

Commercial Sunflowers: Food for Red Foxes in North Dakota

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ABSTRACT — Stomach contents of 70 red foxes (*Vulpes vulpes*) shot in east-central North Dakota during January 1982 and January 1983 were examined. Commercial sunflower seeds were the most frequently found food item, occurring each year in three-fourths of the stomachs and composing about half of the contents. The remainder of the diet was primarily mammals, but included birds, insects, amphibians, and refuse.

Previous studies of stomach contents of midcontinent North American red foxes (*Vulpes vulpes*) have shown the winter diet to be primarily vertebrates (Findley 1956, Kopischke 1968, North Dakota Game and Fish Department 1949, Richards and Hine 1953, Scott 1950). Plant material generally averaged 5% or less of the contents and was primarily vegetation. Seeds, primarily corn and wheat, were found in some stomachs but most were believed to have been ingested inadvertently with other items.

Sunflowers (oil varieties) recently have become one of the principal crops in North Dakota. The amount of land planted annually to sunflowers has increased from less than 52,000 ha before 1971 to more than 961,000 ha after 1978 (North Dakota Crop and Livestock Reporting Service 1980, 1985). Sunflowers now are grown in every county, but they are most abundant in central and eastern parts of the state. They are harvested in fall, generally after other crops, and an average of 7.5% of the seeds fall to the ground during harvest (Hofman and Kucera 1984). The late harvest often delays tillage of sunflower fields until spring, thereby making waste seeds available for consumption by wildlife throughout fall and winter. In this paper, we report the occurrence of commercial sunflower seeds in stomachs of red foxes shot in east-central North Dakota during the midwinters of 1982 and 1983.

METHODS

Several fox hunters were contacted and asked to save carcasses of red foxes they shot in east-central North Dakota during January 1982 and January 1983. The carcasses were brought to the Northern Prairie Wildlife Research Center where the stomachs were removed and frozen. Later, the stomach contents were washed with water in a 1.4-mm sieve and dried; empty stomachs were discarded. Food items were identified to taxon by examining hair (Moore et al. 1974) and by comparing remains with reference materials. Both the percent occurrence and estimated percent volume of each food item were recorded for each stomach.

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Empty stomachs and items estimated to compose less than 0.5% of the washed contents were excluded from analysis. Temperature and snow depth data for Carrington, North Dakota (National Oceanic and Atmospheric Administration 1982, 1983), were used to characterize weather conditions in the study area each winter.

RESULTS

We obtained stomach contents from 34 red foxes in 1982 and 36 in 1983; nine other foxes each year had empty stomachs. Plants and mammals composed most of the diet of the foxes each year and there was little variation in either their frequency of occurrence or estimated volume between years (Table 1).

Nearly all plant material was commercial sunflower seeds. These seeds occurred in 76% of the stomachs in 1982 and 75% in 1983, and composed 53%

Table 1. Percent occurrence and estimated average percent volume¹ of food items in stomachs of red foxes shot in east-central North Dakota during January 1982 and January 1983. Number of stomachs is shown in parentheses; trace (t) amounts composed less than 0.5% of the average volume.

Food item	1982 (n = 34)		1983 (n = 36)	
	Occurrence	Volume	Occurrence	Volume
Plants	82	53	75	45
Sunflower seeds	76	50	75	45
Other ²	6	3	3	t
Mammals	77	39	78	43
Soricidae	3	t	3	t
Leporidae	24	15	6	6
Sciuridae	3	3	3	3
Geomyidae	3	2	0	0
Cricetidae	62	14	64	26
Mustelidae	0	0	3	3
Cervidae	12	4	6	6
Unidentified	6	1	3	t
Birds	21	6	3	t
Phasianidae	6	3	0	0
Rallidae	3	3	0	0
Unidentified	12	t	3	t
Insects	0	0	19	1
Amphibians	0	0	3	t
Refuse ³	9	2	14	9

¹Estimated percentage of washed contents.

²Consisted of grass, chokecherry (*Prunus virginiana*) seeds, and wheat seeds.

³Includes domestic animal carrion.

and 45% of the volume. Contents of 15 (22%) of the stomachs were almost exclusively (>95%) sunflower seeds. The amount of sunflower seeds in the diet varied little between years despite marked differences in climatic conditions. January 1982 was characterized by cold temperatures and moderate snow accumulation; temperatures averaged -22°C and maximum snow depth was 48 cm. In contrast, January 1983 was characterized by moderate temperatures and little snow accumulation; temperatures averaged -8°C and maximum snow depth was 8 cm.

Cricetid rodents, mostly deer mice (*Peromyscus maniculatus*) in 1982 and meadow voles (*Microtus pennsylvanicus*) in 1983, were the predominant mammals in the diet, occurring in 62% and 64% of the stomachs and making up 14% and 26% of the volume, respectively. Leporids (eastern cottontail, *Sylvilagus floridanus*, and white-tailed jackrabbit, *Lepus townsendii*) and a cervid (white-tailed deer, *Odocoileus virginianus*) were eaten commonly in 1982 but composed a small part of the diet in 1983. Four other mammalian families were represented in no more than 3% of the stomachs and composed no more than 3% of the volume either year.

Other food groups (birds, insects, amphibians, refuse) made up a relatively small part of the diet each year (Table 1). Although birds occurred in 21% of the stomachs in 1982, they made up only 3% of the volume. The identified birds included one gray partridge (*Perdix perdix*), one American coot (*Fulica americana*), and one domestic chicken (*Gallus gallus*). No insects were found in the stomachs in 1982, but in 1983 insects occurred in 19% of the stomachs and made up 1% of the volume. All of the insects were grasshoppers (*Acrididae*). The amphibian found in one stomach in 1983 was a leopard frog (*Rana pipiens*). Refuse was found in 9% of the stomachs in 1982 and 14% in 1983, and composed 2% and 9% of the volume, respectively. It consisted primarily of livestock carrion.

DISCUSSION

Commercial sunflower seeds occurred in three-fourths of the stomachs and made up about half of the stomach contents we examined during both a mild and relatively severe winter. Thus, the recent increase in amount of sunflowers planted annually in North Dakota has provided red foxes with an abundant and apparently desirable winter food. Although our data are for January only, several fur hunters and trappers reported to us that red foxes consume sunflowers throughout fall and winter.

Except for the frequent occurrence and large volume of sunflower seeds, our results are similar to those of the midcontinent fox food habits studies already cited. Red foxes consumed a variety of foods, primarily vertebrates, and appeared to be opportunistic foragers. Mammals, especially deer mice, meadow voles, rabbits and hares, and white-tailed deer, were the other principal foods eaten.

Differences in use of individual food items between years likely reflected differences in availability and abundance of those foods. For example, the relatively snow-free conditions during the winter of 1982-83 apparently exposed grasshoppers, allowing foxes to feed on them. Some items found in the stomachs obviously were wild animal carrion, including prey that may have been retrieved

from fox food caches (Murie 1936). For example, the American coot found in one stomach had died at least two months earlier because wild live coots are not present in North Dakota during winter.

The importance of sunflower seeds to the condition and survival of red foxes in North Dakota is unknown. However, during winter red foxes in the state have the least amount of animal food available because many prey have migrated (e.g., most birds) or are located under frozen soil (e.g., ground squirrels [*Spermophilus* sp.]). Although malnutrition has not been identified as a source of winter mortality among midcontinent red foxes, food shortages may occur periodically and could affect reproductive performance (Englund 1970, Allen 1984). The importance of commercial sunflowers to red foxes and other wildlife species should be determined.

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