Neal Smith
National Wildlife Refuge

Prairie City, Iowa

Fiscal Year 1999

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Refuge Manager Date

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Program Supervisor Date

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Program ARD Date

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INTRODUCTION

The Neal Smith National Wildlife Refuge and Prairie Learning Center is among the most unique and valued initiatives in restorative landscape ecology in the United States. The Refuge is located in Jasper County, Iowa, approximately 20 miles east of Des Moines. Prior to Euro-American settlement, the rolling landscape of this portion of Iowa was dominated by tallgrass prairie with islands of oak savanna.

Establishment of the Refuge by the U. S. Fish and Wildlife Service was authorized by Congress on May 25, 1990 for the purposes of restoring native tallgrass prairie, wetland, and woodland habitats; serving as a major environmental education center providing opportunities for study; providing wildlife dependent outdoor recreation benefits to the public; and providing assistance to local landowners to improve their lands for wildlife habitat.

The 8,654 acre project is unlike any existing refuge in that it has been established by Congress to restore a major expanse of tallgrass prairie. The Refuge is the largest prairie reconstruction effort in the country and is symbolic of a growing national and international interest in healing the environment.

HIGHLIGHTS FOR 1999

- To date, over 2000 acres of refuge land have been planted to prairie.
- The Refuge's first ever YCC program was initiated.
- The Friends of the Prairie Learning Center Bookstore grossed over $60,000 in sales.
- Two hundred ninety-five volunteers contributed over 9000 hours.
- Almost 12,000 students participated in EE programs at the Prairie Learning Center.
- Floral Coefficient of Conservation List for Iowa was developed.
- Liessa Thomas' master's thesis, *Breeding Birds of a Large-Scale Tallgrass Prairie Restoration in Iowa* was completed.
- Iowa Department of Natural Resources' study, *Contribution of Baseflow to Nonpoint Source Pollution Loads in Agricultural Watershed* was completed.
- Six elk from the National Bison Range were transferred to the Refuge.

1

Monitoring and Studies

1.a. Surveys and Censuses

The Neal Smith NWR Research Advisory Committee continues to be a valuable asset in implementation of our research program, which includes both monitoring and discrete investigative research projects. This committee consists of scientists and land management professionals and provides a diversity of expertise and perspectives about research in ecological restoration. This committee reviews research proposals, assists in developing research priorities, and assists in promoting the research program at Neal Smith NWR. Current members include: Pauline Drobney, Refuge Biologist; Nancy Gilbertson, Project Leader; Dennis Keeney, Director of the Leopold Center for Sustainable Agriculture; Erv Klass, Unit Leader of the Iowa State University Research Cooperative Unit; Jim Mattsson, Region 3 FWS Regional Biologist; Jim Pease, Iowa State University, Animal Ecology Professor; Jerry Selby, Director of Science and Stewardship, Iowa branch of The Nature Conservancy; and Daryl Smith, University of Northern Iowa, Biology Department Professor. A formal Research Advisory Committee Meeting was held on December 4, 1998. Communications about research issues were active throughout the year via e:mail and telephone.

Floral Coefficient of Conservatism List Development
From March 9-11, 1999, Neal Smith NWR invited several botanists to assist in developing coefficients of conservatism for Iowa, following the Floristic Quality Assessment Technique detailed by Floyd Swink and Gerould Wilhelm in the Plants of the Chicago Region (1994). Participants included Gerould Wilhelm, Conservation Design Forum; Daryl Smith, University of Northern Iowa Professor; John Pearson, Community Ecologist for the IDNR; Dean Roosa, private ecological consultant; Mark Loeske, IDNR; Dianna Horton, Curator of University of Iowa Herbarium; Deb Lewis, Curator of Iowa State University Herbarium; and Pauline Drobney, Refuge Biologist.

After an intensive three day session, a preliminary list of coefficients of conservatism was developed for the entire native flora of Iowa. This list provides an indication of the relative fidelity of each species to a high quality natural community. An eastern white fringed prairie orchid (*Platanthera leucophaea*), for example, would only be found in a high quality natural community, but a giant ragweed (*Ambrosia trifida*) is genetically designed

to thrive in areas of extreme disturbance. On a scale of 0-10, with 10 indicating high fidelity to a natural community and 0 indicating no such fidelity, the white fringed prairie orchid might receive a value of 9 or 10 and ragweed a 0. Species receiving a ranking of 5 would be found in a natural community, but that natural community would be likely to be of high quality only 50% of the time.

The Floristic Quality Assessment Technique will allow evaluation of the quality of natural communities as they develop on the Refuge and will provide an excellent tool for adaptive management. This tool can be used by scientists and land managers for many other purposes where an efficient and repeatable technique is needed to evaluate quality of a natural community.

Members of the sedge and raspberry genera (the *Carex* and *Rubus* genera respectively) are being reviewed by additional experts.

Breeding birds of a large-scale tallgrass prairie restoration in Iowa: Monitoring abundance and frequency of occurrence. Liessa Thomas, MS Thesis; Iowa State University. Advisor: Dr. Erwin E. Klaas.
In 1999, Liessa H. Thomas, graduate student at Iowa State University, along with Dr. Erwin E. Klaas, her major advisor, and other research assistants, completed her thesis research, monitoring of frequency and abundance of breeding birds on restored tallgrass prairie.

Using GIS landscape coverages, they initially selected approximately 25 randomly chosen points in each of four habitats: cropland, herbaceous (including native prairie, reconstructed prairie and non-native cool season grasses), riparian, and woodland. Point-count monitoring was conducted during the summer breeding season in 1994-1998.

Results showed a total of 91 summer resident species were detected, including 8 grassland-specific species. Also short-eared owls, and Northern Harriers, both on Iowa's endangered species list, were observed on the Refuge during the breeding season, though rarely within a point-count radius.

Total species diversity and richness were lowest at cropland points every year. Riparian points had the highest total species diversity in four of the five years and highest species richness each year. Herbaceous points contained the highest total species diversity in 1995, second highest total species diversity in 1994, and second highest species richness in 1998. Woodland points contained second highest total species diversity in 1994, 1996, and 1997, and second highest species richness in 1994, 1995, and 1996. The difference in species richness between vegetation types was significant.

Grassland-specific species analyzed as a guild were detected most frequently at herbaceous points and least frequently at woodland and cropland points. All other species, as a group, were detected most frequently at riparian points and least frequently at cropland points from 1994-1997, and least at woodland points in 1998. As a group, grassland birds showed

a significant decline at cropland sites and a significant increase at riparian points, while results for herbaceous and woodland points were inconclusive. As a group, all other species showed a significant increase at cropland points and significant decline at woodland points, with inconclusive results for herbaceous and riparian points.

Henslow's Sparrow Observation
During Summer, 1999, Craig Olawsky, Neal Smith NWR Operations Specialist, conducted breeding bird surveys consistent with methodology used in past breeding bird point counts. On June 9, as an observation independent of the point count, Craig reported five singing male Henslow's sparrows (*Passerherbulus henslowii)*. Three were observed in the extreme northeastern portion of the bison-elk enclosure, and two in the southern half. Within a week, Craig had spotted a female as well.

1.b. Studies and Investigations

The effects of seeding method and early mowing management of plant diversity and community composition in new tallgrass prairie reconstructions. Scott Moeller, MS Thesis; Iowa State University. Advisor: Dr. Thomas Jurik.
Scott Moeller, Masters Degree student from Iowa State University, with major professor Thomas Jurik, studied the effects of mowing and seeding treatments on a newly constructed prairie.

Mowing showed strong effects on both first-year and third-year community composition in prairie reconstructions. The benefits of mowing depended on the height of the cut and also the maturity of the site. On younger sites (0-2 years), high richness, diversity, and vegetative quality resulted when the vegetation was maintained at 10-15 cm. throughout the growing season. On a first-year site, extremely short (5-6 cm) cutting heights caused a decrease in richness, diversity,and vegetation quality, presumably due to direct damage to seedlings, or by inducing sun-scald and dry soil conditions. On older sites (2-3 years) the optimum mowing treatment maintained 6-25 cm, suggesting that extremely low cutting heights lead to further increases in species richness, diversity, and quality, while controlling the spread and dominance of native grasses. Regardless of the age of the reconstruction or the dominant weed cover, mowing had a universal effect of increasing species richness.

Results showed that relatively deep seeding (4-5 cm.) can benefit native grasses and lead to high species richness. However, the success and quality of other plant groups is compromised. An intermediate (3 cm.) seeding was the most successful in fostering a rich and diverse community of grasses and forbs without increasing weed density. There was limited success in surface sowing seed, yielding low richness, diversity, and vegetative quality. It was suggested that depth of seeding be tailored to the individual site. On consistently moist lowlands, very shallow planting of all seeds may lead to optimal native diversity. On dry upland sites, deeper planting may lead to highest diversity.

Meredith Borchardt, also an Iowa State University Masters Degree student, continued the mowing treatments in 1999. The plots were split and either mowed or not mowed using several different mowing treatments (heights). This established a sequence of plots that will have been mowed for different number of years after seeding including "unmown control" plots that were seeded but not mowed in the first year after planting. Plant community composition was measured in August and September; data analyses will continue throughout year 2000.

The potential effect of herbivorous rodents on plants growing on or near gopher mounds in a prairie reconstruction. Kelly Wolf-Bellin, PhD Project in-progress; Iowa State University. Advisor: Dr. Kirk Moloney.

Kelly Wolf-Bellin, a PhD student at Iowa State University, is studying the role of small mammals in limiting the establishment success of desirable plant species. Created, artificial mounds were sowed with different plant species, to determine the possibility that gopher mounds could be sites of introduction of plant species diversity into a dense sward of warm season grass. The role of small herbivores is potentially an important affect on the survival of growing seedlings. As such, herbivory on plants is being monitored, and small herbivorous mammals. Bellin is determining the distribution and abundance of voles, and the impact of these animals on the establishment success, distribution, and abundance of native prairie plants.

Restoring the Regal Fritillary Butterfly (*Speyeria idalia*) and its host plant (*Viola pedatifida*) at Neal Smith National Wildlife Refuge. Dr. Diane Debinski; Professor of Animal Ecology; Iowa State University.

Dr. Diane Debinski and her students are continuing to work toward reintroduction of the prairie endemic butterfly, *Speyeria idalia*, the Regal Fritillary butterfly to the Refuge. Prairie restoration efforts have the potential to provide new habitat for this rare species. Experimental plots have been established to test hypotheses regarding the use of various management techniques (fire, grazing, and control) to restore *Speyeria idalia's* host plants (*Viola pedatifida*). The National Fish and Wildlife Foundation has approved a grant of $31,000 for NS NWR in order to begin this project. Preliminary results indicate that the violets are responding more favorably to burning than to the control treatment. Data is not yet available for effects of grazing on *Viola pedatifida*. Once these plantings are established, *Speyeria idalia* will be reintroduced to the experimental plots. Burning treatments will then be curtailed.

Contribution of Baseflow to Nonpoint Source Pollution Loads in an Agricultural Watershed. Dr. Keith E. Schilling and Dr. Calvin F. Wolter; Iowa Department of Natural Resources.

Keith E. Schilling and Calvin F. Wolter of the Iowa Department of Natural Resources studied the nonpoint source pollution at the Walnut Creek watershed. Nonpoint source pollution from baseflow ground water was estimated in the Walnut Creek watershed by measuring chemical loads (discharge multiplied by chemical concentration) of atrazine, nitrate, chloride and sulfate at 18 tributary creeks and 19 tiles. Loads were measured during a stable baseflow period at creeks and tiles that discharged into Walnut Creek between two

stream gauges. Chemical concentrations of atrazine (<0.1-12 ug/L), nitrate (0.1-15 mg/l), and chloride (1.5-26 mg/l) in water were similar for creek and tile samples. Water draining predominantly agricultural row crop areas had much higher concentrations than water draining restored prairie areas. Three methods used to estimate baseflow discharge in the watershed, 1) Darcy flux, 2) watershed discharge budget, and 3) discharge-drainage area, yielded similar results (31.2 l/s to 62.3 l/s). Baseflow loads to the main channel were estimated by subtracting the loads from the upstream gauge, creeks and tiles from the total load measured at the downstream gauge station. Baseflow concentration for atrazine ranged from 0.15-0.29 ug/l and sulfate concentration ranged from 32-64 mg/l, whereas concentrations for nitrate and chloride were negative (-1 to -4 mg/l). Calculated baseflow concentrations of atrazine and sulfate appeared to be reasonable estimates, but negative concentrations of nitrate and chloride imply either loss of chemical mass in the stream from upstream to downstream sampling points or measurement error. Load data suggest very little contribution from baseflow pollutants to Walnut Creek water quality, with most of the pollutant load derived from major tributary creeks. Results from this study have implications for determining TMDLs in agricultural watersheds where contributions from point sources (creeks and tiles) can be used to estimate loads from nonpoint source ground water inputs.

Prairie Restoration as a BMP for Watershed Water Quality Improvement. Dr. Keith E. Schilling and Dr. Calvin F. Wolter; Iowa Department of Natural Resources.

Keith Schilling and Calvin Wolter have studied the prairie restoration and water quality improvement on the Walnut Creek Watershed at Neal Smith NWR. They sampled 81 tributary creeks and drainage tiles over a two-day period, with assistance from Refuge staff and volunteers during baseflow conditions to determine the source of elevated nitrate concentrations in the watershed. Nitrate concentrations ranged from <0.1 mg/l to 19 mg/l, with highest concentrations (>15 mg/l) found in headwater areas of many subwatersheds. Water draining restored prairie areas had nitrate concentration less than 1 mg/l. Nitrate loads (concentration times discharge) and loads per acre were greatest in nine headwater drainages located in four subwatersheds. Nitrate loads exceeded 0.1 kg/day/ha in these drainage areas, which, despite constituting one third of the land area in the watershed, contributed more than 50% of the total nitrate load. Land use in these nine headwater drainages averaged more than 90% row crop. Nitrate loads in prairie were less than 0.02 kg/day/ha. A linear relationship between nitrate concentrations and percent row crop in subwatersheds was statistically significant. Results of this study have implications for placement of BMPs in similar watersheds to achieve water quality improvements on a watershed scale.

Class Related Studies

Neal Smith NWR has provided the opportunity for students and classes to carry out class related studies on the Refuge. Despite sometimes disappointing results, the Refuge provides a training ground for budding biologists. The following projects were conducted by students in 99:

Population study of weasels (*Mustela spp.*) by live trapping at Neal Smith National Wildlife Refuge. Todd Bush, Undergraduate Research Project; Central College, Pella, Iowa. Advisor: Dr. Howard Whidden.

Todd Bush, a Central College student, conducted a study in an attempt to capture and identify species of weasels (*Mustela spp.*)during the Spring. Live traps were set in riparian, oak savanna, and prairie habitats. Habitat preferences were to be compared using collected data. No weasels were trapped in the short time span, though weasels have been recently sighted by Refuge staff.

The effects of prairie management techniques, burning and mowing, on Iowa grassland breeding bird communities. Tammy Koontz, Undergraduate Research Project; Grinnell College, Grinnell, Iowa. Advisor: Dr. Chris Rogers.

In Summer 1999, Grinnell College student Tammy Koontz, supervised by Dr. Chris Rogers, conducted a study to compare the grassland breeding bird populations in mowed and burned prairies. Results showed that most bird species preferred areas of prairie that had been burned, rather than mowed as a management method. Only a small number of species showed higher abundance in mowed areas. This suggests that management practices should be determined based on desired forb diversity as well as avian diversity and that uniform management practices may degrade preferred habitats of certain grassland breeding birds.

Interpretation of Research

All researchers approved to do research at Neal Smith NWR are required to provide some form of interpretation of their research findings upon completion of research. A 1997 study was conducted by student Lisa Busch, a University of Northern Iowa, Biology Department M.S. Student to compare the decomposition rates of prairie hay to the abundance of soil microarthropods in three vegetative areas. These areas included native prairie, 1994 reconstructed prairie, and 1997 reconstructed prairie. In addition to formal scientific presentation of research (1997-98), the research was then used to create an interpretive brochure about soil microarthropods, which will be incorporated into our educational and outreach programs.

2

Habitat Restoration

2.a. Wetland Restoration

On-Refuge

Nothing to Report

Off-Refuge

Staff provided technical assistance to other agencies and private landowners on wetland restoration. Numerous acres were protected by the Wetland Reserve Program (WRP) of the Natural Resources Conservation Service (NRCS), and Refuge staff provided much assistance within this program. Refer to 5.c Private Lands Activities.

2.b. Upland Restoration

On-Refuge

In 1999, planting plans were developed to plant native local ecotype prairie seed originating from Refuge harvests on 240.8 acres of former cropland and cool season exotic grassland. Approximately 1,963 lbs. of live seed (3,177 lbs. bulk) was reserved for planting. Mesic, wet-mesic, savanna, "canary buster" (for areas dominated by reed canary grass) and savanna mixes were developed as well as a forb dense custom mix designed for high visibility areas along roadways.

Seeding rates (viable seed) were approximately 12 lbs/acre on mesic sites, 9.5 lbs/acre on wet-mesic and savanna areas and 7.5 lbs/acre on reed canary grass areas. Seeding rates for forb rich mixes varied depending on the site; some were overseedings.

Planting of some areas was designed to occur in late winter or spring after cool season exotics were burned and treated with herbicides. As such, 179.5 acres were planted in this fiscal year, with 61.3 remaining to be planted.

Highway 163 Planting
Highway 163, formerly forming the northern refuge boundary, was converted from a two-lane to a four-lane highway within the last year. Mitigation for crossing the northeastern portion of the Refuge included planting of a forb-rich planting on both roadsides for approximately 3 miles, and in the Prairie City interchange areas. Approximately 1040 lbs. of grass seed and 971 lbs. of forb seed from Neal Smith NWR local ecotype zone were planted by A-1 Seeding for the Iowa Department of Transportation. This mix included 6 grass species and 21 forbs that should support a show of bloom from spring through fall.

Seed Harvest
A team of approximately 100 volunteers assisted in collecting seed of 136 species of forb, sedge, and grass seed on 51 sites, as well as collections on the Refuge by students involved in environmental education programs. These collections represent species that characterize tallgrass prairie and savanna ecosystems but that are poorly represented on the Refuge because they are available in limited quantities. In addition, some of these species are rare or seem to need a matrix of prairie species in order to establish and thrive.

Hand collection was focused on obtaining seed from spring and summer as well as the usual fall seed collections, though early season seed collection tends to be more labor intensive because low growing spring blooming species are quickly obscured by the increasingly tall and profuse summer and fall prairie biomass.

Students assisted in hand collecting seeds.

In addition to focusing on collecting throughout the growing season, seed pickers were asked to obtain seed from as many gene pools as possible within approximately 20 miles of the Refuge in order to develop a diverse gene pool source for future production plots. This increased travel time for volunteers who needed to travel from site to site to collect seeds of several species as they ripened. As a result, our cleaned seed amount was lower than in past years, but included species that are difficult to obtain and collect in our area such as prairie violet (*Viola pedatifida*), prairie lily (*Lilium philadelphicum*) and yellow star grass (*Sisyrinchium campestre*).

A small amount of prairie or slender bush clover (*Lespedeza leptostachya*), a species listed on the Federal Endangered and Threatened Species List as threatened, was also collected for future germination and reintroduction studies.

Seed cleaning equipment purchased this year included a seed sieve shaker and a Dakota blower (air column). Both of these have increased the ease of seed cleaning of small lots of seed. Because volunteers enjoy using these pieces of equipment, we are able to attract more volunteers to clean seed at the Refuge. As a result, more seed is cleaned to a greater degree in less time.

Machine Harvest

Planting projections for the year 2000 were reduced from the average 350 acres per year planted in the past, to 150 acres. This reduction will allow us to address weed problems, to interseed with hand collections on the rest of the Refuge, as well as to focus on development of seed production plots. Despite the reduction in seed needs projected for 2000, approximately 31,000 bulk lbs. of seed were harvested on-site in a cooperative effort between the Refuge, Iowa Private Lands Office (IPLO), and the Iowa Department of Natural Resources. In this effort, the Refuge provided harvesting sites, equipment for harvesting and drying seed and storage facilities; IPLO provided harvesting effort; and Iowa DNR provided 1 FTE during harvest season. Of this harvest, we retained approximately 4,800 bulk lbs., and the IPLO received 26,300 lbs.

Of the seed retained by IPLO most was provided to the Iowa Department of Natural Resources (IDNR) to assist in development of local ecotype seed bases and to develop large scale ecological restoration projects. As such, the Saylorville Wildlife Unit (IDNR) received 22,760 lbs. for projects near Ledges State Park, and at Bays Branch Wildlife Unit near Panora. An additional 2,540 was transported by the Red Rock Wildlife Unit (IDNR) for use in the large scale Chichaqua Project (approximately 7,500 acres) near Des Moines. An additional 1,000 lbs. will be used in various projects in Warren County and in other areas as needed.

Management of Remnants

Approximately 3 acres of woody species have been selectively removed from prairie and woodland communities on the Refuge primarily by volunteers and students involved in environmental education experiences. A December 1998 burn of the Thorn Valley Savanna resulted in an increase in annual weed species in some areas that had formerly been

dominated by a dense woody overgrowth, and in woodland wildflowers, sedges, and grasses in other areas.

Hundreds of orchids of each of three species including twayblade (*Liparis liliifolia*), showy orchis (*Galearis spectabilis*), and nodding ladies' tresses (*Spiranthes cernua*) were manifest and blooming profusely in summer of 1999 in the Buzzard Head Prairie remnant. A special project of one of the Prairie Builder Interns was to evaluate numbers of orchids and make management recommendations. As a result of this study and efforts by the Friends Prairie volunteers, orchid populations were found to be far more extensive than originally believed. The twayblade and showy orchis are primarily species of woody communities and the nodding ladies' tresses of prairie communities. Several young oaks and a number of characteristic prairie species in this area indicate that the area would most appropriately be managed as a savanna remnant.

Propagation

A two-ply polyethylene greenhouse dedicated to propagation of prairie and savanna plants was constructed this year. This 27 foot by 48 foot greenhouse has rolling benches to maximize space and automatic irrigation and environmental controls. It will be used to propagate plant species that are rare or difficult to obtain or establish in the field. These plants will be later transferred to production plots or strategically transplanted into plantings or remnants.

Thanks to our Friends group for many hours of work.

Friends' Prairie

The Friends' Prairie was developed approximately two years ago to allow the Refuge to accelerate development of 20 acres of planted prairie and remnant prairie and savanna areas in an area that is highly visible to the public. It is located along the east end of the Tallgrass Trail near the Prairie Learning Center, and is being stewarded by a dedicated group of Friends of the Prairie Learning Center. Phyllis Johnson, the Friends' Biodiversity Coordinator coordinates work days every second Saturday of the month. Refuge Biologist Pauline Drobney develops a work priority for the day and works along with Friends to complete the task. These fun work days give Friends the opportunity to understand the challenges of ecological restoration of the Refuge first hand, and not only assists the restoration process, but provides a foundation for interpretation of the Refuge to the public they address on our behalf.

The Friends' Stewardship Saturdays have grown in popularity. In the early days approximately 6-10 people typically showed up. Recently, 50 people have come to cut trees, pull weeds, plant seeds or participate in other projects on the Refuge. Special thanks to the stewards of the Friends Prairie for their fine work on the prairie!

Stewardship Saturdays involve many.

Friends' Biological Interns

During the summer of 1999, three nine week internships for college students were sponsored by the Friends of the Prairie Learning Center. Interns included Angela Sokolowski, of Iowa State University in Ames, Sarah Stevens, of University of Missouri in Columbia, and Emily Lutgen, of Grinnell College in Grinnell. Work of the students focused on ecological restoration and research at the Refuge, but included environmental education and operations-type work as well. Not only did the Refuge benefit from the excellent work that was provided by the interns, but the interns were offered the opportunities to get down to the nitty gritty in grappling with ecological restoration problems and techniques that can

be exciting, frustrating, and difficult, sometimes all at once. Interns participated in the following experiences:

- planted 990 prairie violets (*Viola pedatifida*) in 10 plots (5 in bison area, 5 south of PLC) and provided follow-up care of plantings as a part of a regal fritillary butterfly reintroduction project (see Research).

- participated in control of exotic species including Canada thistle *(Cirsium arvense*), musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), and tall thistle (*Cirsium discolor*), reed canary grass (*Phalaris arundinacea*), and sweet clover (*Melilotus alba* and *M. oficionalis*).

- propagated prairie plants from seed and from vegetative cuttings, transplanted seedlings to 8 inch conetainers, and transplanted several species of greenhouse grown plants to prairie plantings. Learned and performed greenhouse care including fertilization, and kept records of care.

- collected prairie seeds in prairie remnants and dried and processed seed. Interns participated in developing the 1999 seed inventory also learned and performed techniques of prairie interseeding.

- assisted in planning and installing a misting system in the propagation greenhouse.

- provided leadership by interpreting the ecology of the Refuge and by leading stewardship activities during two Friends Stewardship Saturdays,and during Buffalo Days.

- led teachers participating in Iowa Corps in stewardship activities.

- participated in breeding bird point-counts with Refuge staff member, Craig Olawsky.

Each intern was responsible for a special project. Angela performed a literature search on thistle control and proposed optimal management techniques for Canada and musk thistles. Emily monitored and proposed a management plan for two species of orchids on the Buzzard Head Prairie. Sarah tested viability of seeds being stratified and developed an information base that will help form us develop next year's production plots. Interns were provided opportunities to develop leadership and public speaking skills by providing presentations to approximately 200 participants in the Integrated Roadside Vegetation Conference field trip to the Refuge, and to teachers participating in the Iowa Corp.

The Refuge also provided the opportunity for all of the interns to participate in the 1999 Iowa Prairie Conference held in Cedar Falls, Iowa.

Off-Refuge

Staff provided technical assistance to numerous individuals and other agencies on upland restoration. Approximately 3,000 acres were restored to tallgrass prairie habitat. Refer to 5.c Private Lands Activities.

2.c. Deepwater/Riverine Restoration

On-Refuge

Nothing to Report

Off-Refuge

Nothing to Report

3

Habitat Management

3.a. Water Level Management

Nothing to Report

3.b. Moist Soil Management

Nothing to Report

3.c. Graze/Mow/Hay

There is no grazing or haying to report. However, mowing plays an integral part at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 1,000 total acres were mowed in FY99, consisting of prairie plantings, firebreaks, demolition sites, and weed management sites.

3.d. Farming

Nothing to Report

3.e. Forest Management

See 2.b. - Upland Restoration

3.f. Fire Management

Following are summaries of burns conducted this fiscal year:

Site Name: Prairie Learning Center; 19 April 1999; 397 Acres
The ecological purpose of this burn was to suppress cool season exotics including smooth brome (*Bromis inermis*), Kentucky bluegrass (*Poa pratensis*) by burning when these species were actively growing.

Cool season exotic grass species dominated approximately 80% of the burn unit, and were actively growing. Brome was approximately one foot tall, and burned slowly but fairly well. In prairie plantings where, Canada wild rye (*Elymus canadensis*), was a major component, fire moved sluggishly. Canada wild rye, a cool season native grass species, was approximately 18 inches tall, and duff was poorly developed in one to two-year old plantings.

Winds were 5.4 to 15.8 and out of the northwest; relative humidity was 51% initially, and dropped to 24%, and then increased to 53% before the fire was declared out. In older plantings, fire moved poorly through areas with sparse vegetation or stalky fuels. As such, a narrow pattern of ignition was needed in this unit.

Two track trucks each with a 2-person team were used to ignite in a methodical pattern creating parallel strip-fires through fuels. The result was a burn of approximately 50% of the available vegetation.

Warm winter temperatures, beginning in February, resulted in a long growing season for cool season exotics and thus unusually well developed plants early in the normal growing season. Though ecological burn objectives were met, burning a week or two earlier could have resulted in a more complete burn that still resulted in cool season exotic suppression, considering the early growing season.

Site Name: Flaherty Burn Unit; 29 March 1999; 169 Acres
Fuels were dry; fire proceeded quickly and efficiently, taking only an hour from start to finish. Winds were approximately 6 mph at 225°, with relative humidity at 21%. Fuels were dry and burn conditions optimal. An impressive set of three fire whirls originated from the center of the unit and lofted vertically.

Site Name: North Savanna Unit; 29 March 1999; 50 Acres
Winds were variable, causing us to proceed with caution. Winds were out of the south, southwest, at 5-8.5 mph; relative humidity at 21%, climbing to 40% near the end of the burn. A wet area to the south burned slowly, because of the presence of discontinuous dry areas. Some snags caught fire in this reed canary grass-dominated wetland with some trees.

A prescribed burn produces an impressive whirl.

Site Name: Savanna and South Savanna; 24 March 1999; 103 Acres
We proceeded slowly and cautiously in tall, dry fuels on the south half of this unit. The wind was out of the north, varying from 12-13.9 mph; relative humidity began at 70%, peaked at 81%, and dropped to below 27% before declared out. A backing fire was developed and carefully observed until approximately a third of the south unit was burned, creating a broad band (approximately 300 feet) of blackline. A headfire was lit in the tallgrass and the fire was fairly complete in native grass dominated area. A head fire was then ignited on the north side of the woods.

In the woods, air was nearly stagnant except in areas where significant cutting of fire-intolerant trees had occurred. Fire moved slowly in most of the savanna, and actually burned significant fuels only in approximately 15% of the woodland. Increasing humidity and decreasing temperature toward the end of the burn day when the savanna was ignited, contributed to poor burn conditions. It appears, however, that in such a degraded savanna, higher wind speeds than prescribed will be necessary to assure a successful woodland burn.

Site Name: Learning Center-Bison Area; 12 April 1999; 53 Acres
Winds were out of the west, northwest at 3 to 7.8 mph.; relative humidity was at 38-41%. Fuels were dry, and the fire moved efficiently through the unit.

Site Name: South Unit (North Planting); 29 April 1999; 60 Acres
Burn proceeded efficiently throughout unit.

3.g. Pest Plant Control

Nothing to Report

4

Fish and Wildlife Management

4.a. Bird Banding

Nothing to Report

4.b. Disease Monitoring and Treatment

Nothing to Report

4.c. Reintroductions

Past wildlife reintroductions provided Neal Smith NWR staff with the first bison gathering on November 3, 1998. Two of our bison have been vaccinated for brucellosis as part of a federal research project. A member of the project from Montana assisted with our roundup. We put all of the herd (with the exception of one bull too large to fit down the alley way) through the handling facility; checking their weight and overall health. This year proved to be very interesting concerning the bison. To the best of our knowledge, one adult cow and four calves died due to apparent natural causes. However, six calves did prosper and at the time of this narrative our herd is up to 42.

Finally, after approximately 16 months, our four lonely bull elk were joined by five cows and a yearling bull. On April 28, 1999 we received six elk from the National Bison Range at Moiese, MT. Again, similar to the bison herd, we lost a bull to natural causes. One of the cows had a calf, so our elk herd now stands at ten.

Bison waiting in the handling facility.

The bison roundup was a success.

Regal fritillary introduction

ISU professor, Dr. Diane Debinski will be beginning efforts to reintroduce the Regal fritillary butterfly (*speyeria idalia)* in summer 2000. This rare prairie endemic species was formerly listed as category 3 on the threatened and endangered list. In preparation for this project, plots of prairie violets (*Viola pedatifida*) totaling approximately 1000 plants were transplanted to prairie sites in June 99. Together with plots planted in previous years, approximately 2000 violets have now been planted for this project. The violets are the only food source for Regal fritillary larva and are essential to the reintroduction.

4. d. Nest Structures

Nothing to Report

4.e. Pest, Predator and Exotic Animal Control

Nothing to Report

5

Coordination Activities

5.a. Interagency Coordination

See 2b., Upland Restoration on Refuge

5.b. Tribal Coordination

Nothing to Report

5.c. Private Land Activities

Approximately 30 individual landowners were visited in the field and were provided technical assistance on programs such as WRP, FmHA, and Partners for Fish and Wildlife. These private land activities affected approximately 3,000 acres. Over $40,000 were contributed by many different partners to projects within our Partners for Fish & Wildlife program.

6

Resource Protection

6.a. Law Enforcement

Law enforcement issues at the Refuge have never been a large problem. The majority of incidents or violations occur during the hunting seasons and even then there are relatively few.

One recurring problem is with hunters parking in Refuge field approaches and out in the fields. This was encountered at 17 different approaches on the Refuge. Drivers were not cited for this because it was not enforced during the pheasant hunting season. By deer hunting season, vehicles were parked even further into the field approaches. A solution would be to gate or fence off these approaches and construct designated parking areas.

The only Refuge Officer on staff for most of FY99 was ROS Bernie Petersen. Refuge Officer Tim Bodeen arrived in June and assisted ROS Petersen with the law enforcement program.

Four hunting citations were written in FY 99, which is minimal compared to the record number of hunters utilizing the Refuge. The Refuge had one car rollover that damaged 30 feet of the bison enclosure fence. The driver left the county road, rolled over in the ditch and slid to a stop along the bison enclosure fence. The Iowa State Patrol responded to the accident.

In FY2000, Park Ranger John Below will be attending the Land Management Police Training at the Federal Law Enforcement Training Center.

6.b. Permits and Economic Use Management

Neal Smith NWR issued eight special use permits in FY99. One was issued as a research tool to collect soil samples throughout the Refuge by the Iowa DNR, another was issued to remove horse manure and the remainder involved our farm program.

Cash rent continued as the method used for Refuge farming. The system is designed to allow the Cooperator a reasonable rent on the land while giving the government a good return on the operation. Rent ranges from $60 to $75.00 per acre which is comparable to rents collected in the area for low quality ground. Rent was collected in two installments, 30% due in May, with the balance due in December. Final rent figures are based on the Report of Planted Acres which each Cooperator submits to the NRCS. Deductions from rent figures include the cost of crop scouting at $5.00 per acre, mowing costs for buffer strips at $12.00 per acre, and any chemical application in preparation for ground being planted back to native plants by the Refuge.

Crop Scouting was utilized as a part of the Integrated Pest Management (IPM) program on the Refuge. The same company was used as in previous years, Farmers Co-Op Exchange of Prairie City. As noted above, the cost of this service was paid by the Cooperator and then deducted from his cash rent. Success of this program has been very good, giving both the Refuge and the cooperating farmers sound information and recommendations regarding the condition of the crops.

There was a total of 816.5 acres planted to corn, soybeans, or alfalfa. The Cooperative Farm Program acres continue to decline as we take out production to plant local ecotype seed.

6.c. Contaminant Investigation

Nothing to Report

6.d. Contaminant Cleanup

Nothing to Report

6.e. Water Rights Management

Nothing to Report

6.f. Cultural Resource Management

Nothing to Report

6.g. Land Acquisition Support

Nothing to Report

6.h. Threats and Conflicts

Nothing to Report

7

Public Education and Recreation

7.a. Provide Visitor Services

Several students enjoyed the Buffalo Program during their visit.

Public Education and Recreation
The Refuge recorded over 112,580 visitors in FY 1999. The majority of 47,000 Prairie Learning Center visitors participated in scheduled educational programs, events or tours. Public use staff provided 227 environmental education programs for 11,877 students during this period.

Public use staff conducted 51 guided tours of the Prairie Learning Center and Refuge for 1,476 visitors. Over 100 scheduled groups learned about the Neal Smith NWR and Prairie Learning Center during meetings and events held in the Center's conference rooms and auditorium. The Center received over 23,000 walk-in visitors. Due to gross inaccuracies with the in-road traffic counters, their numbers are not being reported this year.

In April, Outdoor Recreation Planner Dave Aplin transferred to Kileuea Point NWR after seven years of service as the head of public use. He was replaced by Tim Bodeen, who came to us from the Fergus Falls WMD/Prairie Wetlands Learning Center.

Exhibits and Facilities

The renaming process of the Refuge was completed in FY 1999 with the last of the interpretive signage being replaced. The next challenge is to replace visual graphics in the exhibits to reflect the Service's new uniform colors.

Artists featured in the J.N. "Ding" Darling Art Gallery included:

Susan Gardels, *To Reconstruct a Prairie* which consisted of ten illustrated poems
Iowa Federal Junior Duck Stamp contest winners
J.N. "Ding" Darling art contest entries
Friends of the PLC photography contest entries

The two-mile Tallgrass Trail was in major disrepair after heavy rains had washed away a majority of its aggregate surface. The trail was closed during a large portion of FY 99 for public safety. Late FY 99, the trail was resurfaced with asphalt and re-opened for public use. The asphalt surface was chosen to alleviate future trail erosion.

The flooring in the wet lab area was removed for public safety reasons. It had buckled and bubbled due to moisture saturating the concrete slab.

The three auditorium projectors needed to be repaired and adjusted by contractors several times in FY 99, because of failing fuses. It was suggested that we replace the outdated projectors with new models.

Work on the Travelers Information System was nearly completed during this period. Currently, we are waiting for FCC approval. The transmitting towers are located so travelers on State Highway 163 (near Prairie City) and Interstate 80 (near Colfax) can tune in to Refuge information.

Environmental Education Activities

Curriculum/Teacher Training:

Iowa Corps

The fourth annual Iowa Corps Teacher Training Program brought 30 Iowa educators to the Refuge for six busy days of habitat stewardship and workshop activities. Coordinators Janie Swartz and Bob Winklebock facilitated the workshop and the care of the Iowa Corps participants from their base camp at "William's Farm." Refuge staff provided instruction

and directed stewardship activities. Iowa Corps participants volunteered over 800 hours doing habitat stewardship projects.

Project Bluestem

During FY99, 75 teachers participated in five Project Bluestem (PBS) workshops. To date, over 245 teachers have attended PBS workshops, which introduces participants to the PBS curriculum and the Refuge.

The PBS curriculum revision also began in FY99. The revision will reflect the Refuge's name change, edit errors, and update curricula. The process should be completed in FY00.

School Programs

Approximately 11,877 students of all ages from 227 schools participated in scheduled activities at the Refuge. Over 90% of the school groups visiting the Refuge participated in day-long programs that utilized the PLC, trails, and public use staff. Following is a breakdown of environmental education customers by age groupings:

Level	# of Groups	# of Students
Elementary	94	5,877
Middle	46	3,803
High School	14	413
College	30	900
Day Cares	22	766
Home School	4	163
Teachers	46	488
All Grades	12	560

Students search for clues while participating in the scavenger hunt.

Numerous groups were turned away as the demand for environmental education programs exceeded the staffing availability. The addition of Callie Le'au Courtright in April allowed some expansion of the programming. Callie also serves as the Refuge's Volunteer Coordinator.

Traveling Educational Trunks
The Refuge's Prairie and Elk Traveling Educational Trunks were utilized by several school districts. The Prairie Trunk traveled to utilized by 11 school districts and the Elk Trunk sent to 9 school districts. The goal for FY00 is to send each trunk to 25 school districts.

A Song Bird Trunk was added in FY99. This educational trunk has curricula and materials for conducting song bird ecology activities.

Scouting
Approximately 2,063 scouts participated in on-site activities in FY99. Two Eagle Scouts completed their Eagle Scout projects at the Refuge.

7.b. Outreach

Special Events
Annual special events continue to be an important program element at the Refuge. When well marketed, the events draw large crowds of people who might not otherwise visit the Refuge. Following is a list of events held at the Refuge during FY99 which 1,963 visitors attended:

National Wildlife Refuge Week, A.C. Morris Feed and Seed, Cabin Fever Festival, Going Away Giving Away Party, Junior Duck Stamp, International Migratory Bird Day, Sow Your Wild Oats, Buffalo Day, Ding Darling Day, and Batty Day.

Restoration/Monitoring Seminars
The Refuge relies on volunteers to assist with a variety of biological monitoring and restoration activities. Volunteer training seminars and programs are offered to the general public to recruit new volunteers to specific Refuge restoration and bio-monitoring tasks. In FY99, special training was offered as follows:

Frog Survey, Butterfly Seminar, Early Seed Seminar, and Late Seed Seminar

Off-Site Programming
Refuge staff presented 56 programs to off-site groups during FY99. These groups included conservation agencies, natural resources professional groups, and service organizations.

Ecological Outreach and Information Sharing
Conference Field Trips
The Refuge hosted a field trip for the Integrated Roadside Vegetation Management Conference on September 2. Approximately 200 people attended.

Several ecological outreach efforts were provided to professionals and to the general public as a part of the Refuge's biological program. Among these efforts by Refuge Biologist Pauline Drobney were the following:

- Fielded 1,560 requests for technical biological assistance and advice. Requests originate from conservation organizations, land management professionals, scientists, educators, seed producers, students, and the general public.

- Provided a presentation to approximately 120 biologists at the USFWS Regional Biologist's Training Forum; Biology and the Ecosystem Approach in St. Louis, Missouri, on Feb. 10, 1999.

- Participated in a strategic planning session for the State Preserves Advisory Board of Iowa. State Preserves are parcels of land that are provided the highest legal protection in Iowa because of their high ecological or cultural significance.

- Hosted Paula Powers, a biologist from the USFWS National Fish Hatchery and Technology Center in San Marcos, Texas for three days. Paula had won a trip to Neal Smith NWR in a competition to develop the best monarch butterfly project in her region. She is beginning a prairie reconstruction project in her area and was especially interested in learning ecological restoration and prairie seed collection and plant propagation techniques. As such, Paula participated in many aspects of the biological program at the Refuge.

- Presented rationale for use of the Floristic Quality Assessment Technique to assist in making decisions about what species should be listed as threatened or endangered in Iowa. This invited presentation was a part of a State Endangered Species Expert Workshop to discuss controversial proposed changes to the state Endangered and Threatened Species List.

- Presented an invited paper detailing scientific and ecological restoration activities happening at Neal Smith during an Ecological Restoration Symposium at the Iowa Academy of Science on April 23, 1999.

- With Ron Cole, jointly addressed the National FWS Director, Jamie Rappaport Clark, and her staff in Washington D.C. to support funding of the Northern Tallgrass Prairie Habitat Preservation Project, on April 29.

- Provided an invited presentation about ecological restoration at Neal Smith NWR at the Iowa Wildlife Society Meeting, in Lamoni, Iowa, on June 21.

- Provided training in savanna management and restoration at Neal Smith NWR to 17 members of the Iowa DNR's Department of Forests and Prairies on July 9. This Division was named the Division of Forestry until this year. A concerted effort is being made by the Iowa DNR to provide a series of educational experiences to this

group of professionals who are being called upon to broaden the scope of their work to include prairie and savanna management as well as forestry. The work of this group is especially important because it focuses on interaction with private landowners.

- News Media: Among news stories printed was a full page story on the front page of the Science Section with three color photos in the New York Times on September 21, about Neal Smith NWR.

8

Planning and Administration

8.a. Comprehensive Conservation Planning

Nothing to Report

8.b. General Administration

Refuge Funding - FY99 as compared to FY 98		FY 99	FY 98
Refuge Operations	1261	$711,997	$710,595
RONS (1 FTE)	1261	44,000	
Volunteer Program	1261	6,400	8,900
Maintenance Management	1262	62,700	17,200
Private Lands	1121	7,000	10,000
Fire Management	9251	5,400	5,400
Hazardous Fuel Reduction	9263	11,660	44,375
Total		$849,157	$796,470

Refuge Staffing

Several staff changes occurred during FY 99. Callie Le'au Courtright entered on duty in January as a Student Trainee, GS-099-4. Callie graduated from Iowa State University in August. She was converted to Park Ranger, GS-0025-5/7 on September 12. Callie serves as the Refuge Volunteer Coordinator, in addition to her duties as Park Ranger.

In April, Dave Aplin transferred to Kilauea Point NWR in Kilauea, Kauai, HI. During the time Dave worked at our Refuge, he was instrumental in developing the EE program and played a major role in planning and making the Prairie Learning Center a reality. Tim Bodeen transferred from Fergus Falls Wetland Management District on June 6 to fill the position vacated by Dave.

We introduced the YCC program at the Refuge in June. Jennifer Counts joined our staff as Social Services Assistant, GS-186-5. She supervised four YCC enrollees: Tara Dahlgren (6/7-6/9/99), Rachel Jenkins (6/14-7/2/99); Casey Pierce (6/7-7/30/99) and Ryan Mattix (6/7-7/30/99). These individuals were able to complete several tasks which included: fence removal, landscaping, constructing fire barriers, refurbishing trails, removal of unwanted vegetation around sign posts and benches, and painting benches.

YCC employees and ROS Heisler take a break.

During the period, the station advertised for a Wildlife Biologist, GS-486-7/9, but were not successful in recruiting a qualified candidate. Wayne Byal joined the staff in July as a Maintenance Mechanic. This much-needed position was funded by a RONS project.

Below is a list of employees who were members of the staff at Neal Smith NWR during FY99.

Permanent Full Time	Grade	OD Date
1. Gilbertson, Nancy M. Refuge Manager	GS-13	09/98
2. Aplin, David A. Outdoor Rec. Planner	GS-12	01/92 Transferred 4/8/99
3. Tim Bodeen Park Ranger	GS-12	06/99
4. Petersen, Bernard J. Refuge Ops. Specialist	GS-11	11/92
5. Drobney, Pauline M. Wildlife Biologist	GS-11	03/92
6. Boot, Brian A. Maintenance Worker	WG-8	10/92
7. Wayne Byal Maintenance Mechanic	WG-9	07/99
8. Heisler, John E. Refuge Ops. Specialist	GS-9	04/95
9. Dykstra, Carla J. Administrative Tech.	GS-7	05/91
10. Mehl, Mary C. Park Ranger	GS-5	03/98
11. Below, John J. Park Ranger	GS-5	04/98
12. Courtright, Callie Le'au Park Ranger	GS-5	09/99
13. Van Ryswyk, Doreen Secretary (OA)	GS-5	08/97
Temporary/Term Appointments		
14. Olawsky, Craig D. Refuge Ops. Specialist	GS-9	12/93
15. Counts, Jennifer Social Svc Assistant	GS-5	06/99 Terminated 08/99
Student Temporary Experience Program		
13. Goldsmith, Kristen M. Park Ranger	GS-4	05/98 Terminated 12/98
14. Quijano, Christian F. Bio Science Aid	GS-3	05/98
15. O'Brien, Jason P. Park Ranger	GS-4	06/98 Terminated 06/99

Staff gathered in the Focus Teaching Area for a group photo.

Volunteer Program

Under the guidance of Refuge Volunteer Coordinator Callie Le'au Courtright, 295 volunteers contributed 9067.5 hours to the Refuge during FY99. A large variety of tasks was accomplished by these individuals. Below is a summary accomplishments:

- Water quality surveys & monitoring orchids
- Bird, regal fritillary butterfly, spider & beetle studies
- Prairie restoration: seed collecting, cleaning, analysis, transplanting & watering plants
- Control of non-native species
- Information Desk Attendant
- Outreach including environmental education & interpretive training
- General Administration

Charles Beall, a volunteer, cleans seed.

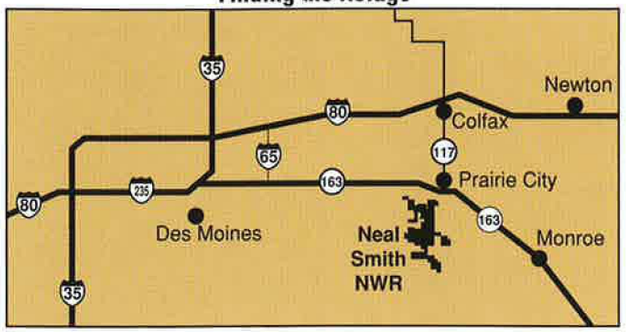
Friends of the Prairie Learning Center

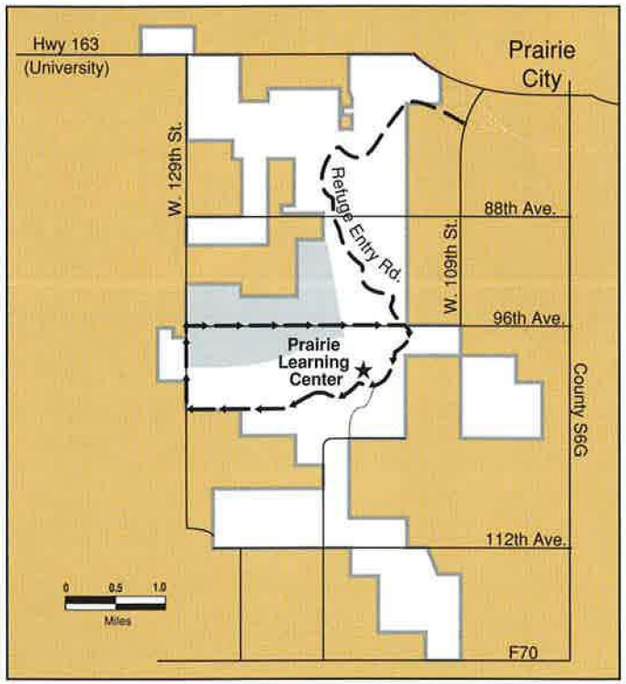
The support by the Friends continues to be a gratifying and motivating experience for the Refuge. Their efforts this past year included monetary support for untold lunches, dinners, and events. The Friends sponsored three college interns for 8 weeks to work on restoration projects. All tolled, the Friends provided over $25,000 toward Refuge goals and projects in 1999.

The bookstore has become a wonderful cornerstone for the visitor center. When we decided to stay open on weekends year-round, the store manager and staff jumped right in and made sure that the bookstore would be staffed on weekends in support of Refuge needs. They grossed over $60,000 in sales in 1999.

The Friends have also developed a terrific website which the Refuge has come to reply heavily upon for maintaining up-to-date information for the general public. The website, www.tallgrass.org, has an average of 1586 hits per day.

Finding the Refuge





Bison and Elk Enclosure

- Refuge Entry Road
- Refuge Boundary
- Roads
- Bison and Elk Range
- Auto Tour Route

Neal Smith National Wildlife Refuge
Prairie Learning Center, Box 399
Prairie City, IA 50228-0399

Phone: 515/994 3400

Web address:
http://www.fws.gov/r3pao/walnut/

U.S. Fish & Wildlife Service
1 800/344 WILD

U.S. Fish & Wildlife Service

Neal Smith
National Wildlife Refuge

American bison
USFWS photo

Neal Smith National Wildlife Refuge

Welcome back to the Tallgrass Prairie!

Over the last 150 years, we have converted the prairies to gravel roads and highways, to towns and cities, to farms and industries. We transformed it to the Midwest we have today. The tallgrass prairie that once covered part or all of 13 states is almost gone.

One hundred fifty years ago, tallgrass prairie covered 85% of Iowa's 36 million acres. *Today, only one-tenth of one percent of that prairie remains!* That's why Neal Smith National Wildlife Refuge exists -- to bring back some of the plants and animals that were the tallgrass prairie.

Paths of wind, Patterns of rain

If you travel across the Rockies from the west on Interstate 80, you climb the tree-rich and well-watered western slopes. As prevailing westerly winds rise up over the mountains, they release most of their moisture in the form of rain. By the time these winds blow down the eastern slopes and spill out onto the Great Plains, they are dry. The plants of these plains are low-moisture plants – prairie grasses and other flowering plants. The Great Plains stretch out to the east in a nearly treeless landscape. This short-grass prairie is typical of the western portion of what is called the "*prairie wedge.*"

As the winds proceed toward the east across the Plains, they collide with the moisture-rich winds sweeping up from the Gulf of Mexico and rainfall grows more plentiful. As more moisture becomes available, the prairie species gradually change – from mixed-grass species in Nebraska to the tallgrass species of Iowa.

The U.S. Congress authorized the acquisition of 8,600 acres – land purchased from landowners willing to sell. Within those acres, there are several miles of surfaced trails to wander and an auto tour to drive; both provide good opportunities to see bison, elk, deer and other prairie wildlife.

Prairie Learning Center

The Prairie Learning Center is at the heart of it all, teeming with fascinating exhibits for all ages – a place to see prairie research in action and *the* place to begin your visit.

As early Euro-American pioneers gazed across the seemingly endless prairie, they reasoned that "*If it can't grow trees, it must be poor ground,*" so they passed it by. Later, however, Iowa was found to contain some of the richest soils in the world.

Some day it may all look like this. But for now...

Meadowlark
B. Angus, USFWS

The tallgrass prairies provided a diversity of wild life – hundreds of plant species – over 350 species of birds – nearly 100 species of mammals – scores of amphibians and reptiles and fish – and uncounted thousands of insect species.

Often dry and unpredictable? To be sure. Lifeless and dull? Hardly.

Neal Smith National Wildlife Refuge offers a rare peek at this incredible collection of life we call the tallgrass prairie.

Canada Wild Rye
USFWS Photo

Lead plant
USFWS photo

Adaptation – the key to prairie life.

Coyote
USFWS photo

Take a driving tour through this developing remnant of our history. Search for the bison and elk herds in their native tallgrass habitat. Wander through the myriad of prairie blooms with a new show each week during the growing season. Lend a hand by helping plant prairie seeds in the spring. Take a walk among the open-grown oaks of the oak savanna with the ghosts of thousands of elk.

In the shortgrass prairies, trees were few, restricted almost entirely to the river bottoms. In tallgrass prairies, trees grew also in savannas - those scattered oases of tree groves with prairie plants beneath that dotted the tallgrass landscape. The trees were often oaks, burr oaks especially – trees with thick bark that could withstand the prairie fires. Their spreading branches provided welcome shade to the bison and elk that roamed these lands.

The plants and animals growing and living in prairies are adapted to the hot summers, cold winters and endless cycles of floods and droughts. They also adapted to fires that often swept over them. The plants and animals in the prairie are strong survivors.

Saving the Pieces

"The first law of intelligent tinkering is to save all the pieces."

Aldo Leopold, 1948

Prairie chickens may someday be a part of the landscape of Neal Smith NWR.

While we won't be able to save all the pieces, Neal Smith NWR is saving as many as possible by:

- restoring small prairie remnants that were left, including some savannas;
- reconstructing prairies by planting prairie seeds, many collected by volunteers from tiny remnants in cemeteries, roadsides, and railroad tracks in south-central Iowa;

- reintroducing bison and elk herds to help understand their roles in shaping the tallgrass prairie;
- using fire to encourage prairie and savanna and to control unwanted or non-native plants and;
- restoring oak savanna by removing trees that don't belong.

Stiff tickseed (left)
USFWS photo

Neal Smith NWR is one of the *National Wildlife Refuge System's* 520 refuges which manage more than 93 million acres throughout the United States.

Goals of Neal Smith NWR

- to increase biodiversity by restoring and reconstructing tallgrass prairie and savanna habitats;
- to increase public knowledge and understanding of prairie through environmental education;
- to increase scientific knowledge and understanding of the prairie and savanna through ongoing research; and
- to provide diverse wildlife-related recreational opportunities.

Some day...

Great Spangled Fritillary Butterfly
Alex Theirman

American bison
USFWS photo

It is possible that elk, prairie chickens, great spangled fritillary butterflies, northern harriers, upland sandpipers, short-eared owls, glass lizards, sedge wrens, pocket mice, speckled king snakes, and spotted skunks will all once again call Neal Smith NWR home.

For now, we are just beginning. But already Neal Smith NWR may be more than you ever imagined. Then we can all say "Welcome back!"

Refuge Information

- Bison are wild, unpredictable animals. Remain in your vehicle.
- Designated trails are for foot traffic only.
- For additional or specific regulations contact the Refuge.
- Visitor Center hours are Tuesday-Saturday from 9am-4pm and Sunday from noon to 5pm.
- Refuge trails and auto tour route are open daily from sunrise to sunset.

The Refuge and the Prairie Learning Center are located south of Highway 163, just 20 miles east of Des Moines and 8 miles south of I-80.

- **Public Education & Recreation**

VISITOR SERVICES

- Bookstore Sales Associate
- Information Desk Attendant
- Public Relations Assistant

OUTREACH

- Special Events Assistant
- Naturalist/Interpreter
- Historian
- Media Resources Manager
- Storyteller
- Artist/Photographer
- Newsletter Publisher/Writer
- VIP Board Member

- **Monitoring & Studies**

SURVEYS & CENSUSES

- Refuge Researcher

STUDIES & INVESTIGATIONS

- Refuge Researcher

If you are interested in volunteering at the Neal Smith National Wildlife Refuge-Prairie Learning Center please fill out the following information. When you have completed the information please drop it off, send it in or fax it to us. Thank you.

Name_____

Address_____

City_____State____Zip_____

Home Phone_____

Work Phone_____

Fax_____

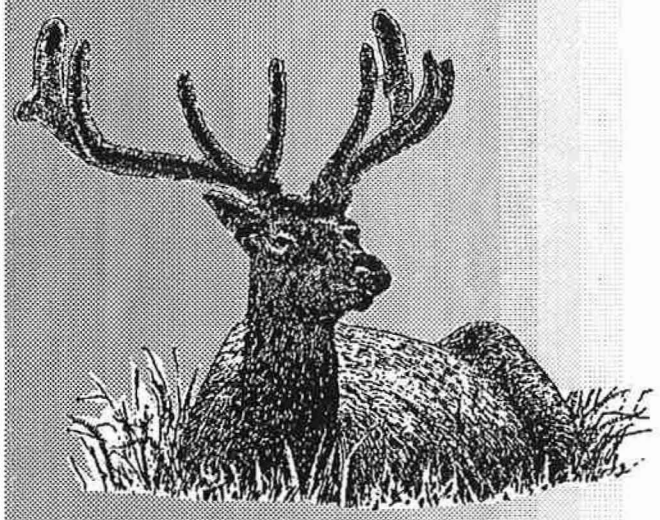
E-mail_____

Callie Le'au Courtright, Volunteer Coordinator
callie_leau_courtright@fws.gov
Phone: (515)994-3400
Fax: (515)994-3459
P.O. Box 399
Prairie City, Iowa 50228

U.S. Department of the Interior
U.S. Fish and Wildlife Service

U.S. Fish & Wildlife Service

Volunteer Opportunities



Neal Smith National Wildlife Refuge & Prairie Learning Center

The Volunteer Program

The volunteer program is an active and vital part of the Neal Smith National Wildlife Refuge. Annually, enthusiastic volunteers contribute hundreds of hours on Refuge projects. Our volunteer program recruits people of all talents, who have an enthusiasm for volunteering and an interest in the Refuge's success. Volunteer projects will vary according to the needs of the Refuge, ability and personal interest; yet all have one thing in common-they are vital to our Refuge's success.

The Refuge

The Neal Smith National Wildlife Refuge is the largest tallgrass prairie reconstruction project ever attempted by the U.S. Fish and Wildlife Service. The goal of this significant reconstruction project is to have a functioning tallgrass prairie ecosystem.

In an ecosystem, every part relies on another and the relationships within are constantly changing. As volunteers, you provide support, community connections, and a greater variety of life within the National Wildlife Refuge System. With your help we have a chance to understand this diverse ecosystem. Together, we can bring back part of our heritage that might have been lost to future generations.

- **Planning & Administration**

GENERAL ADMINISTRATION

Friends Board member

Friends Committee member

Receptionist/Clerical Assistant

Administrative Associate

Data Entry Assistant

E-mail Coordinator

Web Site Administrator

- **Habitat Restoration**

UPLAND RESTORATION

Seed Harvest Team Leader

Prairie Seed Collector

Prairie Seed Handler

Greenhouse Caretaker

Seed Data Entry Tech

WETLANDS RESTORATION

Prairie Seed Collector

- **Habitat Management**

PEST PLANT CONTROL

Prairie Steward

GRAZE/MOW/HAY

Utility Person

Groundskeeper

Maintenance Assistant

Adopt-A-Trail

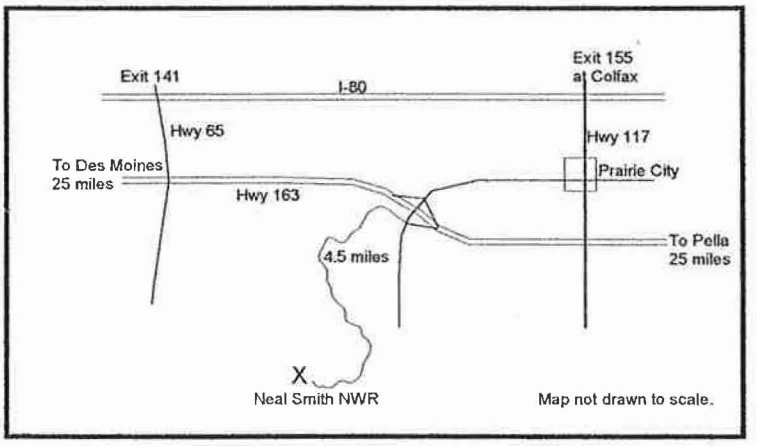
Adopt-A-Prairie Area

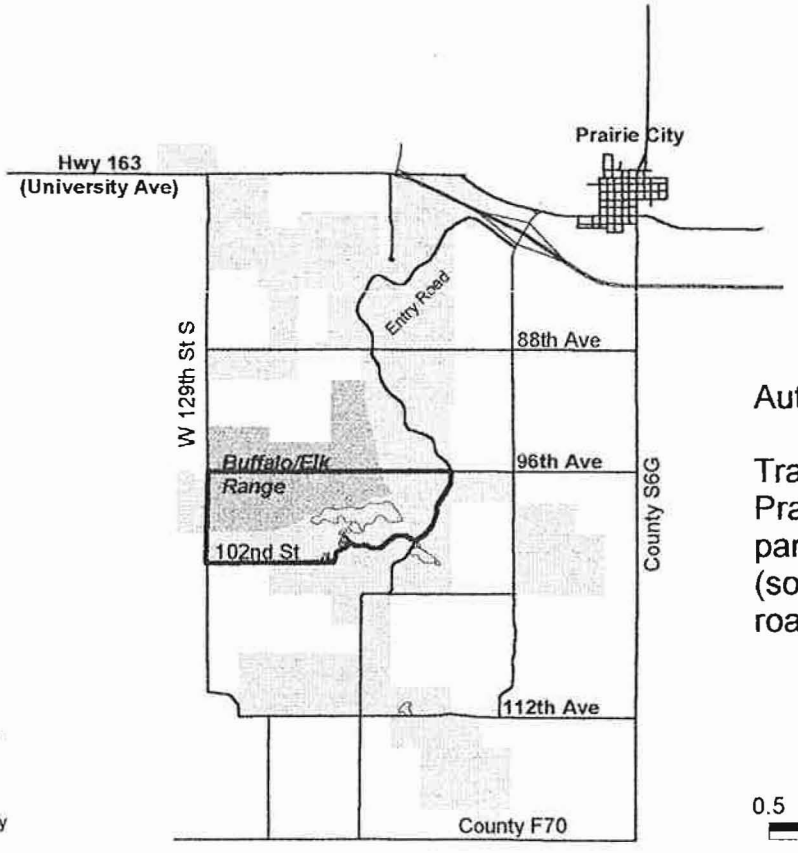
Adopt-A-Road

U. S. Fish & Wildlife Service
Neal Smith National Wildlife Refuge

PO Box 399, Prairie City, IA 50228 (515) 994-3400

Prairie Learning Center hours: Tues.-Sat. 9 am - 4 pm
Sunday 12 pm - 5 pm
Auto Tour Route and Trails: Daylight hours



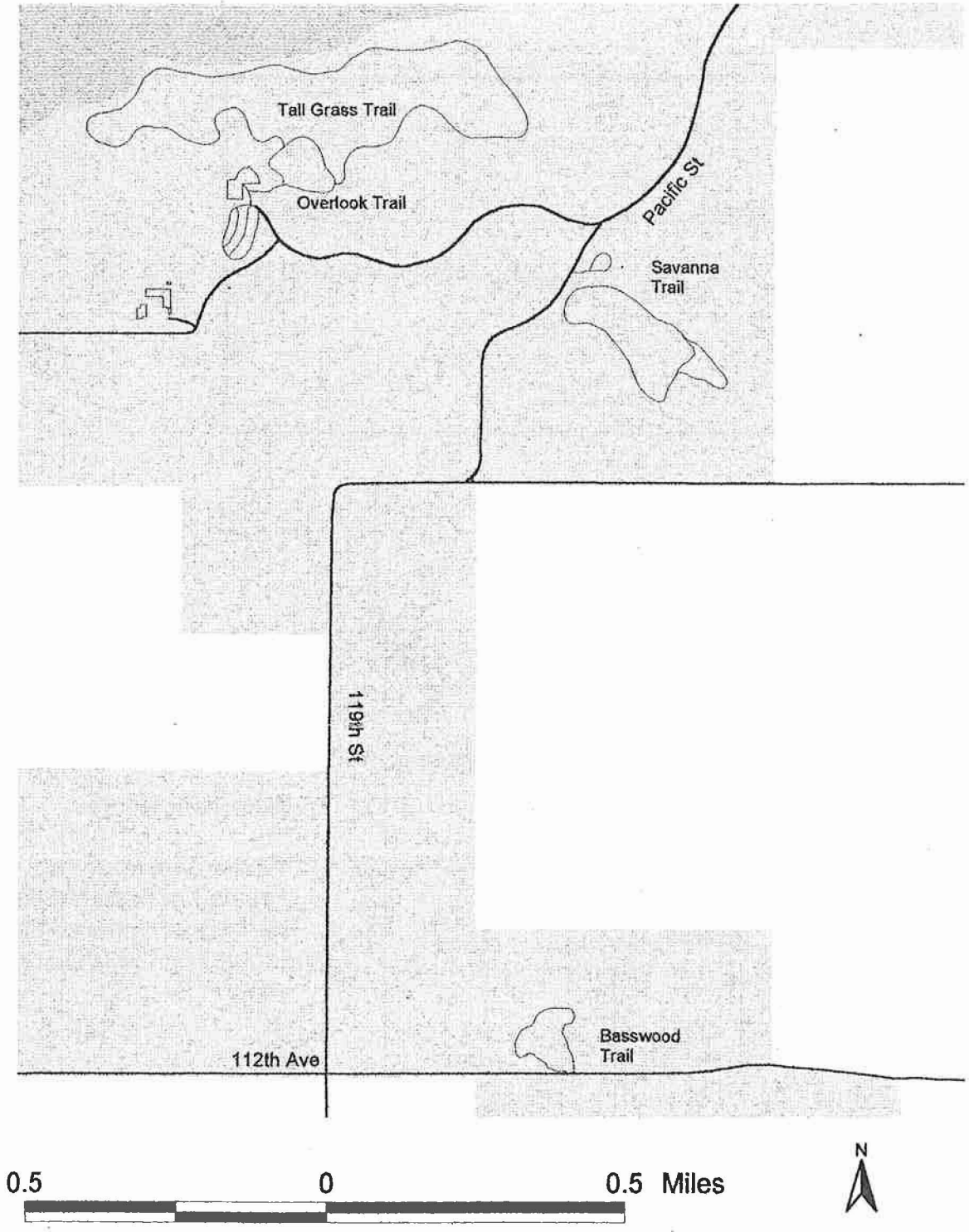


Auto Tour Route

Travel east from the Prairie Learning Center parking lot, turning right (south) on the first gravel road.

Neal Smith NWR
Trail System

Trails are open daylight hours.



Refuge Hunt Seasons
1999 - 2000

Note: All hunting on the Refuge ends January 10, 2000

Game	Dates
Upland Game Birds	
Cock Pheasant	Oct 30 - Jan 10
Bobwhite Quail	Oct 30 - Jan 10
Whitetail Deer	
Bow	Oct 1 - Dec 3
	Dec 20 - Jan 10
Muzzle Loader	Oct 16 - Oct 24*
	Dec 20 - Jan 10
Shotgun	Dec 4 - Dec 8
	Dec 11 - Dec 19
Small Game	
Squirrel	Sept 1 - Jan 10
Cottontail Rabbit	Sept 1 - Jan 10

* *Iowa Residents Only*

Hunter Ethics

- Ethical Hunters respect the rights and property of Refuge tenants, neighbors, and other Refuge users.
- Be alert for tresspassing. Watch for boundary and closed area signs, as shown on the map side of this brochure. Please be aware of the litter problem: take back everything you brought with you to the Refuge.

Neal Smith National Wildlife Refuge
P.O. Box 399
Prairie City, Iowa 50228
515/994-3400

U.S. Fish & Wildlife Service
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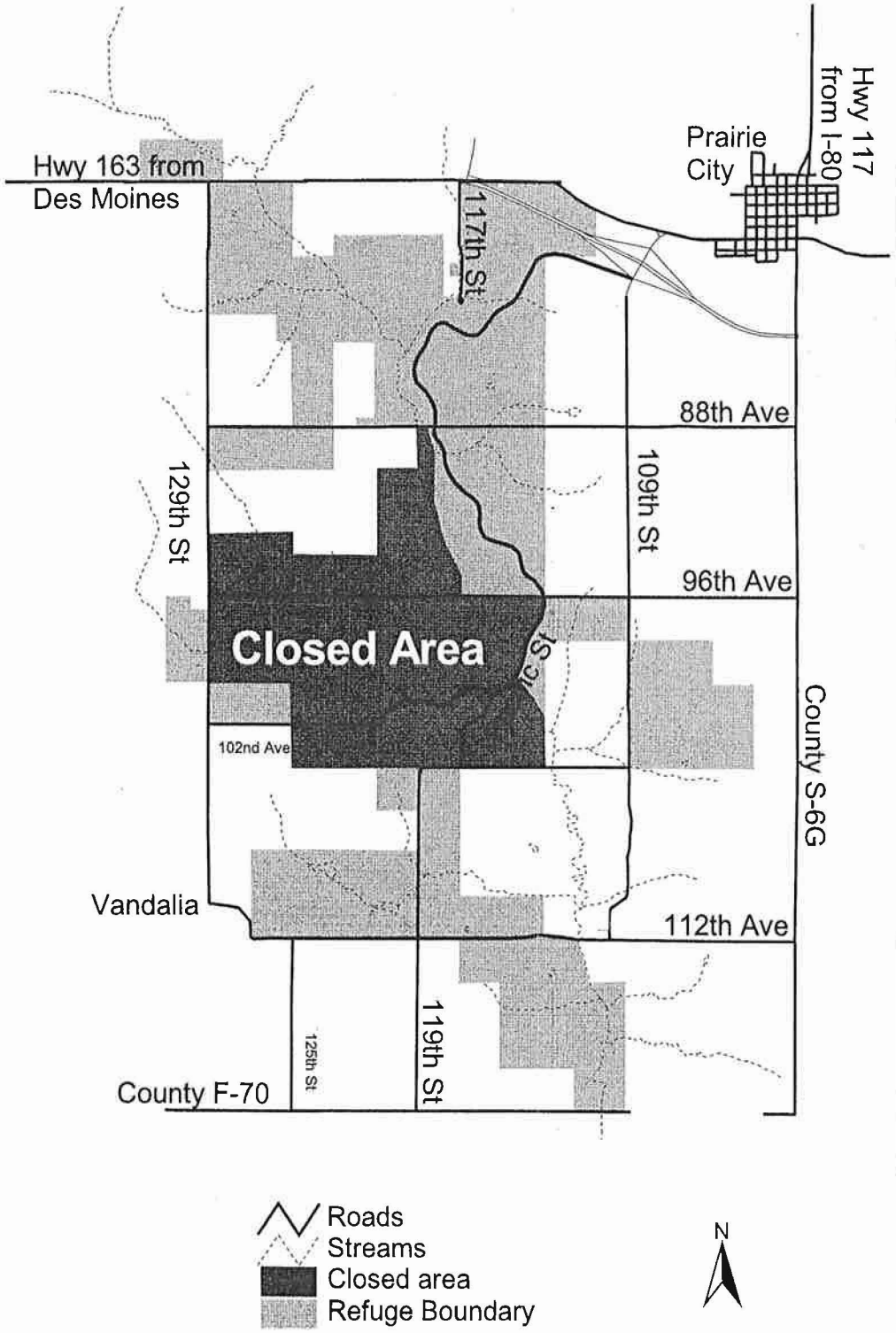
Neal Smith
National Wildlife Refuge Hunting Regulations & Map
1999 - 2000



Refuge Signs

Hunting Prohibited

Refuge Boundary

Off Limits to Public Unless Specified

Hunting Regulations

Please refer to the State of Iowa Hunting Regulations for shooting hours, definition of approved weapons, clothing, bag limits, license requirements and other important information. Contact the Iowa Department of Natural Resources at (515) 281-5145.

Special Refuge Regulations

- Below are regulations specific to hunting on Neal Smith National Wildlife Refuge. These do not include all applicable regulations. Direct additional questions to a Refuge Officer.
- Hunting of species not listed on this brochure is prohibited on the Refuge. Hunting of listed species is permitted only within the dates on this brochure.
- Refuge access is from 1/2 hr before sunrise to 1/2 hr after sunset. See the map and posted signs for areas closed to hunting.
- Do not block roads or field entrances. Do not drive into fields or grassland areas.
- Trapping of fur-bearing animals is prohibited on the Refuge.
- Construction or use of permanent stands or ladders is not permitted. Portable stands may be used but must be removed at the end of each day.
- All persons engaged in gun hunting activities are required to wear an article of solid blaze orange outerwear or a hat. When hunting deer with firearms, refer to State of Iowa Hunting Regulations regarding clothing.
- Report all accidents and injuries to Refuge Headquarters, PO Box 399, Prairie City, IA 50228. Telephone (515) 994-3400.