowa State University, Iowa Western Community College, the University of South Dakota, Morningside College, Hastings College, University of Connecticut and Northwestern College.

Interpretive Foot Trails - The four foot trails were used by more than 35,000 visitors. Volunteers performed 'trail patrol', picking up litter and pruning overhanging branches, plus periodically restocking the Wood Duck Pond and Cottonwood Nature Trail dispensers with interpretive leaflets. Guided tours of the trails were provided to 1,770 visitors (approx. 50 groups). Volunteers provided most of these tours, mostly for conservation-oriented tour groups that called ahead for reservations.

Interpretive Tour Routes - The Auto Tour runs from October 15 through November 30. This includes the peak of the snow goose spectacle. The current route ends at the new "Bob Starr Wildlife Overlook" and people return on the same seven miles of paved road. Generally, this route continues to be well accepted by the public, although it means they are excluded from the unpaved (and dusty) gravel part of the road that continues the loop around Center Island. Compared to previous routes, there are fewer law enforcement problems, less seasonal signing is required, and traffic disturbance at the eagle roost site is eliminated since automobiles no longer pass nearby. Cottonwood picnic ground was kept open during the auto tour, as was the Bertrand Excavation Site and Missouri River Overlook. These sites help to disperse traffic during peak-visit periods. More than 35,000 people drove the horseshoe-shaped tour route during the 47-day period. As usual, the best overall snow goose viewing was from the visitor center viewing gallery.

Fishing - Recreational fishing on DeSoto Lake started out promising, however, with the high water due to spring rains, access to the majority of the piers, rock jetties, and other preferred spots was eliminated for most of the season. On the other hand, the increased water levels provided additional food sources, cover and backwater nurseries for newly hatched fingerlings, benefitting recruitment.

The first month of the fishing season, angler success was quite good. Numerous black and white crappie were caught, some as large as 10 plus inches. Occasionally, sizeable largemouth bass and several large flathead catfish were caught. By the 1st of June, the lake level had increased to the point that access was minimal and success was reduced considerably. This was the fourth year in a row that high water has hindered most of the lake's recreational activities.

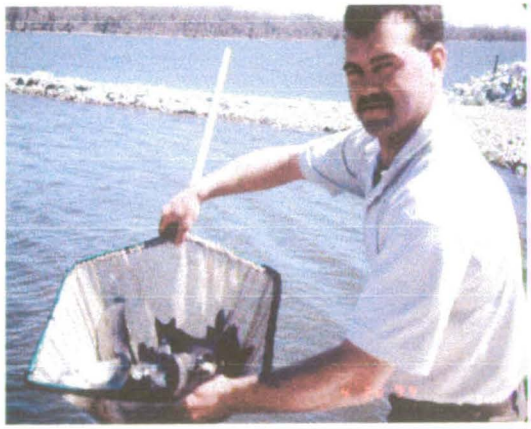
There were three fishing tournaments during the fishing season. Two were bass tournaments with 62 bass caught, 53 entered, for a total weight of 163 lbs. The condition of these bass was excellent with an average weight of more than three lbs. This is an increase over last year's average weight of 2.6 lbs. per bass. Finally, 268 carp and buffalofish, weighting 596 lbs. were harvested during the annual Carp-O-Rama tournament in June.

Two fishing clinics were held at DeSoto Lake during the summer. Approximately 80 youth and 30 adults participated in these annual events. Both the New Era State Laymen's Association and the Omaha Tribe brought youth of all ages and backgrounds for a day of learning, fishing, and fun.

Establishment of an environmental learning site for DeSoto's fishing clinics, has taken off this year. This concept proposed by former FWS Special Agent Cleveland Vaughn and the refuge's project leader is now becoming a reality with the excavating of Marquardt Pond, off the east dike road near the north archery parking lot. This one and a half acre pond is reserved for youth groups only. A management plan has been written and approved to set guide lines and standards for who can use this site, catch and release requirements and maintaining a quality learning environment. An ADA accessible fishing pier, shelter, restroom and rock parking area are currently being planned. Stocking has already started, with the release of 5,000 2" largemouth bass and 10,000 1.5" bluegill fingerlings on the 14th of September.

Renovation of Marquardt Pond started this year. This is the first phase for developing an Environmental Learning Site on the refuge.

Commercial fishing efforts to remove roughfish continued again this year, with the first nets placed on the 14th of April and the final ones pulled the 30th of July. Only two commercial fishing operations were active, and neither one put in the hours experienced in the early 90's. Total rough-fish harvested during the three and a half months of netting was 9,109 lbs. including 8,752 lbs. of buffalofish and 357 lbs. of carp. Totals in '98 were 6,856 lbs. and 12, 358 lbs. in '97.



DeSoto Lake is routinely stocked with native sport fish to provide recreation and slow the progress of the burgeoning gizzard shad population.

Stocking efforts continued again this year, with 400 8-14" white bass, 3,000 8" channel catfish and 2,000 9" walleye being released for recreational fishing and/or for biological control of gizzard shad.

White-tailed Deer Hunting - A total of 474 Nebraska and Iowa archery deer hunters spent 1,837 hours harvesting 27 white-tailed deer. These numbers are gathered from a voluntary sign-in sheet.

This was the second year to conduct two three-day Muzzle loader deer hunts. The first hunt ran from December 5-7th, the second from December 12-14th, with one-hundred hunters

participating in each hunt. For the first hunt, a total of 97 hunters logged 2001 hours during 202 visits, to harvest 44 deer. The success rate was 45 percent. The second hunt brought out one hundred hunters that logged 2061 hours during 221 visits to harvest 34 deer. This is a 34 percent success rate, which is much lower than past hunts, which are usually around 50 percent.

Waterfowl Hunt - The refuge staff committed substantial effort to change the traditional Controlled Waterfowl Hunt to a snow goose only hunt in response to the snow goose overpopulation problem. The intent was to initiate the new hunt this fall. However, it was determined an Environmental Assessment needed to be completed, delaying the new hunt until 1999. Therefore, the old Controlled Waterfowl Hunt was again offered to the public. A total of 158 hunters spent 726 hours to bag 103 birds which was an improvement compared to 1998.

Mushroom Hunting - Two thousand three-hundred ninety-three (2,393) people visited the refuge in search of the highly sought after morel mushrooms.

7b Outreach

Staff provided off-site programs whenever asked. The Outdoor Recreational Planner spoke to a Omaha Rotary Club and at the Blair High School career days. Curator Tuttle spoke the Missouri Valley public library, and at a curators panel in Lincoln. Steve Van Riper was a banquet speaker at the DeSoto Bend Chapter of Ducks Unlimited.

The refuge also does outreach by lending videos. Twenty-seven (27) video loans reached a combined audience of 2,297.

- DeSoto hosted an open house for Blair, NE, and Missouri Valley, IA, Chambers of Commerce to feature the new diorama exhibits and expanded MIA sales area.. The Midwest Interpretive Association provided refreshments and door prizes.

- Some energetic DeSoto staff and summer interns volunteered their time to create and enter a float in the Harrison County, IA, Parade. Much to their amazement, the float won 1st prize in their category.

Planning and Administration

8a Comprehensive Conservation Planning

DeSoto began working on its Comprehensive Conservation Plan this fiscal year. To date, GIS basemaps have been developed and input from internal and external resources has been compiled. The chronology of activity on this project for this fiscal year is as follows:

November — Refuge manager met with Regional Office staff to begin planning the process to develop and publish an approved Comprehensive Conservation Plan (CCP) for DeSoto NWR. The Department of Forest Resources, University of Minnesota-St. Paul, was contracted to develop basic GIS data for the refuge. DeSoto NWR Biologist and Shandy Littlefield, Univ. of Minnesota, and Regional Office Ascertainment and Planning collaborated to produce the necessary data files. The refuge biologist also provided on-site verification of the data files. Types of data files included: digital elevation models, digital orthophoto quadrangles, digital raster graphics, historical vegetation, aquatic resources, basic vegetation covers, land use, National Wetlands Inventory, political boundaries, public lands, soils, roads, archeological sites, habitat and wildlife management units and refuge facilities. Judy McClendon, Service biologist, and Jim Salyer, contract biologist, from the Southern Missouri Ascertainment Office are the CCP team leaders.

Also, at that time DeSoto was designated as a pilot program within USFWS Region 3 for utilizing contracted services to perform the majority of the work associated with developing and publishing the CCP. The consultant will work closely with DeSoto staff, Regional Office Ascertainment and Planning and the Southern Missouri Ascertainment Office.

January — The Mangi Environmental Group, Inc. from Falls Church, VA, was awarded the contract for developing and publishing the CCP.

July — CCP kick-off meeting was held at DeSoto Refuge. The purpose of this meeting was to familiarize the consultant with the refuge, identify issues facing the refuge and establish a schedule for completing the CCP. Refuge professional staff, Jim Mangi, president, Mangi Environmental, Inc., Jim Milligan, Regional Fishery Biologist, Mike LeValley, Missouri River Natural Resources Committee Coordinator, Mark Wilson, Missouri River Ecoteam Coordinator and CCP Team Leaders were present. Leon Kolankiewicz was assigned project manager for Mangi Environmental, Inc. Also, it was decided not to include nearby Boyer Chute NWR in DeSoto's CCP.

August

A focus group meeting was held to solicit input from selected individuals, public and private organizations that routinely interact with the USFWS and DeSoto NWR. Organizations represented at this meeting were Iowa State University Extension, Nebraska Game & Parks Commission, Iowa Department of Natural Resources, University of Nebraska-Lincoln, USDA Natural Resources Conservation Service, Iowa Natural Heritage Foundation, Northwestern College, nearby private landowners, US Army Corp of Engineers, National Park Service, Harrison County Conservation Board and a refuge farmer. Many ideas and issues were proposed and discussed by the group. The most important issues, in rank order, as determined by the focus group were: 1) lake management issues including water level management, opening the lake back up to the river and sedimentation; 2) land use on the refuge, specifically the amount of cropland relative to other habitats; 3) snow goose management; 4) surface and agricultural drainage into the lake; 5) the refuge's fit into the greater scheme of the Missouri River valley (e.g., ecosystem management); 6) deer and beaver damage to adjacent private cropland; 7) fishery management in DeSoto Lake; and 8) public use and outreach.

Focus group meeting with professional wildlife managers and local stakeholders.

September

A public meeting was held at DeSoto to solicit feedback from local citizens. They were asked to respond to the results of the focus group meeting as well as submit their own ideas and concerns. Only a few people attended. The main issues addressed were water level management of the lake and its affect on adjacent private land.

Given this input from internal and external sources, refuge staff and the CCP Team of Salyer, McClendon and Kolankiewicz began the process of developing goals, objectives and strategies for the future management of DeSoto NWR.

8b General Administration

Jennifer L. Stafford began her tour of duty April 10, 1999. She filled the Museum Technician position which had been vacant over a year.

George F. Oliver, was appointed to the position of Maintenance Mechanic Leader on May 9, 1999.

Rex Stambaugh filled the Maintenance Mechanic position on May 24, 1999.

Volunteers - DeSoto continues to use volunteers of all ages. We had 89 individuals this year whose tasks ranged from environmental education, wildlife surveys, trail maintenance, visitor center support, to library and museum conservation. Recruiting and scheduling such a variety of people is a challenge.

- Volunteers contributed 4,697 hours for which the refuge expended $1,400. Activity categories included:

Table 8b.1 *Volunteer Activities and Hours*

Monitoring and Studies	1,434
Habitat Restoration	35
Cultural Resource Management	1,220
Public Education and Recreation	2,008
TOTAL HOURS	**4,697**

- The Outdoor Recreational Planner participated in Region 3 sponsored Volunteer Coordinator's Meeting at LaCrosse in March.

- Volunteer Gary Caldwell contributed 883 hours maintaining nature trails and was chosen the 1998 Volunteer of the Year. His work is never ending, keeping the trails clean and removing debris falling from the aging cottonwoods that line the paths.

- Volunteer interns Kris Drake (North Dakota State University) and Chris Phipps (University of Nebraska - Omaha) contributed 408 and 212 hours, respectively, working on public use activities in the visitor center.

- Foreign graduate student intern Tadashi Mizusaki (University of Nebraska - Lincoln) contributed 304 hours working with museum artifacts.

- Jack Brownrigg was awarded the 2000 hour pin to recognize years of working with school groups and censussing waterfowl populations. Five hundred hour pins were awarded to Pat Jensen, Gary Caldwell and the Freeman Family.

- The Annual Volunteer Recognition Luncheon was held December 8 at noon. The 25 minute video "Snow Geese in Peril" was shown with follow-up comments by Steve Van Riper. In addition to awards, volunteers were given Hollingsworth National Wildlife Refuge calendars and volunteer logo key chains. Sixteen volunteers and nine staff attended.

- Museum operations benefitted greatly from the help of very dedicated volunteers who assisted in nearly all aspects of the museum. Volunteers helped by organizing and upgrading storage of archival photographs and museum objects, organizing original

laboratory processing cards, handling environmental monitoring programs including remote data loggers and IPM, recording location changes, maintaining the library, rotating textiles and helping with numerous other miscellaneous tasks.

Boyer Chute NWR - DeSoto staff continues to provide administrative and management functions for this refuge, although it is officially a Region 6 refuge. Eventually Region 6 will fully staff this refuge, presently only one FTE is assigned, and manage it as an independent stand alone refuge. Until then DeSoto will continue to divert staff resources to develop and manage this new refuge. No timetable has been established for Boyer Chute to begin independent operations. A separate annual narrative for this fiscal year has been published by DeSoto staff for Boyer Chute.

8c Maintenance

Major maintenance activities either started and/or completed this fiscal year were:

- Construction was started on a new rock service road on the refuge's "center island". This road replaces a service road which suffered from chronic tree and shrub encroachment which interfered with vehicle movement, especially farm implements. The road was sited far enough into an adjacent crop field that nearby timber would not interfere with any traffic. Completion is planned for the winter of 1999-2000.

- Rehabilitation contract with Waldinger Corporation, Omaha, NE for the heating, ventilation and air conditioning (HVAC) units at the visitor center was completed.

- A culvert through a flood control levee on the west edge of the refuge was removed in the spring to aid water drainage from private cropland adjacent to the refuge. The culvert was thought to be at least partially plugged and restricting drainage. It was removed with the intent of immediately replacing it with a new culvert. However, persistent spring and summer rainfall kept the excavation site too wet to install the new culvert. Finally, in the fall it was decided to bridge the breech in the levee with the beds of two flatbed rail cars laid side-by-side.

- Crushed limestone was spread over the seasonal public road from the Bob Starr Overlook to DeSoto Avenue improving its utility for large vehicles such as commercial buses.

- Two pit toilets were replaced with lined concrete vault toilets.

- Visitor Center fire alarms were tested to ensure all were functioning properly and to replace or repair those that were not functioning properly.

- A new pole building was purchased to replace lost storage capacity when several years ago one of the bays in the eight stall garage was retrofitted to house the water storage and treatment equipment for the headquarters complex.

8d Safety

Monthly safety meetings and Quarterly Safety Committee meetings were held throughout the year. The intent of these meetings is to update and train personnel, and resolve any safety concerns that arise during the year. Safety meetings are assigned to individual staff members who are then responsible for providing programs. Topics this year included: thin ice, scenarios in self defense, tornadoes, lightning, eating healthy, bomb threats, lyme disease, back injuries, fire drill and winter dangers.

Quarterly safety meetings/inspections were conducted during the year, with concerns presented to the Refuge Manager. All concerns were addressed with the majority being corrected. Some still to be corrected due to funding or further investigation.

The station's Environmental Compliance Audit is discussed in Section 8e.

During the year, all fire extinguishers were checked, proper first aid kits and universal precaution kits were made available to staff, required physicals for fire and law enforcement personnel were provided, water samples were taken and analyzed and finally two of the three lyme disease vaccination series were provided to personnel that were determined as needing this precaution.

8e Compliance

An Environmental Compliance Audit was conducted by RO Safety Officers in August. Deficiencies were noted and corrective actions have been completed on several. A number of the deficiencies require the entire staff to do their part to prevent unsafe working conditions for staff and visitors. Hazardous materials removal, drinking water requirements, general house keeping and proper storage of equipment and flammable items are some of the most noted items needing attention.