

CHAPTER 3 - THE AFFECTED ENVIRONMENT

I. THE BIOLOGICAL ENVIRONMENT

L Birds

For centuries, birds have descended upon Union Slough during their annual migrations between Central and South America and their northern U.S., Canadian, and Arctic breeding grounds. In total, over 240 different species of birds have been observed on the Refuge since its inception. White pelicans, great blue herons, yellow warblers, brown thrashers, sparrows, sora rails, black-crowned night herons, and bobolinks are just a few of the birds that utilize the Refuge during spring, summer, and fall. Annual counts of lesser and greater yellowlegs reach 3-4,000 birds. The Refuge serves as a major migratory corridor for raptors, such as red-tailed hawks, northern harriers, American kestrels and to a lesser extent, bald eagles. Ring-neck pheasants utilize the Refuge for winter cover, food, and nesting habitat. Winter densities may reach 200-300 birds per square mile when they concentrate in dense Refuge vegetation. Under ideal conditions, fall pheasant densities can reach 60-100 birds per square mile.

Management strategies aimed at benefiting grassland bird species at the Refuge include restoring and preserving a large structurally diverse grassland block contiguous to the Refuge, eliminating and controlling woody vegetation encroachment. Midwestern studies have shown that grassland birds nesting in proximity to woody vegetation suffer significantly higher rates of nest predation and nest parasitism than birds nesting far from woody vegetation (Johnson and Temple 1990).

L Waterfowl

The Refuge serves as a major migratory stop-over point for waterfowl during their spring and fall migrations, with peak numbers in excess of 49,000 birds. Up to 10,000 Canada, snow, and white-fronted geese utilize the Refuge during their annual migrations, with peak numbers in the month of October. The Refuge area has long been considered an important production area for mallards, blue-winged teal, and wood ducks, and to a lesser extent, northern shovelers, green-winged teal, gadwalls, American widgeons, and northern pintails. Of late, with the introduction of artificial nest cavities, the Refuge has become a major producer of wood ducks. In 1995, the Refuge produced 2,277 wood duck fledglings in 413 wood duck boxes over 1,000 acres (2.2/acre).

Wetlands are considered the primary factor in waterfowl production at the Refuge. Mallards and Blue-winged teal made up 91-93 percent of the breeding population in 1984-85 (Fleskes and Klaas 1991) and are the most common waterfowl species nesting on Iowa's waterfowl production areas (WPA's) (Bishop et al 1979, Fleskes 1986, Ohde et al 1983, Weller 1979). Northern pintails also nest within this region but at lower densities than mallards and blue-winged teal (LaGrange et al. 1994, Zenner et al. 1993).

Data collected on prairie pothole wetlands in Iowa indicate the average number of mallard, blue-winged teal, and pintail pairs per acre on existing wetlands was .32, .76, and .01 respectively, from 1989-93, while restored wetlands in these locations had .65, 1.10, and .02 pairs per acre during this same time period (Zenner et al. 1993). Zenner (personal comm.) found drainage ditches in northcentral Iowa host 1.1 mallard and .3 blue-winged teal breeding pairs per mile. Many prairie pothole region waterfowl, such as blue-winged teal and mallards, have small home ranges and commonly use nearby wetlands in

their daily activities (Flake et al. 1977; Zenner et al. 1992). Successful production often depends upon the immediate availability of a number of different wetland types, each of which fulfills different habitat requirements of the species. Closely associated wetlands of various types are especially important for waterfowl with small home ranges (Sousa 1985).

Breeding waterfowl are highly dependent on invertebrate foods, and the availability of these foods varies among wetland types (Swanson et al. 1974). Shallow, eutrophic, seasonal and semi-permanent wetlands are dependable recyclers of nutrients that support an available and abundant high protein food source for many breeding waterfowl (Swanson et al. 1974). Twenty to thirty-two families of invertebrates are typically found in natural wetlands in Iowa (Voights 1976) whereas only 4 to 16 families per site are found in restored wetlands (LaGrange and Dinsmore 1989). Animal foods (primarily insect larvae and snails) are important to breeding hens during pre-laying and laying periods.

Food availability in wetlands is typically influenced by environmental conditions and adjacent land use activities. Seasonal wetlands adjacent to undisturbed cover typically contain a higher invertebrate standing crop, while wetlands adjacent to summer fallow contain much lower numbers of invertebrates. In a Manitoba study, the density of blue-winged teal found in wetlands was positively correlated to the density and number of families of benthic invertebrates present in the wetland (Murkin et al. 1982). Seasonal and temporary wetlands are especially important as they become available earlier in the spring than do deeper, more permanent water bodies that remain frozen, thus providing an early season food supply for newly established birds. As seasonal wetlands become dry and the availability of invertebrate foods reduced, dabbling ducks will shift their foraging activities to semipermanent and permanent wetlands, although heavy precipitation can temporarily reverse this trend.

Early successional stages of smooth brome grass, intermediate wheatgrass, and alfalfa provides attractive and secure upland nesting cover for many dabbling ducks, especially blue-winged teal (Duebbert and Lokemoen 1976). In Iowa, blue-winged teal preferred wet meadows over uplands for nesting (Miller 1976), nest cover of Kentucky bluegrass was preferred over alfalfa hayland (Krapu et al. 1970), and showed a strong preference for dense vegetation, having highest nest success in tall, dense herbaceous vegetation containing deep litter (Heiser 1971, cited by Kirsch et al. 1978). Fleskes and Klaas (1991) found mallards and blue-winged teal preferred nest sites that were most available in grass-legume fields at the Refuge (Table 3.1). In a North Dakota study, untilled uplands supported nest densities 5.4 times greater than standing stubble, 12.9 times greater than growing grain, and more than 49 times greater than mulched stubble or summer fallow (Higgins 1977). Pintails preferred prairie nesting areas of short grasses where temporary ponds are nearby (Fredrickson and Heitmeyer 1991). Duebbert and Kantrud (1974) and Kirsch et al. (1978) found waterfowl nest success and nest densities were higher in fields of undisturbed cover compared to fields that were hayed or grazed.

In Iowa, the average distance from blue-winged teal nests to open water ranged from 35.5 m (Bennett 1938) to 95.8 m (Krapu et al. 1970). In North Dakota, blue-winged teal nests averaged 256 m from water, and no nests were located more than 1,000 m from a wetland greater than 3 acres (Duebbert and Lokemoen 1976). Pintails often locate their nests farther from water than other ground nesting ducks, but usually within 91.5 m of water (Bellrose 1976). La Grange and Dinsmore (1989) observed mallards used sheetwater ponds, the modern day remnant of original prairie wetlands, over 200 times more than permanent wetlands. They also noted birds would fly up to 8 miles to over-night on large, permanent water bodies. Zenner et al. (1992) found mallards begin arriving in Iowa between late February and

mid-March, select breeding areas that includes several ponds in a square mile area, generally home back to the same area where they learned to fly, and prefer grass fields where residual vegetation is more than one foot tall and dense enough to provide overhead cover.

TABLE 3.1
Dominant Vegetation At Dabbling Duck Nests
Union Slough NWR, 1984-85 (Fleskes and Klaas, 1991)

Dominant Vegetation	All Ducks		Blue-winged Teal		Mallards	
	Number of Nests	Percent of Total	Number of Nests	Percent of Total	Number of Nests	Percent of Total
Smooth Brome	200	44	102	41	92	50
Reed Canarygrass	93	21	44	18	48	26
Bluegrass	73	16	61	26	5	3
Native Grasses	30	7	20	8	8	4
Sedges	12	2	8	3	4	2
Cattail-Bulrush	17	4	1	1	14	8
Legumes	28	6	8	3	13	7

Mayfield nest success rates (Johnson 1979) for mallards using State Wetland Management Areas (WMA) and Conservation Reserve Program (CRP) fields in Iowa have averaged 18 percent and 16 percent respectively, and 20 percent when combined during 1989-93 (Zenner et al. 1993). Nest success rates for blue-winged teal using WMA and CRP fields in Iowa have averaged 15 percent and 23 percent respectively, and 23 percent when combined during 1989-93 (Zenner et al. 1993). The above only considers upland nesting. Mallards however will nest over water. At Ventura Marsh in northern Iowa, 64 percent of 42 mallard nests found on the WMA were located over water on muskrat houses or in emergent vegetation (Bishop et al. 1978).

Data from long-term studies at Macintosh and Ventura WMA's indicate that .3-.6 mallards and .7-.9 blue-winged teal hatched per acre during 1979-84 (Zenner unpubl. data). Brood survival has been estimated to range from 55 percent at Deweys Pasture (Glover 1956) to 65 percent at Union Slough (Fleskes 1986), to 68 percent at Macintosh WMA (Zenner unpubl data). Brood survival is typically estimated at 50-60 percent (Zenner per comm). An electric fence study on a 40-acre upland associated with a large wetland in northern Iowa produced 4.4 fledglings per upland acre compared to .6 to 1.0 fledglings per upland acre produced without a predator barrier.

L Mammals

The Refuge supports an assortment of mammals including white-tailed deer, woodchucks, red fox, squirrels, raccoons, muskrat, skunk, mink, opossum, shrews, voles, weasels, and badger. Mammals tend to be most abundant in and around the wetland habitat due to the abundant food and cover available.

The distribution and abundance of candidids on the northern plains have changed since the late 1800's (Sargeant et al. 1987). Johnson and Sargeant (1977) attribute much of the change to man's control of

grey wolf and coyotes and the effects of interspecific competition, but supporting evidence is mostly circumstantial. The red fox is the most active predator species on the Refuge in terms of waterfowl predation. Fleskes and Klass (1991) found at least six fox families in 1984 and at least five families in 1985, and reported fox were responsible for the majority (82%) of waterfowl nest failures due to predation. Fox prey heavily on prairie dabbling ducks during the denning season and about 80 percent of those taken are hens (Sargeant 1972). Sargeant (1978) found a typical fox family required approximately 18.5 kg/km² of food for the 12-week denning season and 2.4 kg/km²/week for the postdenning period.

Phillips et al. (1972) found juvenile foxes generally disperse the den during late September or early October when most juveniles are about 7 months old. Seventy percent of the males and thirty percent of the females in their study moved more than 5 miles from their natal ranges during their first year. Once established, fox territories generally range from 1 to 3 square miles in size, depending on population density (Sargeant 1972). With such high rates of interchange, efforts at reducing fox numbers generally fail to meet their objectives. Even if local populations are reduced, the vacant areas usually become repopulated within one year. Phillips et al. (1972) found many foxes traveled 20 to 40 miles to occupy new ranges during their first year.

L *Fish*

At one time Union Slough supported populations of game fish that included northern pike, crappie, catfish, bluegill, and bass. However, due to habitat degradation and competition with exotic species, namely carp, game fish populations have drastically declined. Carp populations have become a serious problem in the Refuge due to their high numbers, aquatic plant diet, and habit of increasing water turbidity during feeding. They retard the growth of aquatic vegetation by consuming it and by roiling the water during feeding so that increased turbidity reduces photosynthetic efficiency, an essential component of wetland food chains. Management strategies aimed at controlling carp include drawdowns and physical barriers.

L *Reptiles And Amphibians*

Reptiles and amphibians are two natural and distinct classes of vertebrate animals common to the area. Some common amphibians found in the southern prairie pothole region include the great-plains toad, American toad, cricket frog, chorus frog, leopard frog, grey treefrog, tiger salamander, mudpuppy, and bullfrog. Common reptiles include the western painted turtle, snapping turtle, blanding's turtle, and garter snake, to name a few. Reptiles and amphibians depend on quality wetland habitat for their survival and may be important indicators of environmental quality.

L *Threatened And Endangered Species*

Federally-listed threatened or endangered species that use the Refuge include the bald eagle and peregrine falcon. However, the least tern and piping plover are possible migrants. Also, the Refuge contains habitat for the western prairie fringed orchid. State-listed threatened or endangered species known to use the Refuge include the northern harrier, king rail, forsters tern, grass pickerel, and black tern, to name a few. Thirty species of animals are considered rare or declining in the southern prairie pothole region (Galatowitsch and van der Valk 1994).

L Biological Diversity

Biological diversity, in simple terms, is the variety of life and its processes. This variety may occur at the genetic, species, community, and ecosystem level. Biodiversity supports the stability, integrity, and resilience of ecological systems. It provides the raw material for evolving life and the "ecosystem services" upon which we depend, such as soil building, erosion control, and hydrologic cycles. In the State of Iowa, like elsewhere, biological diversity is declining. Loss of habitat, both physical loss and the loss of important habitat functions, is the greatest threat to biological diversity.

L Resource Management And Administration

Resource management at the Refuge involves using a variety of management techniques to preserve and enhance wetland and upland habitats for Service trust resources. Wetland management involves establishing and maintaining wetland vegetation and usually involves the manipulation of water to achieve the desired successional stage or zone of wetland plant communities. Each plant species within the wetland attracts its own species of bird, mammal, reptile, invertebrate, amphibian, and fish. Thus, in order to attract and maintain diverse populations of wildlife, Refuge wetlands are managed to promote diverse plant communities. The ideal composition of emergent vegetation (cattails, bull-rushes, phragmites, etc.) and open water areas containing submersed vegetation (pondweeds, coontail, etc.) on the Refuge is a hemi-marsh condition (50% emergent vegetation and 50% open water). Drought conditions, both natural and through periodic draw downs, also play an important role in the life cycle of Refuge wetlands. As wetland areas dry up and soils harden, nutrients are released and made available. This process results in rejuvenation, and when re-flooded, creates an area thriving with animal life and aquatic vegetation essential to wetland wildlife.

Upland management on the Refuge includes establishing and maintaining productive grasslands for waterfowl and other migratory birds. Grasslands provide nesting habitat for waterfowl and other birds and provide a means to control runoff from surrounding lands. Prescribed burning is a tool used to maintain grasslands as burning increases the vigor of desirable vegetation while reducing competition from less desirable plants. Small acreages of brush and timber (mostly riparian associations) are being allowed to expand along Buffalo Creek through natural succession to enhance the habitat for woodland-dependent species, especially neotropical migrant songbirds.

Union Slough and its cooperating partner the Iowa DNR have focused considerable effort over the past few years on encouraging and assisting private landowners in restoring converted and degraded wetlands and associated upland habitats. In a 23 county area surrounding the Refuge, 521 wetland basins totaling 1,824 acres have been restored since 1987. The Refuge provides technical assistance and cost-sharing to complete the work if the landowner agrees to maintain the area for a period of 10 years or more. The program focuses on restoring and enhancing habitats that provide wildlife, fisheries, water quality, aesthetic, and recreation benefits. Participation in this program is strictly voluntary. In the past two years, landowners have also been offered the opportunity to restore warm season grasses for the benefit of wildlife. Two Refuge staff work exclusively on Partners for Wildlife projects.

The Refuge also administers the Iowa Wetland Management District (District) with its partner the Iowa DNR. The District encompasses 35 northcentral Iowa counties and currently consists of 10,011 acres of Waterfowl Production Areas (WPA's). The District uses a landscape-scale approach to manage habitat by incorporating a patch-work of wetlands and grasslands to create habitat conditions more favorable for

self-sustaining wildlife populations in northcentral Iowa. The Service can purchase a wetland and surrounding upland area outright, or enter into a perpetual easement with the landowner and only purchase certain ownership rights. Through a Memorandum of Agreement with the Iowa DNR, management of these WPA's is done by the Iowa DNR in cooperation with the Service.

II. THE PHYSICAL ENVIRONMENT

L Physiography

Union Slough is a pre-glacial riverbed that forms a connection or "union" between the watersheds of the Blue Earth River and the East Fork of the Des Moines River. As glacial ice receded from this area around 12,000 years ago, it created a rich mosaic of "prairie potholes" stretching from Des Moines to Spirit Lake to Mason City, and totaling nearly 7.6 million acres.

The Refuge extends approximately 8 miles along Schwob Marsh, Union Slough, and Buffalo Creek and under normal water conditions, contains approximately 450 acres of open water, 850 acres of marsh, and 1,675 acres of uplands. Uplands on the Refuge consist mainly of idled hay fields and pastures seeded with mixtures of smooth brome, wheat grasses and legumes, and with mixtures of switchgrass, bluestem, gramma grasses, yellow Indian grass, needle grasses, and porcupine grass. Wetlands and open water areas on the Refuge are contained within six manageable units and are recognized by their diversity (or lack thereof) of emergent, floating-leaved, and submersed aquatic plants (pondweeds, coontail, cattails, bull-rushes, smartweed, millet, etc.).

Soil map analysis of the area suggests that prior to European settlement, wetlands and tallgrass prairie covered much of the area in and around the Refuge. Large depressions, characterized by hydric (wetland) soils are found throughout the area, most of which are now farmed in corn or soybeans. Where water is present at least seasonally, aquatic plants such as bulrush, cattail, bladderwort, and pondweeds flourish. Ridges, knobs, and rises that flank the wet areas historically supported tallgrass prairie plants such as big bluestem, little bluestem, Indian grass, as well as an assortment of prairie flowers, while green ash, cottonwood, and willows dominated the stream banks. Bluegrass and brome grass were species introduced to the area by early settlers who also brought silver maple and other non-native trees to establish farm groves. Within a 40,000 acre area surrounding the Refuge, there are 28,657 acres considered "prime farmland" soils and 30,038 acres of hydric soils.

L Hydrology

The Refuge and its watershed are connected by a network of natural and manmade waterways (streams, ditches, and subsurface tile) in which materials and energy are transferred. Some provide an important ecological component to the Refuge by connecting biologically diverse food webs and providing important habitat features for wildlife. Precipitation is the main source of water for the Refuge, thus the quality of water in Refuge pools is directly related to the ecological health of the Refuge watershed. Within the Refuge watershed there are 5,159 acres of erodible soils (B-slopes or greater). Materials and energy are transferred to the Refuge through streams, ditches, and subsurface tile. Stage-control features regulate drainage from the Refuge and waters flow both north and south. Water flowing north from the Refuge drains into the Blue Earth River and eventually the Minnesota and Mississippi Rivers. Water draining south from the Refuge flows into Buffalo Creek and the Des Moines and Mississippi

Rivers.

L Climate

The area climate is characterized as extreme midcontintal or humid continental.. The average winter temperature is 19 degrees F, and the average summer temperature is 71 degrees F. Sunshine occurs about 70 percent of the time in the summer and about 55 percent of the time in the winter. Prevailing winds are from the northwest with average springtime windspeeds of 13 miles per hour. Total annual precipitation is about 29 inches, of which 21 inches usually falls between April and September. Snowfall is around 38 inches.

L Cultural Resources

Very little in the way of archeological investigations have been performed in this part of Kossuth County and just one small-scale archeological survey on the Refuge. Five archeological sites and one farmstead have been reported in the south end of the Refuge, but topography indicates the Refuge and surrounding area has moderately high potential for containing numerous unreported archeological sites.

III. THE SOCIOECONOMIC ENVIRONMENT

Union Slough Refuge is located in Kossuth County, Iowa, approximately 5 miles east of Bancroft, Iowa; 55 miles north of Fort Dodge, Iowa; 160 miles southwest of Minneapolis/St. Paul, Minnesota; and 130 miles north of Des Moines, Iowa.

Settlement began in the county in the mid-1850's and in 1990, the county population was 18,591. The county seat is Algona, which has a population of approximately 6,500 people. The economic base of the county is predominantly agriculture, accounting for approximately 25 percent of the work force (Table 3.2). Other employment sectors are retail, professional services, and durable manufacturing.

Total land area for the county is 626,560 acres. Landuse is predominately agriculture (Table 3.3). The majority of crop acres in the county are utilized for corn and soybeans, with yields averaging around 135 bu. per acre for corn (corn following soybeans) and 45 bu. per acre for soybeans (soybeans following corn). Cattle, sheep, and hogs are also raised for market in the county. Cash rental rates on agricultural lands range from \$125/acre for high quality lands, \$108/acre for medium quality lands, and \$93/acre for low quality lands, with a weighted average of \$114/acre. Of the county's cropland, 50 percent is considered high quality, 32 percent medium quality, and 18 percent low quality. About 419,935 acres or 78.5 percent of the county's farmland is considered "prime farmland" (USDA classification). Drainage is a management need on about 53 percent of the acreage used for crop production in the county.

TABLE 3.2
Employment by Industry In Kossuth County

Industry	Number	Percent
Agriculture	2,258	25.3%
Mining	10	0.1
Construction	531	6.0
Manufacturing Nondurable	325	3.6
Durable	920	10.3
Transportation, Com., Utilities	415	4.7
Wholesale	623	7.0
Retail	1,444	16.2
Finance, Insurance, Real Estate	319	3.6
Business, Repair Services	237	2.7
Personnel Services	250	2.8
Entertainment/Recreation	82	0.9
Professional Services	1,380	15.5
Public Administration	130	1.5
TOTAL	8,924	100.0

TABLE 3.3
Landuse In Kossuth County

Landuse	Acres (%)
Development Unincorporated Residential	1,210 (0.2)
Commercial & Services	835 (0.1)
Manufacturing	120 (0.0)
Transport, Com, Utility	300 (0.0)
Recreation, Cultural	2,840 (0.5)
Resource Production	820 (0.1)
Water Areas	1,522 (0.2)
Agriculture	597,636 (95.4)
Concentrated Rural	19,651 (3.1)
Urban	1,630 (0.3)
TOTAL	626,560 (100)

Union Slough Refuge, the largest tract of publicly owned land in the county, is a popular destination for approximately 8,000 people per year. The Refuge provides its visitors with an auto tour route, opportunities for outdoor classroom education, scientific research, hunting, fishing, hiking, and interpretation.

The auto tour route is a major attraction for local residents. Unfortunately, the tour route is only open during special events and for two to three weeks in late summer and early fall. Access to the tour route is limited due to wildlife disturbance resulting from the close proximity of the tour route to the waters edge. Improvement to the tour route are currently being planned through the CMP process.

Hunting and fishing are also popular activities on the Refuge. Hunting is currently allowed on the Schwob Marsh and Buffalo Creek units of the Refuge. Hunting is permitted for all species allowed by state law in accordance with state seasons. Waterfowl, pheasant, and white-tailed deer are the most commonly hunted species. Squirrel and wild turkey are also hunted by a few individuals. Most fishing occurs at two main water discharge points; the D Pool water control structure at the north end, and the Tienan's Dam water control structure at the south end. Parking is a problem at both sites. The Tienan's Dam site has access problems as the public currently cross private land to reach the area. Fishing also occurs along county roads where they cross the Refuge. County road B-14 is the most popular of those sites and is also undeveloped for public use. Several other fishing areas have been created in Kossuth county in recent years.

Hiking and walking trails are available at Vanishing Prairie and Deer Meadow. Trails are mowed grass and traverse hills with fairly steep grades in areas. No trails are accessible for persons with disabilities. A portion of the trail at Deer Meadow which was very popular 10-15 years ago has been abandoned due to annual spring flood damage. Trail areas have not been improved since the 1960's.

Existing Refuge signing and interpretation is minimally adequate but numerous signs are in need of routine cyclic replacement. Current plans call for replacing the older direction signs along county roads and ordering new signs for important intersections not signed. Plans for new interpretive signs are underway for Vanishing Prairie, Deer Meadow Nature Area, and a new kiosk at the office. The Refuge office is open from 7:30 am to 4:00 pm, Monday through Friday.

Over 600 local school students visit the Refuge each year. Most visit with county naturalists who coordinate their visit with the Refuge staff. Additional classes are lead directly by Refuge staff.

