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MANAGING FOR COYOTES TO ENHANCE WATERFOWL PRODUCTION: AN ALTERNATIVE PERSPECTIVE

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Abstract: The Prairie Pothole Region (PPR) of North America produces about half of the continent's duck population. Predation on hens, young, and eggs severely impacts duck production in the region decreasing fall flights. Recent studies conducted in the region suggest that management efforts to increase duck production need to consider both habitat and predator effects. Research indicates that managing on the landscape level to protect coyotes in sufficient numbers to exclude red foxes should be encouraged in PPR areas suitable for duck production and where the risks of damage to domestic livestock and other wildlife species are minimal

Over the past century, migratory waterfowl hunting in North America has undergone a transition from a subsistence activity with recreational overtones to a recreational activity with subsistence overtones (USFWS 1986). Concurrently, hunting of migratory waterfowl has become more intensively managed. Since 1948, waterfowl hunting in the United States has been managed on the basis of migrational units, called "Flyways" (Figure 1)

Lincoln (1935) classified the migratory routes across North America into 4 flyways, based on analysis of banded birds and their movements These flyways, the Pacific, Central, Mississippi, and Atlantic, correspond to major migrational routes followed by millions of waterfowl and other birds (Bellrose 1976) Although the boundaries between the routes are not exact, and several species of ducks regularly cross from one flyway to another, the 4 flyways serve as administrative units for managing continental waterfowl populations. The southwestern states of Texas, Oklahoma, and New Mexico are part of the Central Flyway administrative unit.

In 1985, over 5 million U S. residents spent over 41.7 million hunter-days in pursuit of waterfowl. During this same period, 691,000 Texans spent 4.88 million hunter-days hunting waterfowl. This figure constitutes over 10% of all days spent hunting waterfowl in the U.S. during 1985. Total expenditures for migratory bird hunting in the U S. during 1985 were $1.1 billion (USFWS 1988).

The Prairie Pothole Region: duck factory for the Southwest

The Prairie Pothole Region (PPR) of North merica (Figure 2) is the primary breeding ground for many of the waterfowl that are hunted in the Central Flyway and subsequently winter in Texas. Although the PPR represents only 10% of North America's duck breeding grounds, about half of the continent's ducks fledge there (Smith et al 1964, Bellrose 1976). Hence, factors affecting duck production in this region are of special interest to waterfowl populations, wildlife managers and to those that participate in associated recreational activities (Bellrose 1976, Turner et al. 1987, Sargeant et al. 1993).

Studies of nesting ducks conducted in the PPR indicate that duck production has been reduced because of low nesting success attributed to predation on hens, ducklings and eggs (Cowardin et al 1985, Greenwood et al. 1995). Predation severely limits duck production in the region, ultimately affecting the size of the fall flights (Johnson et al 1992)

Effects of predator community composition on nest success

Prairie ducks exhibit evolutionary adaptations (large clutches, renesting, antipredator behaviors, and cryptic coloration) designed to minimize the effects of predation However, alteration of the

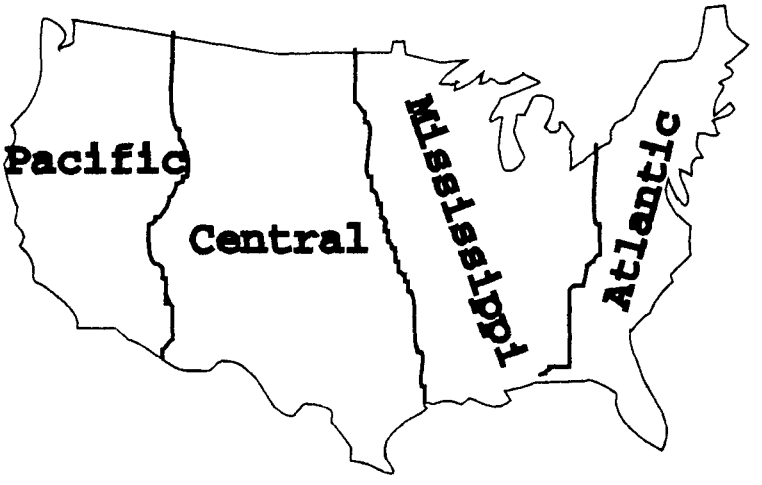

Figure 1. Major waterfowl flyways of North America.

Figure 2. The Prairie Pothole Region of North America.

prairie landscape has resulted in significant changes in the composition of the predator community which can have severe effects on waterfowl populations (Sargeant and Raveling 1992).

During the past 120 years, the PPR has been transformed from a largely pristine ecosystem to on that is farmed intensively (Turner et al. 1987). These changes have contributed to the degradation and fragmentation of duck nesting habitat Further, land use changes also have exposed nesting hens, their eggs and ducklings to different types of predator communities than existed during pristine times (Cowardin et al 1983, 1985, Greenwood et al. 1987).

Predators that were common and widely distributed before settlement of the region disappeared from all or most of the area These include the swift fox (*Vulpes velox*) and the gray wolf (*Canis lupus*). Other species that were scarce and distributed narrowly, such as the raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*), and the coyote (*Canis latrans*), clearly benefitted from habitat changes in the region Sargeant et al. 1984)

These "new" mammals are the principal predators currently affecting duck production in the region (Keith 1961, Johnson and Sargeant 1977, Sargeant et al. 1993). The red fox has emerged as the major predator affecting duck production, preying on both ducks and eggs (Duebbert and Lokemoen 1976, Higgins 1977, Sargeant et al 1984, Klett et al 1988, Greenwood et al 1995, Sovada et al. 1995) Recent evidence suggests that coyotes may have less impact on nesting ducks than red foxes, raccoons, and striped skunks (Johnson et al. 1989, Sargeant et al 1984, 1993, Greenwood et al. 1995, Sovada 1995)

Factors affecting predator abundance and distribution in the PPR

Major habitat changes affecting predator populations in the region include the conversion of wetland/grassland complexes to annually-tilled cropland and the establishment of farmsteads with associated windbreaks, food sources, water, and human presence (Sargeant et al. 1993) These changes increased habitat structural diversity, favoring many predator species More diverse and stable food supplies became available to coyotes, red foxes, and raccoons. However, changes in the abundance of these species, particularly the canids, cannot be attributed solely to habitat changes.

Extensive killing of predators in the PPR by humans not only resulted in the extirpation of some species, such as the gray wolf, but probably prevented the expansion of new predator populations for several decades. High fur prices prior to the 1940s, coupled with rural residents' dislike for predators, held populations at low levels. When fur prices collapsed during the 1940-60s, the animal damage and control-of-disease programs resulted in the deaths of tens of thousands of mammalian predators These programs, however, failed to reduce red fox populations to low levels, while having a considerable effect on coyote abundance, particularly in intensively farmed areas (Adams 1961)

Interspecific relations of canids appear to be another dominant factor affecting the current distribution and abundance of the canid species in PPR (Sargeant 1982). Although habitat changes also allowed raccoons to expand their range, incompatibility with other predator species probably impeded raccoons from expanding their range earlier.

Inter- and intraspecific predator interactions: duck production consequences

Predator community composition can impact duck nesting success (Sargeant et al. 1993, Greenwood et al 1995, Sovada et al. 1995) Of particular consequence to duck production in the prairie pothole region are interactions between (among) specific predator species

Coyotes suppress the abundance of red foxes (Criddle 1929, Sargeant 1982, Voight and Earle 1983, Sargeant et al. 1987, Harrison et al. 1989) Sargeant et al. (1993) reported a strong inverse relationship between coyote and red fox numbers. Circumstantial evidence also suggests that coyotes may suppress raccoon populations in the PPR (Cowan 1973, Stelfox 1980, Clark et al. 1989, and Sargeant et al. 1993) Coyotes also occasionally prey upon striped skunks (Godin 1982).

Several authors have suggested that coyotes can affect the abundance of predators other than red

foxes sufficiently to the extent that duck nesting success is enhanced. However, there is little evidence in the literature to support this contention. Klett et al. (1988) initially suggested that differences in predator communities from east to west in the PPR, particularly the canids, may have been the reason for observed higher nest success in western portions of the region. Coyotes were more common than red foxes in the western portion of the region than in the east.

Greenwood et al. (1995) and Sovada et al. (1995) attributed differences observed in nest success between coyote-dominated areas and fox-dominated areas to coyote suppression of red foxes. Sovada et al. (1995) reported that average nest success in coyote-dominated areas was 15% higher than in fox-dominated areas. This difference in nest success is important because the higher rate exceeds nest success threshold levels suggested by Cowardin et al. (1985) for maintaining stable populations of several species of dabbling ducks.

Greenwood et al. (1995) and Sovada et al. (1995) suggest that, in areas where coyotes densities are relatively low, coyotes may benefit ducks by reducing nest predation by foxes. However, in areas where coyotes are abundant, they can prey extensively on nesting hens and duck nests (Glup and McDaniel 1988).

Management Implications

Greenwood et al. (1995) and Sovada et al. (1995) reported a high degree of variability in nest success among study sites and among years. Both studies also reported that predation was the cause of most nest failures, and predator indices also varied considerably among areas and years. These results support Johnson et al.'s (1989) contention that predator numbers alone are not the sole determinant of nest success. Other factors also affect nest success, such as the abundance of buffer species, habitat quality and quantity, the abundance of other predators species, and waterfowl nest densities.

Variability in nest success among coyote-dominated and fox-dominated areas indicates that the presence of coyotes alone may not ensure high nest success (Sovada et al. 1995). Their work was conducted during a drought period, primarily on Conservation Reserve Program lands that had been seeded to perennial grass cover. The additional grassland may have resulted in greater dispersion of duck nests which reduced their risk to predation. The drought also may have contributed to a reduction in duck abundance and nesting effort (Smith 1969, Krapu et al. 1983). Low nest density may have a positive influence on nest success by reducing predator efficiency (Marshall 1967, Weller 1979, Hill 1984).

Long-term management efforts designed to increase duck production must be applied at the landscape level in full consideration of the species' habitat requirements, habitat quality and quantity, predator composition and abundance, and predation risks. Consideration also should be given to encouraging sufficient coyote numbers to exclude red foxes in areas of the PPR where the potential exists to increase duck production without consequence to domestic livestock production or other wildlife species (Greenwood et al. 1995, Sovada et al. 1995).

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