Fuller, T.K. 1989. Population dynamics of wolves in northcentral Minnesota. Wildlife Monographs 105: 3-41.

During September 1980-December 1986, 81 radio-collared wolves (Canis lupus) were monitored in and near the 839-km2839-km2 Bearville Study Area (BSA) in north-central Minnesota. Each year winter-territory size averaged 78−153 km278−153 km2; no territories had road densities >0.72 km/km2>0.72 km/km2. From zero to 30% of radio-marked pup, yearling, or adult wolves left their territories each month. Pups left natal packs during January-March and older wolves left frequently during September-April. Wolves temporarily leaving territories moved 5-105 km away and were absent 3-118 days; up to 6 exploratory moves were made prior to dispersal. Dispersing wolves traveled 5-100 km away during periods of 1-265 days. One disperser joined an established pack, but 16 others formed new packs. Annual dispersal rates were about 0.17 for adults, 0.49 for yearlings, and 0.10 for pups. Each year mean pack size ranged from 5-9 in November-December to 4-6 in March. Annual wolf density (including 16% lone wolves) ranged from 39−59 wolves/1,000 km239−59 wolves/1,000 km2 in November-December to 29−40 wolves/1,000 km229−40 wolves/1,000 km2 in March. Annual immigration was 7%. The observed mean annual finite rate of increase was 1.02, and annual rates of increase were correlated with mean number of pups per pack in November. Litters averaged 6.6 pups at birth and 3.2 by mid-November, at which time pups made up 46% of pack members. Annual survival of radio-marked wolves >5 months old was 0.64. Despite legal protection, 80% of identified wolf mortality was human caused (30% shot, 12% snared, 11% hit by vehicles, 6% killed by government trappers, and 21% killed by humans in some undetermined manner); 10% of wolves that died were killed by other wolves. During sample periods in 2 winters, wolves were located twice daily to estimate predation rates on white-tailed deer (Odocoileus virginianus). Estimated minimum kill rates during January-February ($\bar{x}$ = 21 days/kill/wolf) did not differ between winters with differing snow depths. Winter consumption averaged 2.0 kg deer/wolf/day (6% wolf body wt/day). Scat analyses indicated deer were the primary prey in winter and spring, but beaver (Castor canadensis) were an important secondary prey (20-47% of items in scats) during April-May. Neonatal deer fawns occurred in 25-60% of scats during June-July whereas the occurrence of beaver declined markedly. Overall, deer provided 79-98% of biomass consumed each month. Adult wolves consumed an estimated 19 deer/year of which 11 were fawns. A review of North American studies indicates that wolf numbers are directly related to ungulate biomass. Where deer are primary prey, territory size is related to deer density. Per capita biomass availability likely affects pup survival, the major factor in wolf population growth. Annual rates of increase of exploited populations vary directly with mortality rates, and harvests exceeding 28% of the winter population often result in declines. Management decisions concerning wolf and ungulate densities and ungulate harvests by humans can be made using equations that incorporate estimates of wolf

density, annual ungulate kill per wolf, ungulate densities, potential rates of increase for ungulates, and harvest.

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