PRELIMINARY REPORT

ENVIRONMENTAL ASSESSMENT - WILDLIFE IMPACTS

PROPOSED WIND TURBINE PROJECT IN GREENBRIER COUNTY, WV

SUBMITTED TO:

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PRELIMINARY REPORT:

ENVIRONMENTAL ASSESSMENT - WILDLIFE IMPACTS OF PROPOSED WIND TURBINE PROJECT IN GREENBRIER COUNTY, WV

INTRODUCTION

Kenetech Windpower, Inc. has proposed to construct a 400 megawatt windplant, involving approximately 1,200 wind turbines, in Greenbrier County, WV. Initial construction (Phase I) is proposed for 1996 and will produce 50 megawatts from 150 wind turbines. Although Kenetech is concerned about the impact of this project on the total environment, one specific concern involves wildlife. Potential impacts on wildlife are: (1) disturbance during the construction phase, (2) disturbance and mortality during the operational phase, and (3) long-term habitat modification (both positive and negative).

The primary objective of this environmental study is to assess the impact of the proposed windplant on wildlife, with emphasis on avian populations. Surveys conducted during 1994 involved only the site to be impacted by Phase I (150 wind turbines).

PROJECT AREA

The proposed windplant will be located on property owned by forest products companies in Greenbrier County, West Virginia, between the towns of Rupert and Richwood. Phase I will be sited on the Gauley Woodlands of the Westvaco property (38° 5′ N, 80°

24′ W). Gauley Woodlands lies in the rugged and mountainous Appalachian Plateau Province. Clarkson (1966) described the area as greatly dissected high altitude plateaus interspersed with numerous rugged peaks that rise to elevations over 1220 m. Elevation of the proposed project area ranges from 976 to 1220 m.

Soils of the area are of the Dekalb stony loam series (U.S. Dept. Agric. 1941) with some large rock outcroppings interspersed throughout the area. The drainage pattern is typically dendritic, consisting of numerous winding streams fed by many convoluted branches.

In general, Gauley Woodlands are characterized by long cold winters and short warm summers. Precipitation is approximately 103-128 cm per year, including snowfall of 179-256 cm (Price and Heck 1939 and Chang and Lee 1975). Snow cover is usually continuous from late December to late March, depending on altitude. Temperatures range from a monthly mean of -0.6 C in January to a mean of 22.2 C in July (Price and Heck 1939).

Principal land uses of the proposed project area consist of hardwood timber production and coal strip-mining operations. Much of Gauley Woodlands was timbered in the 1910-1950 period by Meadow River and other lumber companies which resulted in extensive clearcut areas. These woodlands are now being systematically clearcut, in units approximately 16 ha in size.

Dominant tree species consist primarily of American beech (Fagus grandifolia), sugar maple (Acer saccharum), yellow-poplar (Liriodendron tulipifera), black cherry (Prunus serotina), yellow

birch (Betula lutea), red oak (Quercus rubra), and cucumber tree (Magnolia acuminata). Typical understory vegetation includes: striped maple (Acer pensylvanicum), mountain maple (Acer spicatum), mountain laurel (Kalmia latifolia), blackberry (Rubus allegheniensis), greenbrier (Smilax rotundifolia), stinging nettle (Urtica dioica), jewelweed (Impatiens pallida), and numerous species of ferns.

METHODS

Initial assessments of impacts on wildlife in 1994 focused on: (1) threatened and endangered species, (2) rare and unusual plant communities, (3) herptiles, (4) birds, and (5) mammals. Assessments for impacts on birds involved the following: (1) breeding songbirds, (2) migrating songbirds, (3) resident upland gamebirds, (4) resident crows, raptors, ravens, and vultures, and (5) migrating raptors.

The presence of threatened/endangered species and rare/unusual plant communities was determined by literature review, examination of historical records, computer search conducted by the West Virginia Division of Natural Resources Natural Heritage Program, and on-site examinations. Thomas K. Pauley (Biology Department, Marshall University) was responsible for assessments of herptiles (amphibians/salamanders), Edwin D. Michael (Division of Forestry, West Virginia University) was responsible for mammals, and William N. Grafton (Division of Forestry, West Virginia University) was responsible for

assessments of plants and plant communities.

The areas to be impacted by the development of windplants in the Beech Ridge Project Area were examined for rare and unusual plant communities and for potential amphibian and reptile habitats in August, 1994.

Assessments of impacts of the proposed windplant project on birds involved breeding bird surveys along pre-established transect lines, drive routes along existing roads through the project area, and observations from selected vantage points within the project area. Dr. George A. Hall (West Virginia University, retired) was the technical advisor for bird surveys.

Breeding bird surveys were conducted from May 25 to June 6, 1994, to determine relative abundance of all avian species that breed in the Phase I construction area. Ten line transects were established parallel to the mountain ridges where wind turbines would be located if construction occurs (Fig. 1). Locations of transects were selected from topographic maps, followed by on-site delineation using plastic flagging and numbered aluminum tags. The length of each transect line depended on access and the length of the ridge where construction would occur. These 10 transect lines totaled 19,500 m (12.2 miles) in length and passed through a variety of habitat types, including, but not restricted to: reclaimed surface mines, mature hardwoods, immature hardwoods, recent clearcuts, and shrub/sapling areas.

Breeding bird surveys were conducted on foot from 30 minutes before sunrise until 4 hours past sunrise. Surveys were not

conducted on mornings when rain or wind reduced the observer's ability to see/hear birds. All paired birds and/or males identified by sight or sound and detected within 33 meters of either side of the transect were recorded. Three different observers conducted these surveys on 7 different mornings from May 25 to June 6. Usually only 1 transect was surveyed per observer per morning, but 2 of the short transects were often surveyed by the same observer on the same morning.

Drive surveys to record resident birds were conducted on 10 different mornings from May 24 until June 23. Three different routes were driven: Beech Ridge-Pole Road (8.5 miles), K.P. Skyway (6.0 miles), and Richwood Road (5.0 miles) (see Fig. 1). Survey counts began 30 minutes before sunrise on dry, windless mornings, and ended approximately 4 hours later. Observers stopped their vehicles every 0.5 miles, listened for 5 minutes, and recorded all birds seen and/or heard. All raptors, ruffed grouse, and wild turkey seen while driving between stops were also recorded.

Migrating songbirds were surveyed from August 20 to October 15 along a 10-mile drive-route from Beech Knob to Cold Knob. Observers stopped every 0.5 mile at 20 different locations and recorded all birds seen and/or heard during a 10-minute observation period. Daytime surveys were conducted on 29 days and nighttime surveys were conducted on 10 nights. Nighttime observers used a parabolic reflector, microphone, and earphones to increase the likelihood of detecting migrating songbirds

overhead.

Resident crows, raptors, ravens, and vultures were surveyed by driving the Beech Ridge-Pole Road from Cold Knob to Beech Knob monthly during June, July, and August and stopping at 10 selected vantage points. Observers recorded all crows, raptors, ravens, and vultures seen and/or heard during 10-minute stops at each observation point.

Migrant raptors were surveyed by Hawkwatch International observers from September 10 through November 29, 1994 from 6 observation points: Beech Knob (29 days), Job Knob (7 days), Joe Knob (2 days), Five-Points (3 days), Craters (9 days), and Cold Knob (36 days)(Fig. 2). Observers with binoculars recorded the following information: species, age (immature-vs-adult), height of flight, direction of flight, time sighted, wind direction, and wind speed. Surveys usually extended throughout most of the daylight hours, but were not conducted during inclement weather. Three different observers participated in these migrant-raptor surveys, and all 3 individuals typically observed on the same day at different sites.

Volunteers were recruited to conduct surveys of migrant birds on September 10 and 11, 1994. These individuals were all amateur ornithologists and possessed varying bird-identification skills. Volunteers observed from 7 vantage points and a crew of professionals observed from 3 additional vantage points. A total of 16 volunteers observed from 10 vantage points from 10 a.m. to 5 p.m. on September 10 and from 10 a.m. to 3 p.m. on September

11. They recorded all birds sighted and the direction of travel of migrating raptors.

To determine the mammal species present in the project area, a thorough literature search was conducted, biologists with the WV Division of Natural Resources were contacted, and the availability of suitable habitat for individual species was determined while conducting bird surveys.

RESULTS

Threatened and Endangered Species

A computer search by the West Virginia Division of Natural Resources Natural Heritage Program indicated that only 1 species listed as threatened or endangered by the U. S. Fish and Wildlife Service is known to occur in the vicinity of the proposed wind turbine project in Greenbrier County. The Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) has been reported from 3 locations near the northeast border of the proposed project site. These locations are approximately 4 miles from the area proposed for Phase I. The northern flying squirrel in West Virginia is restricted to high elevations (usually over 3,500 feet: 1,067 m) and its preferred habitat is red spruce forests (*Picea rubens*). An extensive search of the project area was made to determine if suitable habitat for the northern flying squirrel is present. No red spruce forests occur within the project area and few stands of mature hardwood forest are present. It is highly unlikely that northern flying squirrels are present within

the proposed project area.

The bald eagle, listed as endangered by the U.S. Fish and Wildlife Service, was recorded on only 1 occasion. A single bird was sighted flying past Cold Knob on October 16, 1994.

The eastern woodrat (Neotoma floridana) has been proposed for listing as a threatened and endangered species by the U. S. Fish and Wildlife Service. This species lives in caves or rock outcroppings having large boulders and associated crevices. Woodrats have not been previously reported from the proposed wind turbine site and an extensive search of the project area did not locate suitable woodrat habitat. It is highly unlikely that eastern woodrats occur within the proposed project area.

West Virginia does not have state legislation relating to endangered species, but has published a list of Vertebrate Species of Special Concern (WVDNR 1991). These vertebrate species are classified as: (1) Special Concern, (2) Scientific Interest, and (3) Status Undetermined. These classes are defined as follows:

Special Concern: "A species which was once more common or widespread in West Virginia and is now thought to be declining, becoming more restricted in range, or possibly extirpated."

Scientific Interest: "A species which has a unique scientific value (e.g. endemic, uncertain taxonomic status), or has probably always been uncommon in West Virginia because the State is on the periphery of its range."

Status Undetermined: "Species in this classification are

believed to be uncommon in West Virginia, but supportive data are lacking."

No amphibian or reptile Species of Special Concern are known to occur in the proposed windplant project area.

Six bird species that are listed as Species of Concern by the WVDNR were observed in the proposed project area during 1994 surveys. One species (golden-winged warbler) apparently nested in the area (Tables 3 and 4) and the other 5 species (black vulture, osprey, golden eagle, Cooper's hawk, and northern harrier) were migrants (Tables 8, 10, and 12). Two sightings were made of the golden-winged warbler (Species of Special Concern) during May-June surveys.

Black vultures (Species of Scientific Interest) were sighted during September and October only. One sighting was during the volunteer weekend, 4 during drive surveys, and 52 during raptor surveys. Osprey (Species of Scientific Interest) also were sighted during only September and October: 2 during volunteer weekend, 1 during a drive survey, and 7 during raptor surveys. Cooper's hawks (Species of Special Concern) were sighted only during fall surveys: 9 during volunteer weekend, 12 during drive surveys, and 50 during raptor surveys. Golden eagles (Status Undetermined) were sighted on 7 occasions as they migrated through the project area. Northern harriers (Species of Scientific Interest) also were restricted to the fall migration period: 1 during the volunteer weekend, 4 during drive surveys, and 46 during raptor surveys.

The only mammalian species of Special Concern known to occur in the project area is the rock vole (Microtus chrotorrhinus). This small rodent, classified as a Species of Scientific Interest by the WVDNR, was trapped in clearcut and forested areas by Hahn (1980).

Plants and Plant Communities

No plant species listed as threatened or endangered by the U.S. Fish and Wildlife Service, nor plant species on the West Virginia "Watch List of Rare Plants" were identified from the project site. The area between Beech Knob and Cold Knob was surveyed for unique plant communities, with emphasis on rock outcrops, cliffs, natural "balds", and wetlands. Locations and elevations of sites where intensive surveys were conducted follows: (1) a knob 1.2 miles ESE of Beech Knob (3,960 feet), (2) a knob 1.75 miles ESE of Beech Knob, south of Beech Ridge Road (4,040 feet), (3) a knob 2.5 miles ESE of Beech Knob, north of Beech Ridge Road (4,040 feet), (4) the north slopes at head of Linn Branch near 5-Points (3,880 feet), (5) the northwest slopes of Job Knob (3,850-4,200 feet), (6) the east slopes of Job Knob (4,000-4,160 feet), (7) Old Field Mountain Road (4,050-4,360 feet), (8) Grassy Knob Fire Tower Road (4,160-4,360 feet), and (9) Cold Knob (4,160-4,280 feet).

The majority of the forested areas in the project area are typical of numerous other high-elevation, cold-climate ridges of the central Appalachians. The ridges have steep slopes and range

from 3,800 to 4,360 feet in elevation. They are predominantly northern hardwood forest types, except where old agricultural fields have been recolonized by pioneer tree species such as red maple (Acer rubrum), hawthorn (Crataegus spp), and black birch (Betula lenta).

Some interesting plant species are present in the project area, but no truly rare plant species or plant communities are present. The most interesting botanical sites are seeps and their associated small streams on the northwest slopes between 5-Points and Job Knob. These seeps contain several interesting plant species, including Carex scabrata, lettuce saxifrage, purple-stem aster, closed gentian, and turtlehead.

A list of those herbaceous and woody plants identified in the August 1994 survey is presented in Table 1. This was an autumnal survey, and plants that bloom in spring and summer could not be identified.

Herptiles

The following habitats were identified as suitable habitat for amphibians/reptiles: (1) xeric forests, (2) temporary and permanent ponds, (3) roadside ditches, (4) road puddles, (5) old fields, and (6) strip mines with high walls. These habitats could potentially support 28 species of amphibians and 19 species of reptiles. While all potential species are listed and discussed, several may not occur in higher elevations. Previous studies in higher elevations in northeastern mountains of West

Virginia revealed that several of the species discussed in this report do not occur above 3,000 ft. Since studies have not yet been conducted to determine species of amphibians and reptiles that occur in higher elevations in the southern sections of the state, all potential species are considered. Three species of amphibians (Ambystoma jeffersonianum, Aneides aeneus, and Pseudacris triseriata feriarum) and 2 species of reptiles (Eumeces a anthracinus and Thamnophis s. sauritus) that could occur in the Beech Ridge Project Area are on the West Virginia Division of Natural Resources' list of species of concern.

Amphibians. Table 2 lists the amphibians that potentially occur in the Beech Ridge Project Area under consideration for construction of windplants. Eighteen species of salamanders could occur in the Beech Ridge Project area. Three species of ambystomatid salamanders, Ambystoma jeffersonianum, A. maculatum, and A. opacum, probably occur here. Ambystoma jeffersonianum is listed as a species of concern (undetermined status) by the West Virginia Division of Natural Resources (1990). Notophthalmus v. viridescens is a common species in West Virginia and probably occurs in all ponds in the area.

Three desmognathine species probably occur in the Beech Ridge Project Area. Two, Desmognathus f. fuscus and D. ochrophaeus, are possible residents in seeps and first/second order streams. The third species, D. monticola, has not been recorded in Greenbrier County but could inhabit first/second

order streams in the higher elevations.

Four species of woodland salamanders (Plethodon) may inhabit this area. The forests in the impact areas are xeric, and this could restrict some Plethodon species. Plethodon cinereus and P. glutinosus are the 2 most likely species to occur here, but P. hoffmani and P. wehrlei could also be present.

Hemidactylium scutatum probably occurs in marsh habitats around ponds and roadside ditches that are moss-covered. Gyrinophilus p. porphyriticus and Pseudotriton r. ruber could be present in first/second order streams. Pseudotriton r. ruber is also known to use wet sites with Sphagnum moss. Pseudotriton montanus diastictus typically occurs in muddy bottom wetlands, and there are known populations in Greenbrier County. However, it is doubtful this species occurs at these elevations in the Beech Ridge Project Area.

Aneides aeneus typically occurs in crevices in emergent rocks and rock outcrops. While these habitats are apparently not present in the project area, additional surveys are needed to determine the status of this species in the impact sites. This species is listed by the West Virginia Division of Natural Resources as a species of special concern (1990).

Eurycea bislineata and E. l. longicauda are species that occur in seeps and first/second order streams. Both species also breed in ponds and could therefore be present in the impact area.

While 2 toad species are listed as potential, only Bufo a. americanus is likely to occur at these elevations. In previous

studies in the New River Gorge (Pauley 1992), it was determined that, when in sympatry, B. a. americanus breeds in higher elevations and B. woodhouseii fowleri breeds in lower elevations. Bufo a. americanus could use any of the ponds and roadside ditches and road puddles in this area for breeding habitats.

Greenbrier County is in the zone of sympatry for the 2 species of gray tree frogs (Hyla chrysoscelis and H. versicolor) that occur in West Virginia and, as a result, either or both species could occur in the Beech Ridge Project Area. Ponds in strip mines and other areas and roadside ditches are possible breeding habitats.

The 3 species of Pseudacris that occur in West Virginia could breed in this area. Certainly P. c. crucifer would use the roadside ditches and ponds as breeding sites. Records show that P. brachyphona and P. triserata feriarum occur in Greenbrier County. Little is known about the habitat requirements of P. t. feriarum in West Virginia. While it probably occurs only in the lower elevations, it should be determined if this species occurs in the potential impact sites. Both species breed in roadside ditches and heavy vegetation (grasses) at the edges of ponds.

Four ranid species could occur in the Beech Ridge Project Area. While Rana catesbeiana is less likely to breed in the ponds than the other species, there is potential for this species. The other species, R. clamitans melanota, R. sylvatica, and R. palustris most likely occur in this area. Rana clamitans melanota and R. sylvatica will breed in the ponds in the

potential impact sites. Although R. sylvatica has not been reported from Greenbrier County, it certainly occurs there.

Reptiles. Table 3 lists the 19 species of reptiles that likely occupy habitats in the Beech Ridge Project Area. Of these only 2 turtles, Terrapene c. carolina and Chelydra s. serpentina, probably occur here. Terrapene c. carolina occurs throughout the area, although it may be absent in the higher elevations. While C. s. serpentina is known to occupy almost any type of permanent water, it is not known if it occurs in ponds in the impact area.

Habitats of 3 species of lizards were observed in the Beech Ridge Project Area. Sceloporus undulatus hyacinthinus and Eumeces fasciatus are common throughout most of West Virginia. Eumeces a. anthracinus is a species of concern in West Virginia (WVDNR 1990). Although lizards have not been observed in the higher elevations in northeastern West Virginia (Pauley 1993), they may occur in higher elevations in the southern portions of the state.

Fourteen species of snakes could occur in this area. Nine of these have been observed in higher elevations in the northeastern mountains in West Virginia. These are indicated with an asterisk in Table 3. Most terrestrial species inhabit old field habitats such as strip mine sites.

Nerodia s. sipedon probably inhabits ponds in this area. Storeria o. occipitomaculata inhabits moist habitats and could be found in the strip mine areas. Storeria d. dekayi occurs in

similar habitats but is less likely to be in the higher elevations. Thamnophis s. sirtalis is the most common snake in West Virginia's upland forests. It probably occurs throughout the Beech Ridge Project Area. Thamnophis s. sauritus is one of the 3 most uncommon snakes in West Virginia and is listed as a species of concern by the WVDNR (1990). It is known to occupy ponds and marshes in Greenbrier County. However, it may not occur at these high elevations.

Heterodon platirhinos is not common in West Virginia. It is usually found in sandy habitats where toads are abundant. Although it is doubtful that it occurs in higher elevations, it should be considered as a potential species. The status of Carphophis a. amoenus in the higher elevations of southern West Virginia is not known, but it could potentially occur here. Diadophis punctatus edwardsii and Opheodrys v. vernalis are common species in the higher elevations of the state and should occur in the Beech Ridge Project Area. Two of the 3 black snakes, Coluber c. constrictor and Elaphe o. obsoleta, that occur in West Virginia could occupy habitats in this area. Only E. o. obsoleta is known to occur in higher elevations. Lampropeltis t. triangulum is a common snake in the old field habitat and should occur in this area.

The 2 venomous snakes known to occur in West Virginia, Agkistrodon contortrix mokasen and Crotalus horridus, could be found throughout this area, particularly in the strip mine sites.

Birds

A total of 53 species of resident birds were recorded while conducting walk transects and 59 species were recorded during drive surveys (Table 4). The most abundant resident bird species in the project area were the red-eyed vireo, chestnut-sided warbler, veery, dark-eyed junco, and rufous-sided towhee. In addition to Beech Ridge/Pole Road, 2 additional road segments were surveyed with the objective of having one or both of them serve as a control for comparing future changes in bird populations within the project area. Results of 1994 surveys indicate that the K. P. Skyway is a more appropriate control road than is Richwood Road. A total of 52 bird species was recorded along Beech Ridge/Pole Road, compared to 47 along K. P. Skyway (Table 5). Number of individuals per mile was also quite similar; 103.9 for Beech Ridge/Pole Road and 104.2 for K. P. Skyway.

Relative abundance of resident birds recorded on the 2 types of surveys (walk and drive) was similar. A total of 825 individuals of 53 species was recorded along walk-transects, compared to 883 individuals of 52 species along the Beech Ridge Road/Pole Road drive route. A comparison of walk-transect data with Beech Ridge Road/Pole Road drive-survey data shows the 3 most abundant species (red-eyed vireo, veery, and chestnut-sided warbler) were the same for both drive- and walk-transects (Table 6). Certain species were more likely to be observed during walk-surveys than during drive-surveys, including: junco, black-

throated green warbler, ovenbird, least flycatcher, and hermit thrush. Other species were more likely to be observed during drive-surveys than during walk-surveys, including: indigo bunting, crow, catbird, solitary vireo, and raven.

Bird abundance, as indicated by drive-surveys, was not equal along all sections of Beech Ridge/Pole Road (Fig. 3). Highest numbers were recorded at stops 9, 12, and 17.

As was expected both bird diversity and abundance differed among the various transects. Number of resident species varied from a low of 15 on the Old Field transect to 36 on the Les McClung Road/microwave towers transect (Table 7). Relative abundance varied from a low of 6.7 individual birds per 100 meters on the Grassy Knob transect to a high of 11.3 individuals per 100 meters on the Les McClung/reclaimed stripmine transect. The variation in relative density was due primarily to differential visibility on different transect lines. Visibility was better on the Les McClung/reclaimed stripmine transect than on any other transect.

Drive-surveys conducted along Beech Ridge/Pole Road during summer months detected few resident birds of prey. Only 7 species were recorded: turkey vulture, osprey, red-shouldered hawk, broad-winged hawk, red-tailed hawk, crow, and raven (Table 8). Numbers of resident raptors were quite low, including 3 red-shouldered hawks, 3 broad-winged hawks, and 4 red-tailed hawks.

Relative abundance of birds-of-prey along Beech Ridge Road/Pole Road is presented in Fig. 4, 5, 6, and 7. Due to low

sample size it is not possible to identify areas of concentration.

Amateur ornithologists gathered some interesting and worthwhile data during the volunteer weekend of September 10-11. Although it was not possible to distinguish between resident and migrating birds, it was evident that several of the raptors recorded were migrating through the area. A total of 52 species representing 1,313 birds was recorded by the volunteers (Table 9). This total included 136 raptors, 138 turkey vultures, and 1 black vulture. The most numerous raptors recorded were broad-winged hawks and red-tailed hawks. The most numerous songbirds recorded were chimney swifts, cedar waxwings, and American goldfinches.

The weekend of September 10-11 was the peak concentration of songbird migration through the Appalachians as indicated by bird banding records from the Allegheny Front Migration Observatory in Grant County, WV (Table 10). A total of 1,007 songbirds were banded at the banding station on September 9-10-11, compared to the next highest 3-day total of 767 on September 15-17.

Drive-surveys conducted during August, September, and October indicated that species diversity was slightly higher during September than August, and was lowest in October (Table 11). Bird abundance was greatest during August (157.6/survey), due to higher numbers of goldfinch and unidentified songbirds. Although there were no obvious concentrations of songbirds along the Beech Ridge Road, the highest numbers recorded were at

observation points 5, 6, and 7 (approximately 2-3 miles east of Beech Knob) and at Cold Knob (Fig. 8, 9, 10, 11). Areas of low numbers of birds were at observation points 8, 11, and 16-18.

Sample sizes for raptors, crows, ravens, and turkey vultures from the August-October drive surveys were too small to detect concentrations of birds-of-prey (Fig. 12, 13, 14, 15). Crows appear to be more numerous in the Beech Knob area (near agriculture fields), while ravens are more abundant in the Cold Knob area. Turkey vultures are more abundant in both the Beech Knob and Cold Knob areas than in the areas in between.

Only 201 birds were recorded during the 10 nighttime surveys in August, September, and October (Table 12). Most songbirds could not be identified by species because they were not seen and birds used call-notes rather than typical songs. There did not appear to be concentrations of birds at night at specific points along Beech Ridge Road (Fig. 16).

Raptor observations from select vantage points by Hawkwatch International personnel detected 974 migrating raptors during September, October, and November (Table 13) (Hawkwatch International 1995). The red-tailed hawk was the most abundant species (322 individuals), followed by sharp-shinned hawks (158), turkey vultures (155), and broad-winged hawks (118). Broad-winged hawks were recorded only in September and sharp-shinned hawks were most abundant in September and October. Red-tailed hawks were most abundant in the area in November. The greatest diversity of raptors migrating through the area occurred in

October (13 species), but raptors abundance was greatest in November due to the large numbers of red-tailed hawks migrating through the area. Red-tails comprised 67% of all migrating raptors recorded during November and 33% of all raptors recorded during September-November. The highest numbers were recorded at Cold Knob (112 raptors/100 hours) and Beech Knob (63/100 hours). The high numbers at Cold Knob were due primarily to the concentrations of red-tailed hawks migrating past the knob. Accipiters were slightly more abundant at Beech Knob (41/100 hours) than at Cold Knob (51/100 hours), whereas buteos were slightly more abundant at Cold Knob (131/100 hours) than at Beech Knob (112/100 hours).

Scientific names of all bird species known to occur or expected to occur in the project area are presented in Table 14.

Mammals

A list of mammal species known to occur or expected to occur in the project area is presented in Table 15. The only small mammal trapping previously conducted in or near the project area was by Hahn (1980). He conducted snap-trapping in mature forests and in clearcuts ranging from 1 to 6 years in age. Nine species of small mammals were captured in the mature forest cover type, including the deer mouse, woodland jumping mouse, boreal redback vole, meadow vole, rock vole, southern bog lemming, smoky shrew, masked shrew, and shorttail shrew (Table 15). The same 9 species were captured in clearcuts, and all except the southern bog

lemming were captured in edge habitats where mature forests were adjacent to clearcuts (Hahn and Michael 1980). The most abundant small mammals (> 3.3 captures/100 trapnights) were the deer mouse and redback vole. Capture rates for all other small mammals were <1.0 capture/100 trap nights.

Other mammals known or expected to occur in the project area include: hairy-tailed mole, cottontail rabbit, snowshoe hare, chipmunk, woodchuck, gray squirrel, fox squirrel, southern flying squirrel, red fox, gray fox, black bear, raccoon, long-tailed weasel, spotted skunk, bobcat, and white-tailed deer (Table 15). Bats were observed feeding over roads on several nights, but it was not possible to identify them by species. Bat species most likely to occur in the project area are the little brown bat, eastern pipistrelle, and big brown bat.

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TABLES

Table 1. List of plant species known to occur in the proposed windplant project area, Greenbrier County, WV.

Herbaceous Plants	
Lycopodium lucidulum	Shining club moss
Lycopodium flabelliforme	Groundpine
Osmunda cinnamomea	Cinnamon fern
Thelypteris noveboracensis	New York fern
Dryopteris campyloptera	Mountain wood fern
Dryopteris spinulosa	Spinulose shield fern
Dennstaedtia punctilobula	Hay-scented fern
Athyrium angustum	Northeastern lady fern
Brachyelytrum erectrum	Grass
Danthonia spicata	Poverty oatgrass
Hystrix patula	Bottlebrush grass
Dulichium arundinaceum	Three-way sedge
Carex trisperma	Sedge
Carex scabrata	Sedge
Carex intumescens	Sedge
Amianthium muscaetoxicum	Fly poison
Veratrum viride	White hellebore
Uvularia pudica	Mountain bellwort
Allium tricoccum	Ramp
Clintonia borealis	Yellow clintonia
Clintonia umbellulata	White clintonia
Mianthemum canadense	Wild lily-of-the-valley
Disporum lanuginosum	Hairy disporum
Streptopus roseus	Twisted stalk
Medeola virginiana	Indian cucumber-root
Trillium undulatum	Painted trillium
Smilax rotundifolia	Common greenbrier
Dioscorea villosa	Wild yam
Laportea canadensis	Wood nettle
Cimicifuga americana	Mountain bugbane
Caulophyllum thalictroides	Blue cohosh
Saxifraga micranthidifolia	Lettuce saxifrage
Tiarella cordifolia	Foamflower
Rubus canadensis	Thornless blackberry
Amphicarpa bracteata	Hog-peanut
Oxalis montana	White wood sorrel
Impatiens capensis	Spotted touch-me-not
Viola papilionacea	Common blue violet
Viola blanda	Sweet white violet
Thaspium barbinode	Hairy-jointed meadow-parsnip
Angelica spp.	Angelica
Monotropa uniflora	Indian pipe
Gentiana clausa	Closed gentian
Cuscuta gronovii	Common dodder
Phlox divaricata	Wild blue phlox

Table 1. Continued.

Hydrophyllum virginianum	Virginia waterleaf
Hydrophyllum canadense	Broad-leaved waterleaf
Collinsonia canadensis	Richweed
Chelone glabra	Turtlehead
Pedicularis canadensis	Common lousewort
Epifagus virginiana	Beechdrops
Mitchella repens	Partridgeberry
Solidago puberula	Downy goldenrod
Solidago erecta	Slender goldenrod
Aster puniceus	Purple-stem aster
Uncommon Trees and Shrubs	
Magnolia acuminata	Cucumber tree
Magnolia fraseri	Mountain magnolia
Tsuga canadensis	Hemlock
Pyrus americana	Mountain-ash
Menziesia pilosa	Allegheny menziesia
Common Trees and Shrubs	
Quercus rubra	Red oak
Acer rubrum	Red maple
Acer saccharum	Sugar maple
Acer pensylvanicum	Striped maple
Fagus grandifolia	American beech
Prunus serotina	Wild black cherry
Hamamelis virginiana	Witch hazel
Betula lenta	Black birch
Betula alleghaniensis	Yellow birch
Prunus pensylvanica	Fire cherry
Fraxinus americana	White ash
Tilia americana	American basswood
Rhododendron calendulaceum	Flame azalea
Ilex montana	Mountain holly
Viburnum alnifolium	Hobblebush

Table 2. List of amphibian species known to occur or expected to occur in the proposed windplant project area, Greenbrier County, WV.

Salamanders	
Ambystoma jeffersonianum	Jefferson salamander
Ambystoma maculatum	Spotted salamander
Ambystoma opacum	Marbled salamander
Notophthalmus v. viridescens	Red-spotted newt, Red eft
Desmognathus f. fuscus	Northern dusky salamander
Desmognathus monticola	Seal salamander
Desmognathus ochrophaeus	Mountain dusky salamander
Plethodon cinereus	Redback salamander
Plethodon hoffmani	Valley and ridge salamander
Plethodon glutinosus	Slimy salamander
Plethodon wehrlei	Wehrle's salamander
Hemidactylium scutatum	Four-toed salamander
Gyrinophilus p. porphyriticus	Northern spring salamander
Pseudotriton montanus diastictus	Midland mud salamander
Pseudotriton r. ruber	Northern red salamander
Aneides aeneus	Green salamander
Eurycea bislineata	Northern two-lined salamander
Eurycea l. longicauda	Longtail salamander
Toads	
Bufo a. americanus	Eastern American toad
Bufo woodhouseii fowleri	Fowler's toad
Frogs	
Hyla versicolor/chrysoscelis	Gray treefrog (complex)
Pseudacris c. crucifer	Northern spring peeper
Pseudacris brachyphona	Mountain chorus frog
Pseudacris triserata feriarum	Upland chorus frog
Rana catesbeiana	Bullfrog
Rana clamitans melanota	Green frog
Rana sylvatica	Wood frog
Rana palustris	Pickerel frog

Table 3. List of reptile species known to occur or expected to occur in the proposed windplant project area, Greenbrier County, WV.

Turtles	
Chelydra s. serpentina	Common snapping turtle
Terrapene c. carolina	Eastern box turtle
Lizards	
Sceloporus undulatus hyacinthinus	Northern fence lizard
Eumeces fasciatus	Five-lined skink
Eumeces a. anthracinus	Northern coal skink
Snakes	
Nerodia s. sipedon*	Northern water snake
Storeria o. occipitomaculata*	Northern redbelly snake
Storeria d. dekayi	Northern brown snake
Thamnophis s. sirtalis*	Eastern garter snake
Thamnophis s. sauritus	Eastern ribbon snake
Heterodon platirhinos	Eastern hognose snake
Carphophis a. amoenus	Eastern worm snake
Diadophis punctatus edwardsii*	Northern ringneck snake
Coluber c. constrictor	Northern black racer
Opheodrys v. vernalis*	Eastern smooth green snake
Elaphe o. obsoleta*	Black rat snake
Lampropeltis t. triangulum*	Eastern milk snake
Agkistrodon contortrix mokasen*	Northern copperhead
Crotalus horridus*	Timber rattlesnake

*Species known to occur in the higher elevations of the northeastern section of the state.

Table 4. Total numbers of resident birds recorded during breeding bird surveys along transect lines and drive routes, May-June, 1994. N = number of different days surveyed.

Species	Numbers of Individuals Sighted: Walk Transects (N=29)	Drive Routes (N=10)
Mallard	-	2
Turkey vulture	2	10
Red-shouldered hawk	2	-
Broad-winged hawk	-	2
Ruffed grouse	2	2
Wild turkey	1	1
Mourning dove	2	3
Yellow-billed cuckoo	2	8
Barred owl	2	-
Chimney swift	-	1
Ruby-throated hummingbird	-	1
Northern flicker	2	8
Pileated woodpecker	2	5
Downy woodpecker	7	1
Hairy woodpecker	1	2
Unidentified woodpecker	2	17
Acadian flycatcher	-	1
Willow flycatcher	2	6
Least flycatcher	19	23
Eastern wood peewee	5	9
Tree swallow	1	1
Blue jay	3	11
Common raven	2	18
Common crow	12	52
Black-capped chickadee	11	16
White-breasted nuthatch	3	7
House wren	3	1
Winter wren	-	2
Gray catbird	8	49
Brown thrasher	2	10
American robin	31	51
Wood thrush	4	29
Hermit thrush	18	15
Veery	84	215
Cedar waxwing	14	30
Solitary vireo	8	51
Red-eyed vireo	126	264
Black and white warbler	1	2
Golden-winged warbler	1	1
Magnolia warbler	-	2
Black-throated blue warbler	4	23
Black-throated green warbler	57	73
Chestnut-sided warbler	81	247
Ovenbird	41	27

Table 4. Continued.

Species	Numbers of Individuals Sighted Walk Transects (N=29)	Drive Routes (N=10)
Kentucky warbler	3	1
Mourning warbler	19	39
Common yellowthroat	9	27
Hooded warbler	5	16
Canada warbler	5	8
American redstart	1	11
Brown-headed cowbird	26	59
Scarlet tanager	2	19
Rose-breasted grosbeak	14	46
Indigo bunting	12	65
American goldfinch	25	65
Rufous-sided towhee	40	100
Dark-eyed junco	65	101
Vesper sparrow	-	3
Chipping sparrow	5	13
Field sparrow	5	16
Song sparrow	21	22
Total # species	53	59

Table 5. Total numbers of resident birds recorded during 10 drive routes, May-June, 1994.

	K.P. Skyway (6 miles)	Richwood Road (5 miles)	Beech Ridge/ Pole Road (8.5 miles)
Mallard	-	-	2
Turkey vulture	3	3	4
Broad-winged hawk	1	-	1
Ruffed grouse	1	-	1
Wild turkey	-	-	1
Mourning dove	-	-	3
Yellow-billed cuckoo	4	2	2
Chimney swift	1	-	-
Ruby-throated hummingbird	-	-	1
Northern flicker	4	1	3
Pileated woodpecker	-	3	2
Downy woodpecker	1	-	-
Hairy woodpecker	2	-	-
Unidentified woodpecker	11	3	3
Acadian flycatcher	-	1	-
Willow flycatcher	2	1	3
Least flycatcher	12	5	6
Eastern wood peewee	6	-	3
Tree swallow	-	-	1
Blue jay	5	3	3
Common raven	4	4	10
Common crow	7	11	34
Black-capped chickadee	8	2	6
White-breasted nuthatch	2	3	2
House wren	-	-	1
Winter wren	2	-	-
Gray catbird	10	9	30
Brown thrasher	4	1	5
American robin	12	13	26
Wood thrush	22	3	4
Hermit thrush	10	3	2
Veery	63	53	99
Cedar waxwing	4	5	21
Solitary vireo	7	23	21
Red-eyed vireo	112	55	97
Black and white warbler	-	-	2
Golden-winged warbler	1	-	-
Magnolia warbler	1	-	1
Black-throated blue warbler	18	2	3
Black-throated green warbler	34	14	25
Chestnut-sided warbler	62	60	125
Ovenbird	6	4	17
Kentucky warbler	-	1	-
Mourning warbler	14	10	15
Common yellowthroat	8	2	17

Table 5. Continued.

	K.P. Skyway (6 miles)	Richwood Road (5 miles)	Beech Ridge/ Pole Road (8.5 miles)
Hooded warbler	2	2	12
Canada warbler	2	2	4
American redstart	4	-	7
Brown-headed cowbird	13	5	41
Scarlet tanager	6	5	8
Rose-breasted grosbeak	14	16	16
Indigo bunting	11	8	46
American goldfinch	33	6	26
Rufous-sided towhee	32	20	48
Dark-eyed junco	39	32	30
Vesper sparrow	-	-	3
Chipping sparrow	1	3	9
Field sparrow	4	2	10
Song sparrow	-	1	21
Total # individuals	625	402	883
Total # species	47	41	52
# individuals/mile	104.2	80.4	103.9

Table 6. Relative abundance of resident birds recorded during breeding bird surveys along transect lines and the Beech Ridge/Pole Road drive routes, May-June, 1994. N = number of different days surveyed.

Species	Numbers of Individuals Sighted	
	Walk Transects (N=29)	Drive Routes (N=10)
Red-eyed vireo	126	97
Veery	84	99
Chestnut-sided warbler	81	125
Dark-eyed junco	65	30
Black-throated green warbler	57	25
Ovenbird	41	17
Rufous-sided towhee	40	48
American robin	31	26
Brown-headed cowbird	26	41
American goldfinch	25	26
Song sparrow	21	21
Mourning warbler	19	15
Least flycatcher	19	6
Hermit thrush	18	2
Cedar waxwing	14	21
Rose-breasted grosbeak	14	16
Indigo bunting	12	46
Common crow	12	34
Black-capped chickadee	11	6
Common yellowthroat	9	17
Gray catbird	8	30
Solitary vireo	8	21
Downy woodpecker	7	0
Hooded warbler	5	12
Field sparrow	5	10
Chipping sparrow	5	9
Canada warbler	5	4
Eastern wood pewee	5	3
Wood thrush	4	4
Black-throated blue warbler	4	3
Blue jay	3	3
White-breasted nuthatch	3	2
House wren	3	1
Kentucky warbler	3	0
Common raven	2	10
Scarlet tanager	2	8
Brown thrasher	2	5
Turkey vulture	2	4
Willow flycatcher	2	3
Northern flicker	2	3
Unidentified woodpecker	2	3
Mourning dove	2	3

Table 6. Continued

Species	Numbers of Individuals Sighted: Walk Transects (N=29)	Drive Routes (N=10)
Pileated woodpecker	2	2
Yellow-billed cuckoo	2	2
Ruffed grouse	2	1
Barred owl	2	0
Red-shouldered hawk	2	0
American redstart	1	7
Black and white warbler	1	2
Wild turkey	1	1
Tree swallow	1	1
Hairy woodpecker	1	0
Golden-winged warbler	1	0
Vesper sparrow	0	3
Mallard	0	2
Broad-winged hawk	0	1
Ruby-throated hummingbird	0	1
Magnolia warbler	0	1
Total # individuals	825	883
Total # species	53	52

Table 7. Total numbers of resident birds recorded during transect line surveys, May-June, 1994. N = number different days surveyed.

	Transect Line							
	A* N=4	B N=5	C N=3	D N=3	E N=4	F N=3	G N=3	H N=4
Turkey vulture	1	-	-	-	-	-	-	-
Red-shouldered hawk	-	1	-	-	-	-	-	-
Ruffed grouse	1	-	-	1	-	-	-	-
Mourning dove	-	-	-	-	-	-	-	6
Chimney swift	-	-	-	1	-	-	-	-
Northern flicker	2	-	-	3	-	-	-	-
Pileated woodpecker	-	-	-	1	-	-	-	-
Downy woodpecker	1	1	1	1	-	-	2	-
Unidentified woodpecker	1	1	-	-	-	-	-	-
Acadian flycatcher	-	-	-	1	-	-	-	-
Willow flycatcher	-	-	1	-	-	-	-	2
Least flycatcher	-	-	1	8	-	7	12	1
Eastern wood-pewee	1	-	-	1	-	-	6	-
Tree swallow	-	-	-	-	1	-	-	-
Blue jay	-	-	1	-	-	-	1	-
Common raven	-	-	-	-	-	-	2	-
American crow	3	-	2	4	5	-	-	-
Black-capped chickadee	-	-	-	7	-	-	4	2
White-breasted nuthatch	-	-	-	4	-	-	-	-
Gray catbird	-	-	2	5	1	-	2	2
Brown thrasher	-	-	2	-	-	-	-	1
American robin	4	8	3	10	15	2	8	6
Wood thrush	-	-	-	2	-	2	1	-
Hermit thrush	2	2	2	9	-	6	9	1
Veery	28	36	19	52	2	8	26	10
Cedar waxwing	-	-	-	2	-	1	9	2
Solitary vireo	1	1	1	4	-	-	3	-
Red-eyed vireo	44	26	19	77	4	9	49	6
Black and white warbler	-	-	-	1	-	-	-	-
Golden-winged warbler	-	-	2	-	-	-	-	-
Bl-throated blue warbler	1	-	-	1	1	-	1	-
Bl-throated green warbler	25	21	3	28	3	3	19	-
Chestnut-sided warbler	11	22	24	44	4	10	38	15
Ovenbird	28	10	2	25	1	5	18	2
Kentucky warbler	-	-	-	2	-	1	2	-
Mourning warbler	3	9	4	1	-	2	9	2
Yellowthroat	2	1	4	1	2	-	3	2
Hooded warbler	3	-	-	2	-	-	-	-
Canada warbler	-	4	-	-	-	-	2	-
American redstart	-	-	-	-	-	-	1	-
Northern oriole	-	-	-	-	-	-	1	-
Brown-headed cowbird	-	1	1	7	44	-	6	-

Table 7. Continued.

	Transect Line							
	A* N=4	B N=5	C N=3	D N=3	E N=4	F N=3	G N=3	H N=4
Scarlet tanager	-	2	-	-	-	-	1	-
Rose-breasted grosbeak	1	2	1	9	-	-	5	-
Indigo bunting	-	2	6	2	2	-	1	4
American goldfinch	-	-	1	-	18	7	8	1
Rufous-sided towhee	4	14	11	13	5	3	24	13
Dark-eyed junco	12	14	6	35	-	12	45	11
Chipping sparrow	-	-	2	1	2	-	2	1
Field sparrow	-	-	1	2	-	-	-	3
Song sparrow	-	-	2	4	25	-	1	4
Total # individuals	179	178	124	371	135	78	321	97
Total # species	22	20	20	36	17	15	33	22
Transect length (meters)	2600	1700	1700	5400	1200	1000	4800	1100
# individuals/100 meters	6.9	10.5	7.3	6.9	11.3	7.8	6.7	8.8

*A = Beech Ridge Road: 3.2 miles east of Anjean Road junction.
B = Job Knob: 4.0 miles east of Anjean Road junction.
C = Five-points: 4.1 miles east of Anjean Road junction.
D = Les McClung Road/microwave towers: 6.1 miles east of Anjean Road junction.
E = Les McClung Road/reclaimed stripmine: 6.2 miles east of Anjean Road junction.
F = Old Field Road: 8.0 miles east of Anjean Road junction.
G = Grassy Knob: 8.2 miles east of Anjean Road junction.
H = Cold Knob: 10.0 miles east of Anjean Road junction.

Table 8. Total numbers of resident turkey vultures, raptors, crows, and ravens sighted during drive surveys along Beech Ridge-Pole Road, June-August 1994. N = number of surveys conducted.

	June (N=1)	July (N=3)	August (N=2)
Turkey vulture	22	9	10
Osprey	-	-	1
Red-shouldered hawk	-	3	-
Broad-winged hawk	2	-	1
Red-tailed hawk	-	-	4
American crow	-	19	9
Common raven	1	4	8

Table 9. Total numbers of birds (resident and migratory) sighted from 7 observation points between Beech Knob and Cold Knob during "volunteer weekend", September 10-11, 1994.

	Observation Points						
	A*	B	C	D	E	F	G
Turkey vulture	15	19	-	33	3	43	25
Black vulture	-	1	-	-	-	-	-
Osprey	-	1	-	1	-	-	-
Northern harrier	-	-	-	-	1	-	-
Sharp-shinned hawk	2	4	-	-	1	3	1
Cooper's hawk	1	4	-	2	-	-	2
Unidentified accipiter	-	-	-	1	1	6	1
Red-shouldered hawk	2	2	-	2	2	-	3
Broad-winged hawk	2	13	-	2	1	20	2
Red-tailed hawk	4	3	-	1	3	1	5
Unidentified buteo	1	-	-	1	-	13	-
American kestrel	-	2	-	-	1	3	1
Merlin	-	1	-	-	-	-	-
Unidentified hawk	2	1	6	1	-	-	3
Ruffed grouse	-	-	-	1	-	-	-
Wild turkey	-	-	-	4	-	1	-
Mourning dove	-	-	-	1	-	-	1
Barred owl	-	-	-	1	-	-	-
Common nighthawk	-	-	-	4	-	-	-
Chimney swift	-	60	-	40	-	3	5
Hummingbird	1	1	-	-	-	-	-
Northern flicker	-	-	-	4	-	-	2
Pileated woodpecker	-	-	-	3	-	-	-
Downy woodpecker	-	-	-	1	-	-	-
Unidentified woodpecker	1	-	-	-	-	-	-
Eastern wood-pewee	-	-	-	3	-	-	-
Eastern phoebe	-	-	-	7	-	3	-
Eastern kingbird	-	-	-	1	-	-	-
Tree swallow	-	35	-	-	-	-	-
Barn swallow	-	2	-	1	3	2	-
Unidentified swallow	-	6	1	-	-	-	-
Blue jay	-	-	-	3	1	-	-
Common raven	5	2	-	13	2	-	2
American crow	10	6	-	16	7	10	1
Black-capped chickadee	1	2	-	5	-	1	-
White-breasted nuthatch	-	15	-	3	-	-	-
Golden-crowned kinglet	-	-	-	2	-	-	-
Gray catbird	7	1	-	3	-	-	-
Wood thrush	-	-	-	-	-	-	1
Cedar waxwing	12	46	-	11	94	-	9
Red-eyed vireo	1	-	-	8	-	-	-
Magnolia warbler	-	-	-	3	-	-	-
Black-throated green warbler	-	-	-	6	-	-	-

Table 9. Continued.

	Observation Points						
	A*	B	C	D	E	F	G
Chestnut-sided warbler	-	-	-	6	-	-	-
Yellow-throated warbler	-	2	-	-	-	-	-
Yellowthroat	-	-	-	1	-	-	-
Blackpoll warbler	-	-	-	-	-	-	1
Yellow-breasted chat	1	1	-	1	-	-	-
Unidentified warbler	1	31	-	3	-	-	2
Rose-breasted grosbeak	-	2	-	-	-	-	-
Indigo bunting	1	-	-	-	-	-	-
American goldfinch	10	9	-	28	-	13	50
Rufous-sided towhee	-	2	-	4	-	4	-
Dark-eyed junco	1	3	-	-	-	5	1
Field sparrow	-	-	-	2	-	1	1
Grasshopper sparrow	-	-	-	-	-	-	1
Savannah sparrow	-	-	-	1	-	-	-
Unidentified sparrow	1	4	-	14	-	-	-
Unidentified songbird	27	78	2	55	-	17	125
Total # individuals	109	358	9	303	120	149	265

*A = Westvaco tree sign (2.5 miles east of Anjean Road junction): 9/10/94 - 2 observers and 9/11/94 - 2 observers.

B = Powerline crossing/Kiosk overlook (3.1 miles east of Anjean Road junction): 9/10/94 - 2 observers and 9/11/94 - 3 observers.

C = Five-points (4.0 miles east of Anjean Road junction): 9/10/94 - 2 observers.

D = Les McClung/South Laurel (6.0 miles east of Anjean Road junction): 9/10/94 - 4 observers and 9/11/94 - 3 observers.

E = Joe Knob (2 miles east of Anjean): 9/10/94 - 1 observer.

F = Grassy Knob/Cut-off Road (8.0 miles east of Anjean Road junction): 9/10/94 - 3 observers and 9/11/94 - 3 observers).

G = Cold Knob (10.0 miles east of Anjean Road junction): 9/10/94 - 3 observers and 9/11/94 - 3 observers.

Table 10. Number of songbirds banded at the Allegheny Front Migration Observatory, August-October, 1994 (from George Hall).

Date	# Birds Banded		# Birds Banded
August		September	
13	3	25	209
14	16	26	39
15	16	27	57
16	8	28	12
17	rain	29	37
18	rain	30	94
19	22	October	
20	24	1	156
21	19	2	11
22	5	3	19
23	6	4	40
24	13	5	29
25	32	6	73
26	68	7	35
27	14	8	47
28	58	9	24
29	16		
30	58		
31	78		
September			
1	6		
2	13		
3	19		
4	5		
5	22		
6	33		
7	46		
8	111		
9	185		
10	542		
11	280		
12	92		
13	65		
14	99		
15	256		
16	230		
17	281		
18	66		
19	117		
20	59		
21	49		
22	12		
23	21		
24	76		

Table 11. Total numbers of birds (resident and migratory) sighted during 29 daytime drive routes along Beech Ridge-Pole Road (10 miles), August-October, 1994. N = number of surveys conducted.

Species	August (N=7)	September (N=16)	October (N=6)
Black vulture	-	4	-
Turkey vulture	14	35	40
Osprey	-	1	-
Northern harrier	-	3	1
Sharp-shinned hawk	-	3	6
Cooper's hawk	2	6	4
Red-shouldered hawk	-	6	2
Broad-winged hawk	6	5	1
Red-tailed hawk	1	4	7
Unidentified buteo	-	2	-
Kestrel	1	1	1
Unidentified hawk	-	1	2
Ruffed grouse	-	1	2
Wild turkey	-	-	9
Mourning dove	-	1	-
Yellow-billed cuckoo	2	3	1
Chimney swift	3	5	-
Hummingbird	11	-	-
Northern flicker	2	7	2
Pileated woodpecker	-	3	3
Downy woodpecker	3	8	6
Hairy woodpecker	-	1	-
Unidentified woodpecker	1	1	5
Acadian flycatcher	3	-	-
Eastern wood-pewee	3	-	-
Eastern phoebe	1	5	-
Unidentified flycatcher	-	2	1
Eastern kingbird	1	-	-
Tree swallow	13	-	-
Blue jay	4	12	12
Common raven	5	44	45
Common crow	48	123	71
Chickadee	52	123	35
White-breasted nuthatch	2	4	-
Carolina wren	2	-	-
Ruby-crowned kinglet	-	-	10
Gray catbird	42	81	-
American robin	10	29	21
Northern mockingbird	-	2	-
Veery	8	-	2
Cedar waxwing	111	246	50
Solitary vireo	2	2	7
Red-eyed vireo	37	16	4

Table 11. Continued.

Species	August (N=7)	September (N=16)	October (N=6)
Black & white warbler	3	1	-
Worm-eating warbler	1	-	-
Black-throated blue warbler	-	19	2
Black-throated green warbler	2	7	4
Palm warbler	-	1	2
Chestnut-sided warbler	6	9	-
Ovenbird	2	6	-
Yellowthroat	19	44	1
Hooded warbler	3	1	-
Canada warbler	-	1	-
American redstart	-	2	-
Unidentified warbler	15	125	21
Red-winged blackbird	1	-	-
Brown-headed cowbird	1	-	-
Scarlet tanager	1	-	-
Rose-breasted grosbeak	1	6	-
Indigo bunting	5	-	-
American goldfinch	148	132	29
Rufous-sided towhee	36	70	23
Dark-eyed junco	25	30	17
Chipping sparrow	2	9	-
Field sparrow	6	12	3
Song sparrow	20	9	11
White-throated sparrow	-	-	5
Unidentified songbird	416	550	112
Total # individuals	1,103	1,824	580
Total # species	48	53	39
Ave. # individuals/survey	157.6	114.0	96.7

Table 12. Numbers of birds (resident and migratory) recorded during 10 nightime drive routes along Beech Ridge-Pole Road (10 miles), August-October, 1994.

Species	Number Recorded
Screech owl	1
Barred owl	9
Unidentified owl	1
Common nighthawk	2
Great-crested flycatcher	1
American robin	1
Red-eyed vireo	1
Yellowthroat	1
Unidentified songbird	184
Total # individuals	201

Table 13. Total numbers of migrating birds-of-prey recorded at 6 observation points from Beech Knob to Cold Knob, September-November, 1994. N = number of surveys conducted.

	Observation Point						
	Beech Knob N=10	Five Points N=3	Job Knob N=4	Joe Knob N=2	Craters N=2	Cold Knob N=7	TOTAL N=28
September							
Turkey vulture	-	-	-	-	-	-	0
Black vulture	-	-	-	-	-	-	0
Osprey	2	-	-	-	-	3	5
Bald eagle	-	-	-	-	-	-	0
Golden eagle	-	-	-	-	-	-	0
Harrier	2	-	1	-	-	1	4
Sharp-shinned	25	4	2	1	-	27	59
Cooper's	3	1	2	-	-	5	11
Northern goshawk	-	-	-	-	-	-	0
Red-shouldered	2	-	-	-	-	1	3
Broad-winged	58	10	28	3	3	16	118
Red-tailed	7	3	-	-	-	2	12
Kestrel	14	-	2	1	-	5	22
Merlin	-	-	-	-	-	-	0
Unid. Accipiter	1	1	3	1	-	1	7
Unid. Buteo	12	1	-	-	-	6	19
Unid. Raptor	5	5	1	1	-	15	27
Total	131	25	39	27	3	82	287

	Observation Point						
	Beech Knob N=10	Five Points N=0	Job Knob N=5	Joe Knob N=0	Craters N=7	Cold Knob N=13	TOTAL N=35
October							
Turkey vulture	11		5		-	57	73
Black vulture	-		-		-	7	7
Osprey	1		-		-	1	2
Bald eagle	-		-		-	1	1
Golden eagle	-		-		-	1	1
Harrier	-		-		-	2	2
Sharp-shinned	22		29		14	27	92
Cooper's	6		-		1	20	27
Northern goshawk	-		-		-	3	3
Red-shouldered	-		-		1	1	2
Broad-winged	-		-		-	-	0
Red-tailed	5		-		1	43	49
Kestrel	1		-		1	5	7
Merlin	1		-		-	-	1
Unid. Accipiter	6		1		3	4	14
Unid. Buteo	-		-		-	4	4
Unid. Raptor	1		5		1	5	12
Total	54	-	40	-	22	181	297

Table 13. Continued

	Observation Point						
	Beech Knob N=9	Five Points N=0	Job Knob N=0	Joe Knob N=0	Craters N=0	Cold Knob N=16	TOTAL N=25
November							
Turkey vulture	38					44	82
Black vulture	-					-	0
Osprey	-					-	0
Golden eagle	1					5	6
Harrier	2					7	9
Sharp-shinned	-					7	7
Cooper's	3					4	7
Northern goshawk	-					-	0
Red-shouldered	2					1	3
Broad-winged	-					-	0
Red-tailed	90					171	261
Kestrel	-					1	1
Merlin	-					-	0
Unid. Accipiter	-					-	0
Unid. Buteo	6					8	14
Unid. Raptor	-					-	0
Total	142	-	-	-	-	248	390

	Observation Point						
	Beech Knob N=29	Five Points N=3	Job Knob N=9	Joe Knob N=2	Craters N=9	Cold Knob N=36	TOTAL N=88
Sept.-Oct.-Nov.							
Turkey vulture	49	-	5	-	-	101	155
Black vulture	-	-	-	-	-	7	7
Osprey	3	-	-	-	-	4	7
Bald eagle	-	-	-	-	-	1	1
Golden eagle	1	-	-	-	-	6	7
Harrier	4	-	1	-	-	10	15
Sharp-shinned	47	4	31	1	14	61	158
Cooper's	12	1	2	-	1	29	45
Northern goshawk	-	-	-	-	-	3	3
Red-shouldered	4	-	-	-		3	7
Broad-winged	58	10	28	3	3	16	118
Red-tailed	102	3	-	-	1	216	322
Kestrel	15	-	2	1	1	12	31
Merlin	1	-	-	-	-	-	1
Unid. Accipiter	7	1	4	1	3	5	21
Unid. Buteo	18	1	-	-	-	18	37
Unid. Raptor	6	5	6	1	1	20	39
Total	327	25	79	7	24	512	974

Table 14. Scientific names of birds known to occur or expected to occur in the proposed windplant project area, Greenbrier County, WV.

Anas platyrhynchos	Mallard
Coragyps atratus	Black vulture
Cathartes aura	Turkey vulture
Accipiter striatus	Sharp-shinned hawk
Accipiter cooperi	Cooper's hawk
Buteo jamaicensis	Red-tailed hawk
Buteo lineatus	Red-shouldered hawk
Buteo platypterus	Broad-winged hawk
Circus cyaneus	Northern harrier
Pandion haliaetus	Osprey
Aquila chrysaetos	Golden eagle
Falco sparverius	Kestrel
Falco columbarius	Merlin
Bonasa umbellus	Ruffed grouse
Meleagris gallopavo	Wild turkey
Charadrius vociferus	Killdeer
Philohela minor	American woodcock
Coccyuzus americanus	Yellow-billed cuckoo
Otus asio	Screech owl
Strix varia	Barred owl
Chordeiles minor	Common nighthawk
Chaetura pelagica	Chimney swift
Archilochus colubris	Ruby-throated hummingbird
Colaptes auratus	Northern flicker
Dryocopus pileatus	Pileated woodpecker
Sphyapicus varius	Yellow-bellied sapsucker
Dendrocopos villosus	Hairy woodpecker
Dendrocopos pubescens	Downy woodpecker
Tyrannus tyrannus	Eastern kingbird
Sayornis phoebe	Eastern phoebe
Myiarchus crinitus	Great-crested flycatcher
Empidonax trailli	Willow flycatcher
Empidonax virescens	Acadian flycatcher
Empidonax alnorum	Alder flycatcher
Empidonax minimus	Least flycatcher
Contopus virens	Eastern wood pewee
Iridoprocne bicolor	Tree swallow
Hirundo rustica	Barn swallow
Cyanocitta cristata	Blue jay
Corvus corax	Common raven
Corvus brachyrhynchos	Common crow
Parus atricapillus	Black-capped chickadee
Parus bicolor	Tufted titmouse
Sitta carolinenis	White-breasted nuthatch
Certhia familiaris	Brown creeper
Troglodytes aedon	House wren

Table 14. Continued.

Troglodytes troglodytes	Winter wren
Dumetella carolinensis	Gray catbird
Toxostoma rufum	Brown thrasher
Turdus migratorius	American robin
Hylocichla mustelina	Wood thrush
Catharus guttata	Hermit thrush
Catharus fuscescens	Veery
Sialia sialis	Eastern bluebird
Polioptila caerulea	Blue-grey gnatcatcher
Regulus satrapa	Golden-crowned kinglet
Regulus calendula	Ruby-crowned kinglet
Bombycilla cedrorum	Cedar waxwing
Sturnus vulgaris	Starling
Vireo solitarius	Solitary vireo
Vireo olivaceus	Red-eyed vireo
Mniotilta varia	Black and white warbler
Vermivora chrysoptera	Golden-winged warbler
Vermivora peregrina	Tennessee warbler
Vermivora ruficapilla	Nashville warbler
Parula americana	Northern parula
Dendroica magnolia	Magnolia warbler
Dendroica caerulescens	Black-throated blue warbler
Dendroica coronata	Yellow-rumped warbler
Dendroica virens	Black-throated green warbler
Dendroica pensylvanica	Chestnut-sided warbler
Dendroica fusca	Blackburnian warbler
Seiurus aurocapillus	Ovenbird
Geothlypis trichas	Common yellowthroat
Oporornis formosus	Kentucky warbler
Oporornis philadelphia	Mourning warbler
Wilsonia citrini	Hooded warbler
Wilsonia canadensis	Canada warbler
Setophaga ruticilla	American redstart
Sturnella magna	Eastern meadowlark
Agelaius phoeniceus	Red-winged blackbird
Quiscalus quiscula	Common grackle
Molothrus ater	Brown-headed cowbird
Piranga olivacea	Scarlet tanager
Pheucticus ludovicianus	Rose-breasted grosbeak
Passerina cyanea	Indigo bunting
Carpodacus purpureus	Purple finch
Spinus tristis	American goldfinch
Pipilo erythrophthalmus	Rufous-sided towhee
Junco hyemalis	Dark-eyed junco
Pooecetes gramineus	Vesper sparrow
Spizella passerina	Chipping sparrow
Spizella pusilla	Field sparrow
Ammodramus savannarum	Grasshopper sparrow
Passerculus sandwichensis	Savannah sparrow
Melospiza melodia	Song sparrow

Table 15. List of mammal species known to occur or expected to occur in the proposed windplant project area, Greenbrier County, WV.

Didelphis virginiana	Opossum
*Sorex fumeus**	Smoky shrew
*Sorex cinereus**	Masked shrew
*Blarina brevicauda**	Short-tailed shrew
Parascalops breweri	Hairy-tailed mole
Myotis lucifugus	Little brown bat
Pipistrellus subflavus	Eastern pipistrelle
Eptesicus fuscus	Big brown bat
Lepus americanus	Snowshoe hare
Sylvilagus floridanus	Eastern cottontail
Tamias striatus	Eastern chipmunk
Marmota monax	Woodchuck
Sciurus carolinensis	Eastern gray squirrel
Sciurus niger	Fox squirrel
Glaucomys volans	Southern flying squirrel
*Peromyscus maniculatus**	Deer mouse
*Clethrionomys gapperi**	Southern red-backed vole
*Microtus pennsylvanicus**	Meadow vole
*Microtus chrotorrhinus**	Rock vole
*Synaptomys cooperi**	Southern bog lemming
*Napaeozapus insignis**	Woodland jumping mouse
Vulpes vulpes	Red fox
Urocyon cinereoargenteus	Gray fox
Ursus americanus	Black bear
Procyon lotor	Raccoon
Mustela frenata	Long-tailed weasel
Mephitis mephitis	Striped skunk
Felis rufus	Bobcat
Odocoileus virginianus	White-tailed deer

* = Trapped by Hahn (1980) in project area.

FIGURES

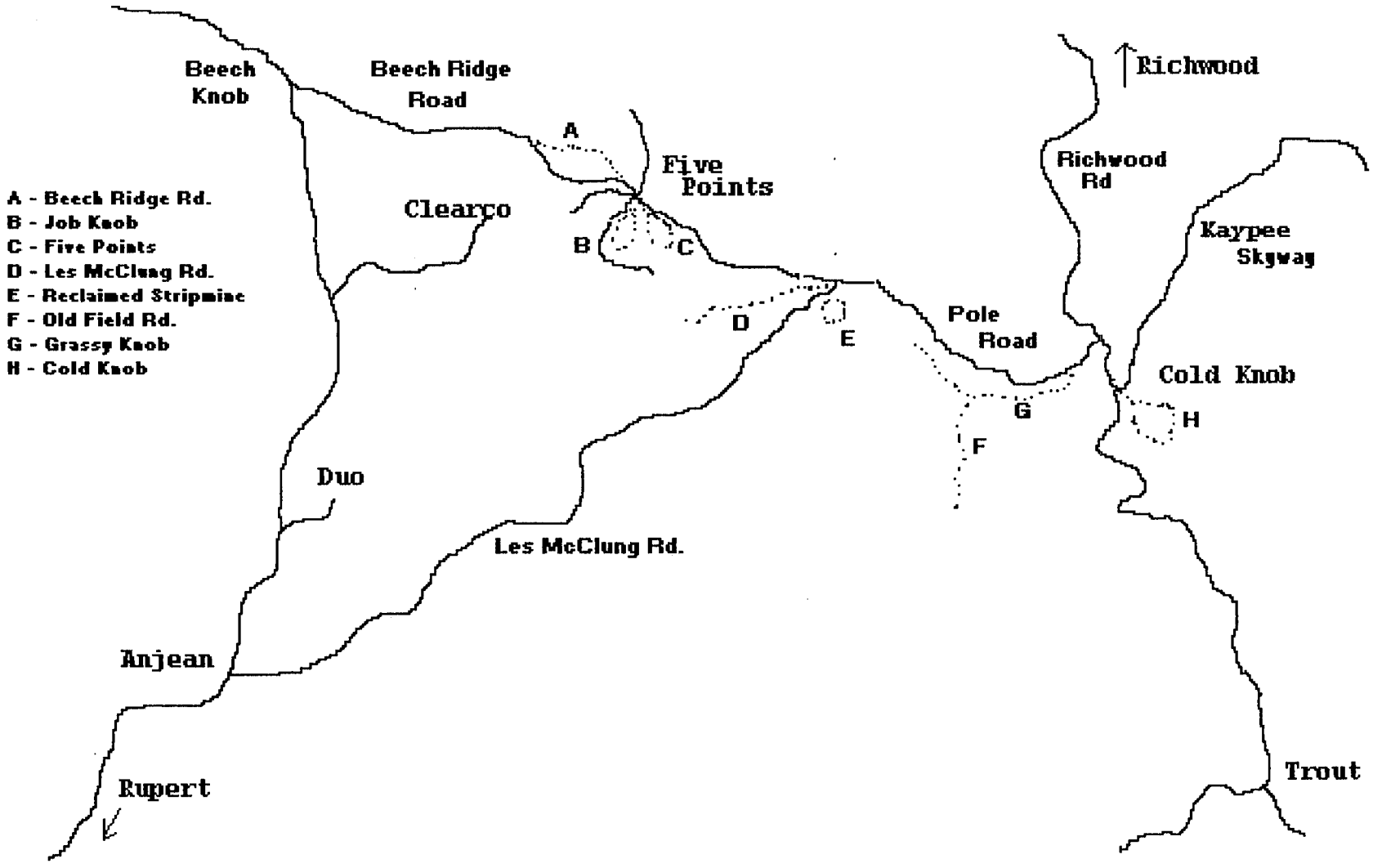

Fig. 1. Map of project area showing locations of line transects and drive routes.

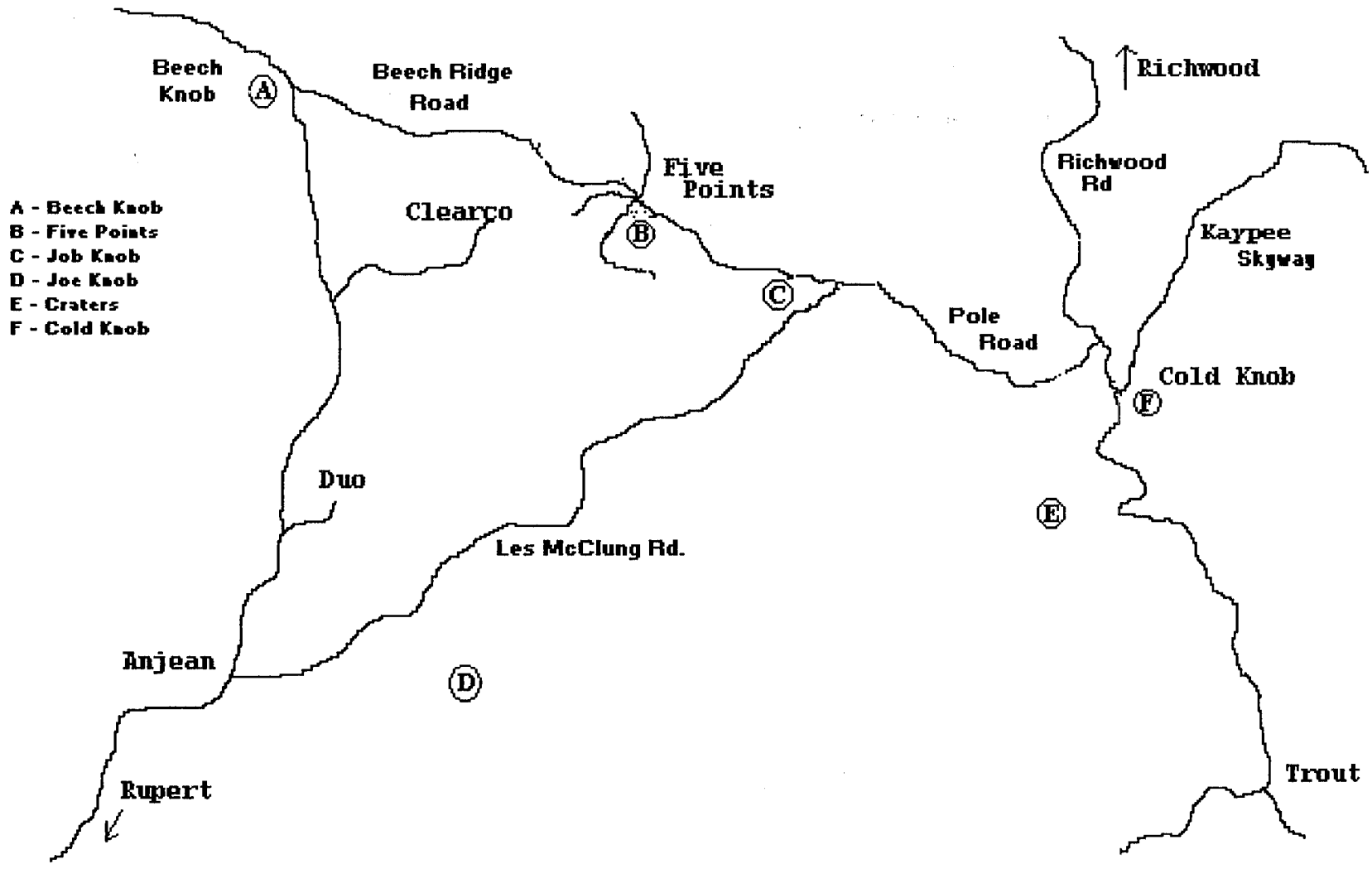

Fig. 2. Map of project area showing locations of line transects and drive routes.

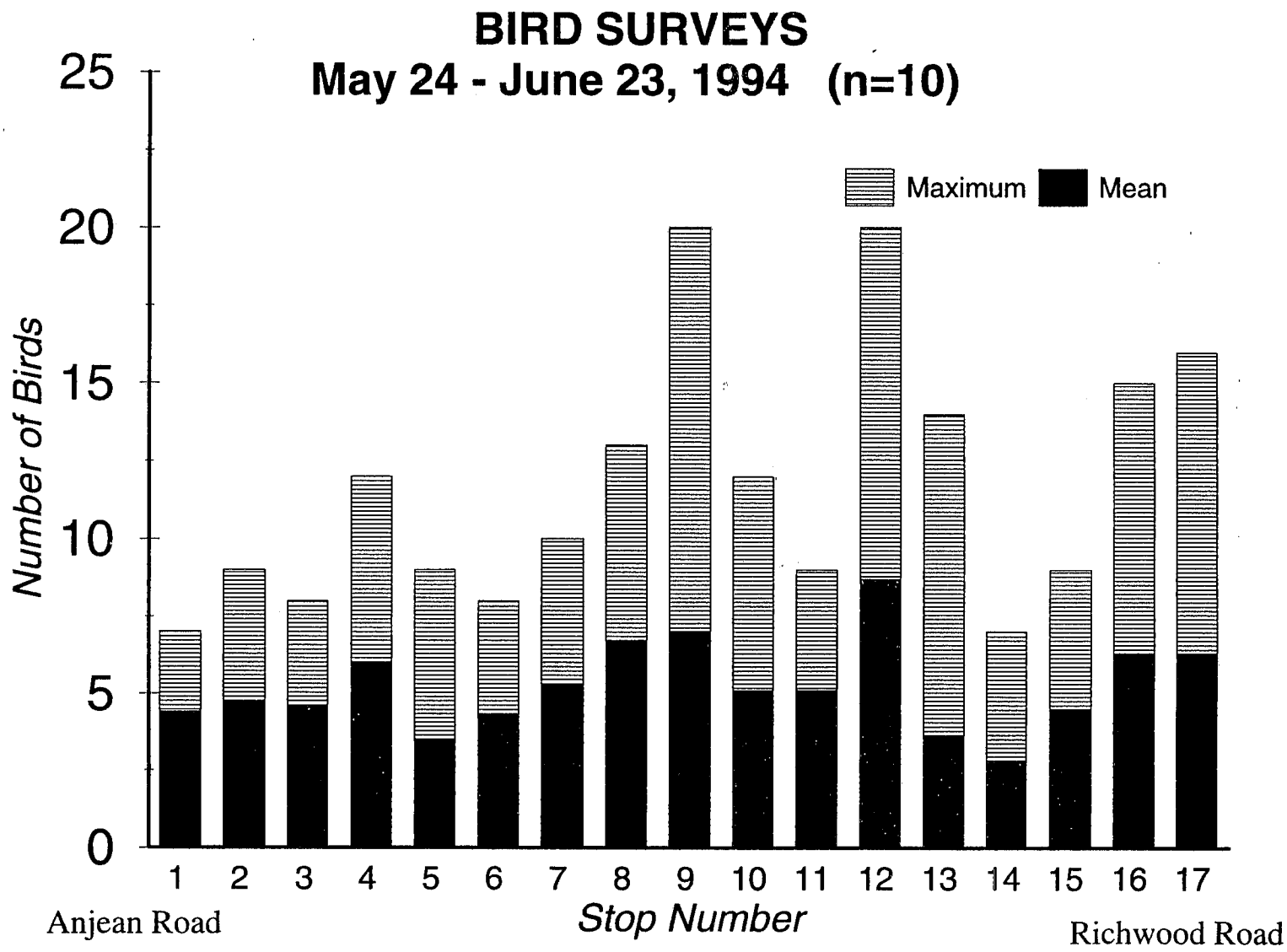

Fig. 3. Number of birds recorded during drive surveys along Beech Ridge/Pole Road.

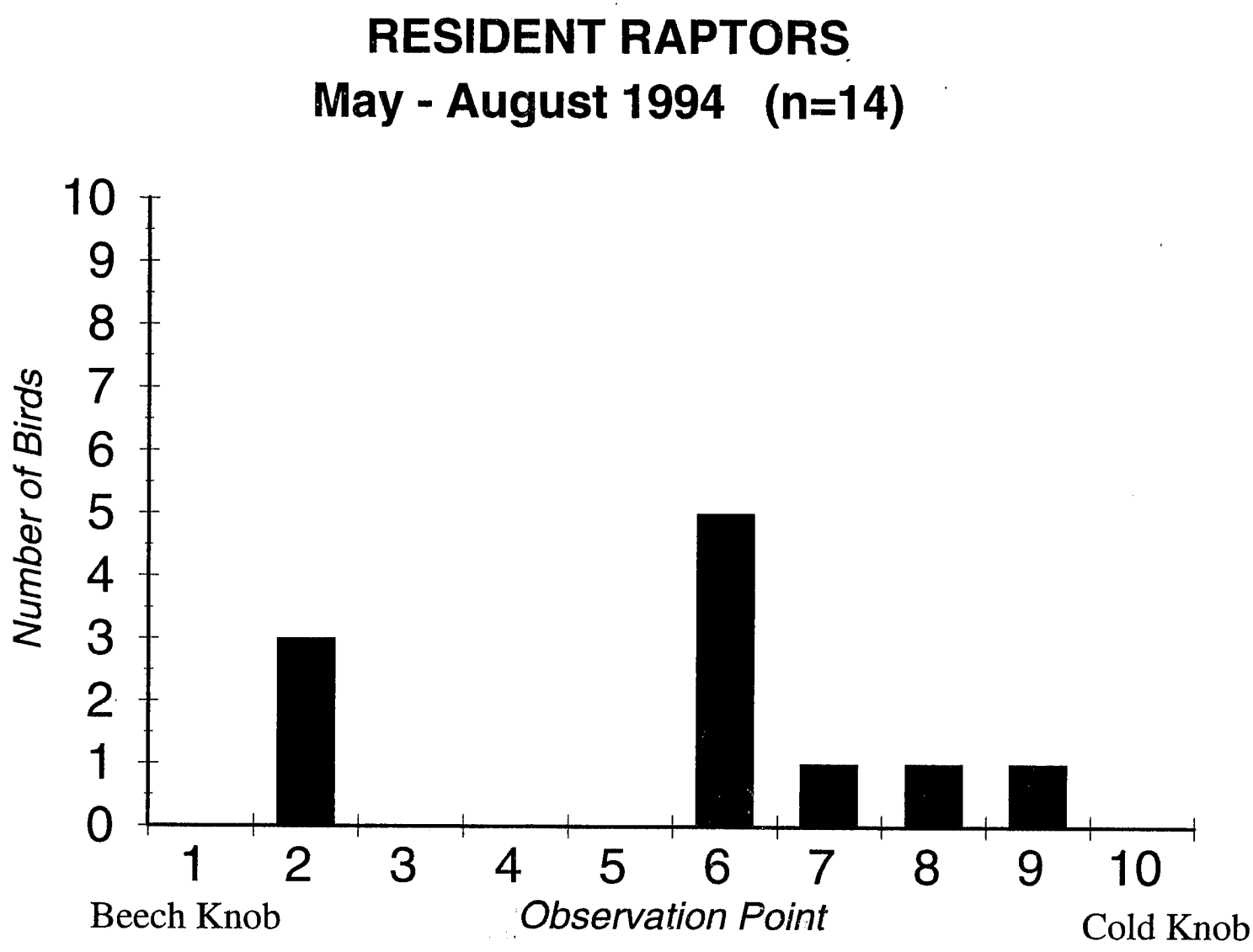

Fig. 4. Total number of resident raptors observed during 14 surveys along Beech Ridge Road.

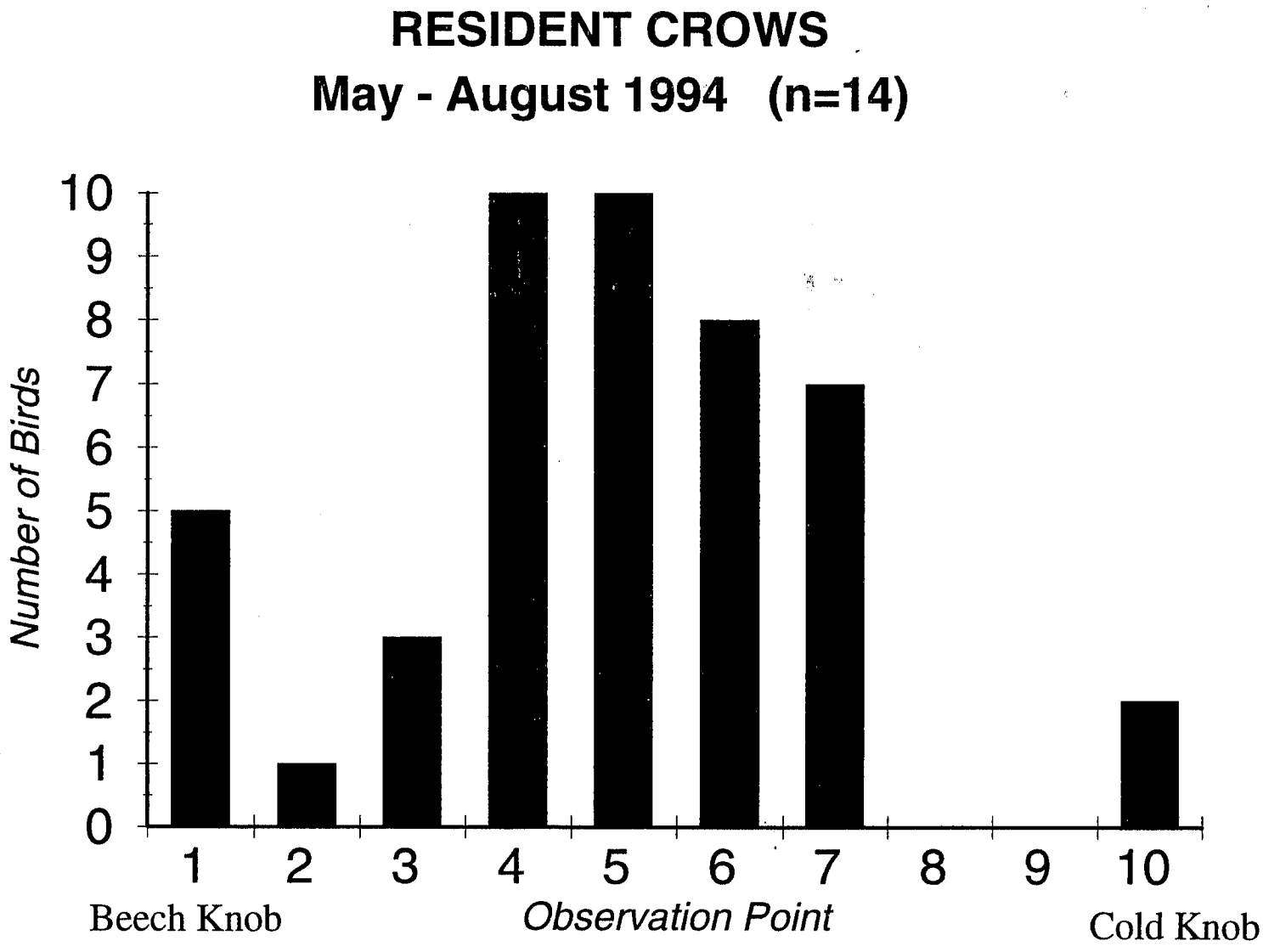

Fig. 5. Total number of resident crows observed during 14 surveys along Beech Ridge Road.

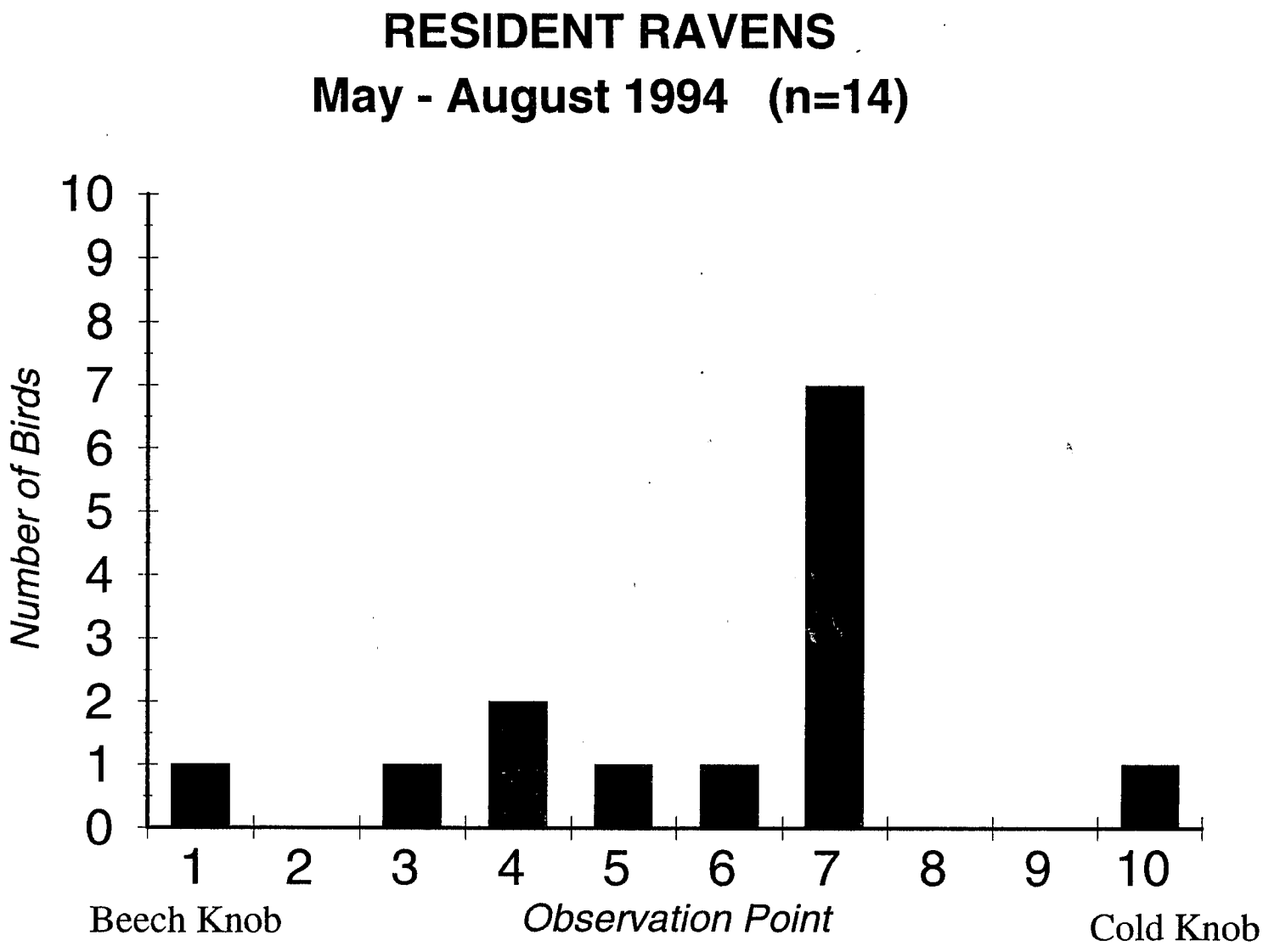

Fig. 6. Total number of resident ravens observed during 14 surveys along Beech Ridge Road.

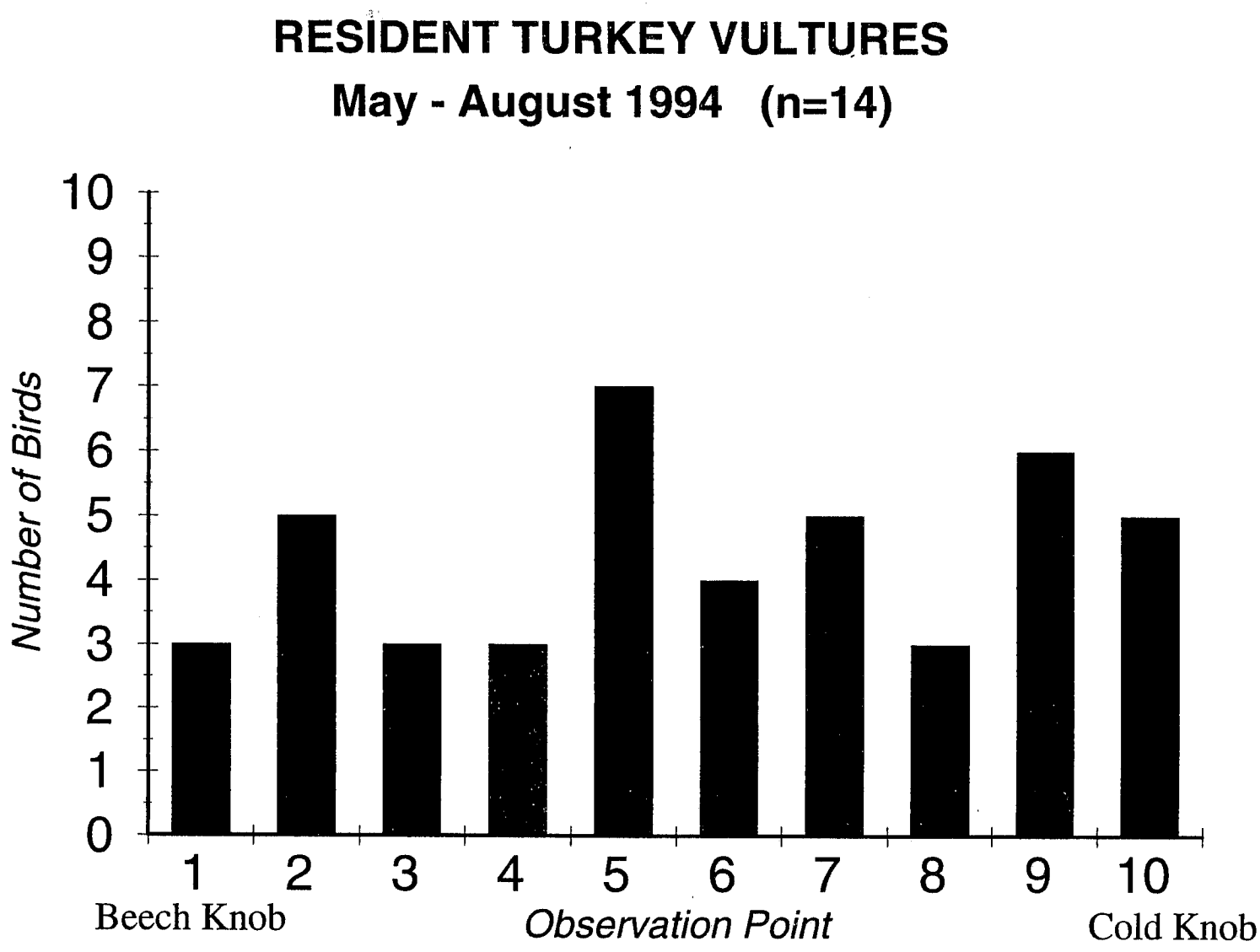

Fig. 7. Total number of resident turkey vultures observed during 14 surveys along Beech Ridge Road.

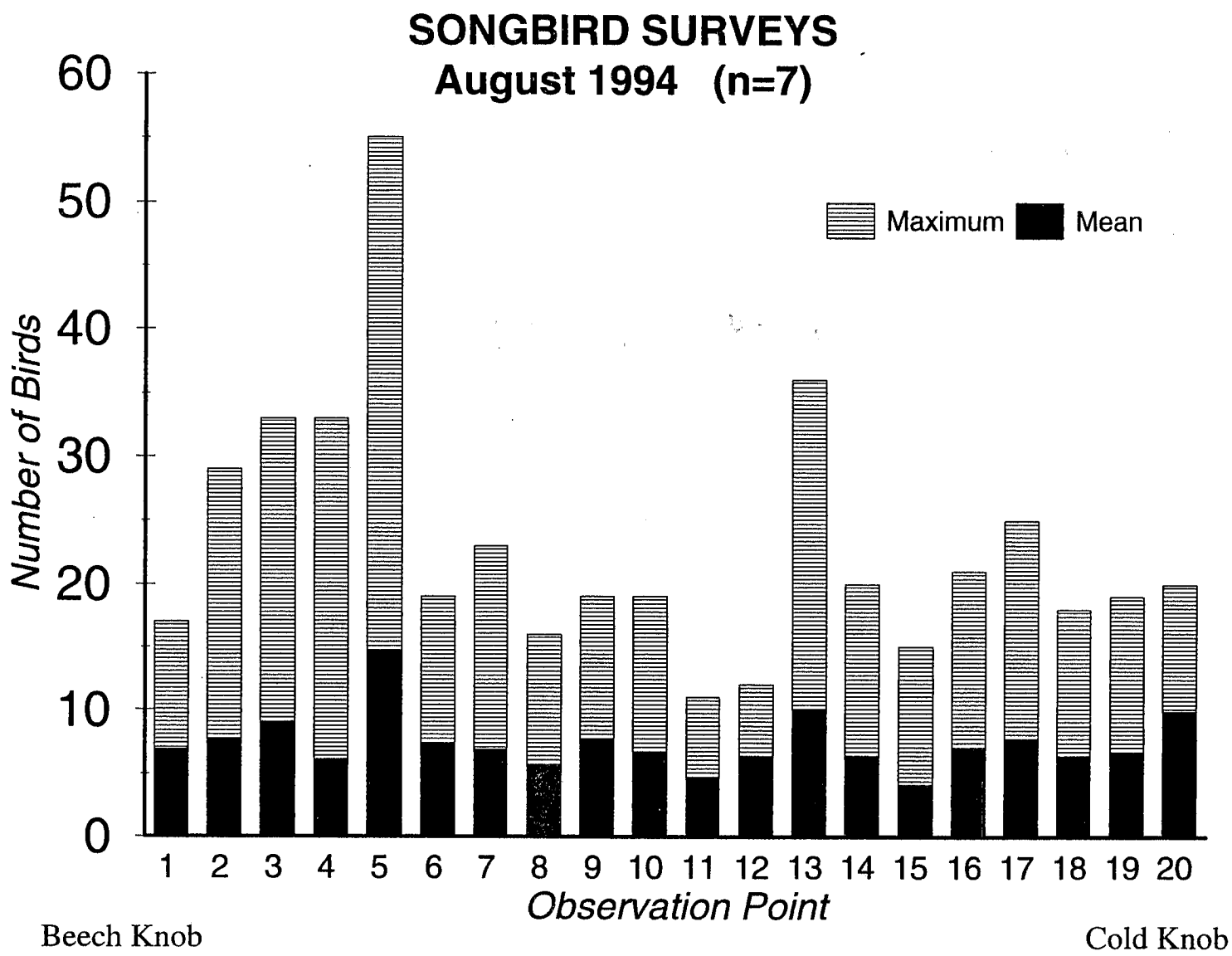

Fig. 8. Number of songbirds observed during 10 minute counts at 0.5 mile intervals along Beech Ridge Road, August 1994..

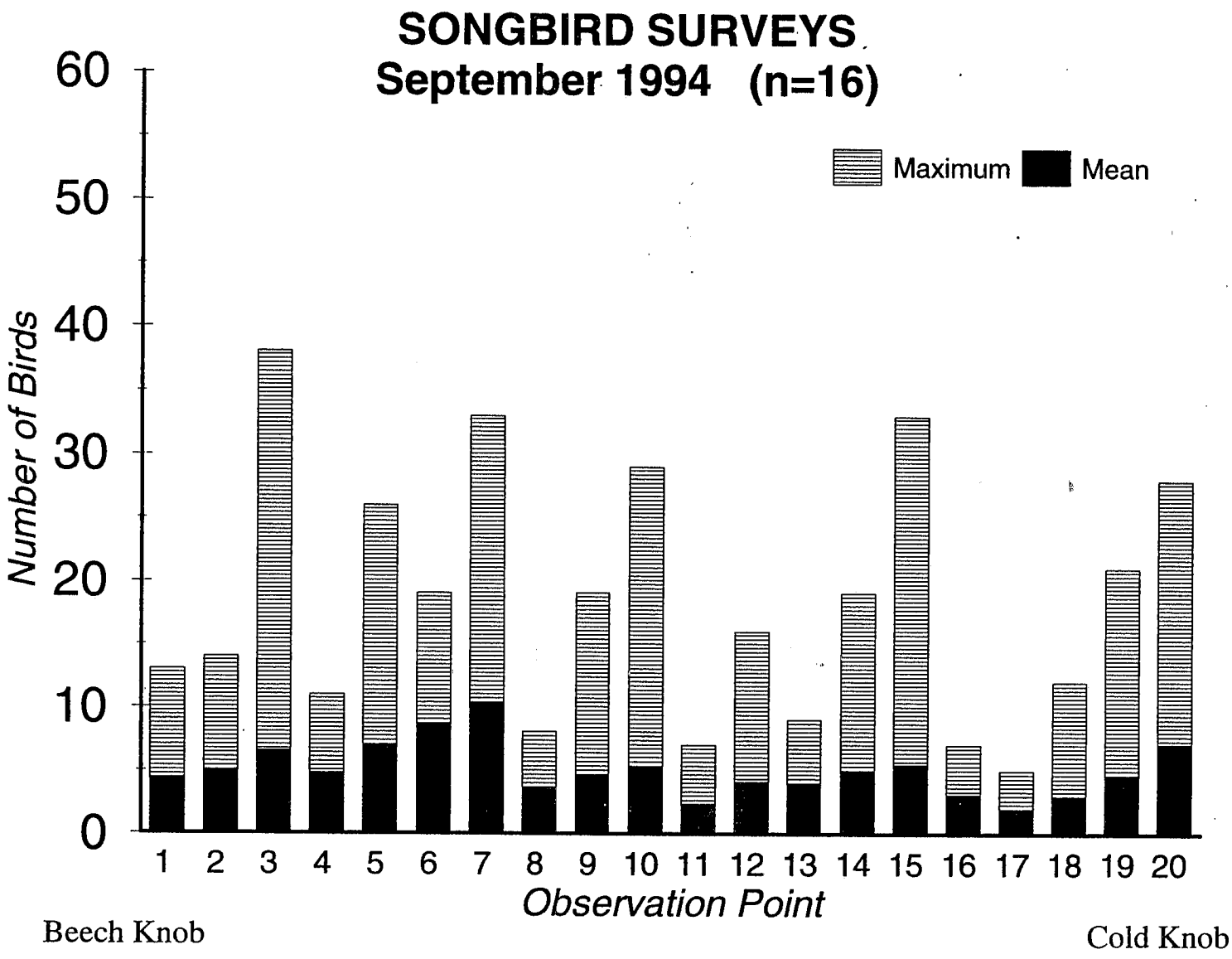

Fig. 9. Number of songbirds observed during 10 minute counts at 0.5 mile intervals along Beech Ridge Road, Sept. 1994.

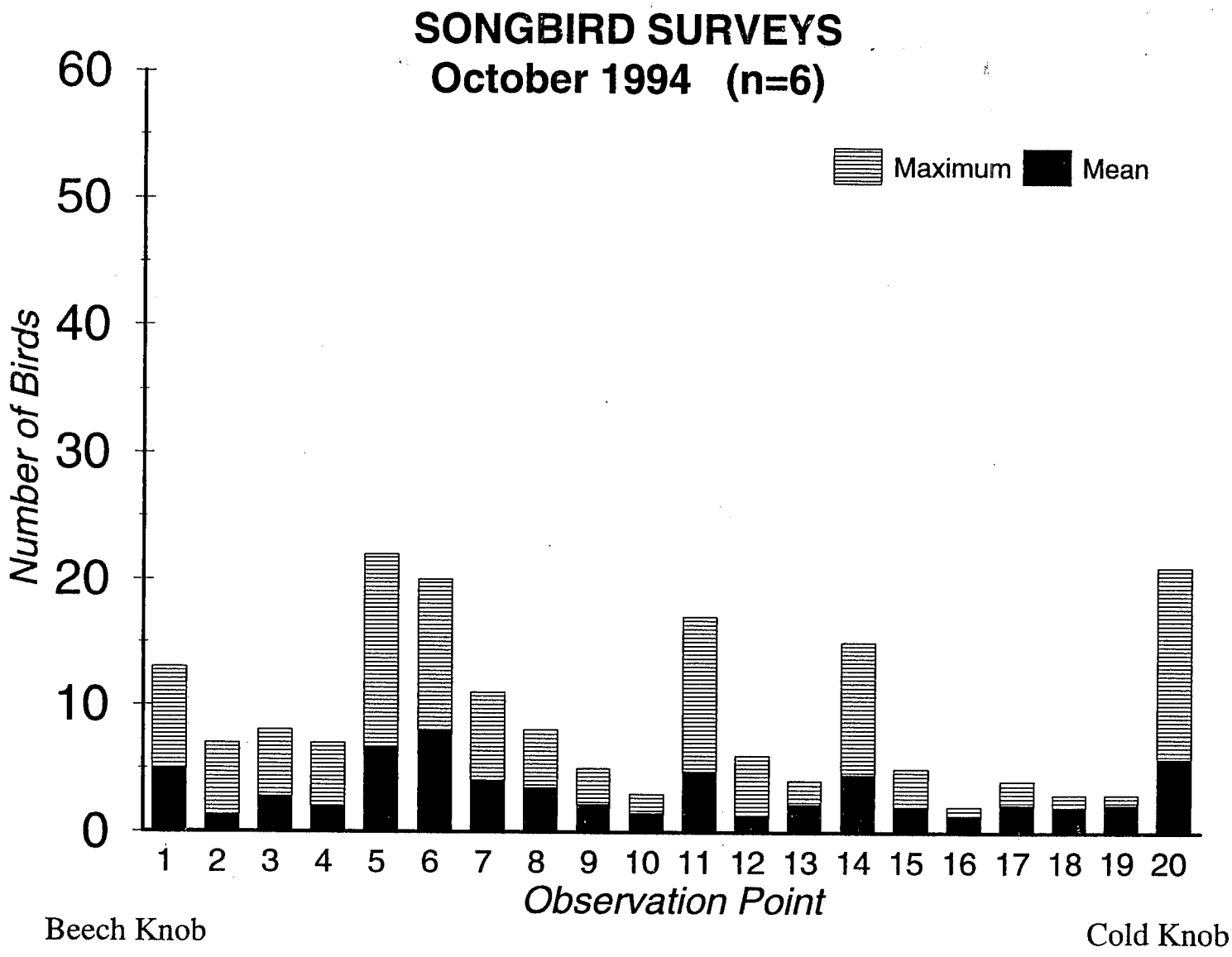

Fig. 10. Number of songbirds observed during 10 minute counts at 0.5 mile intervals along Beech Ridge Road, Oct. 1994.

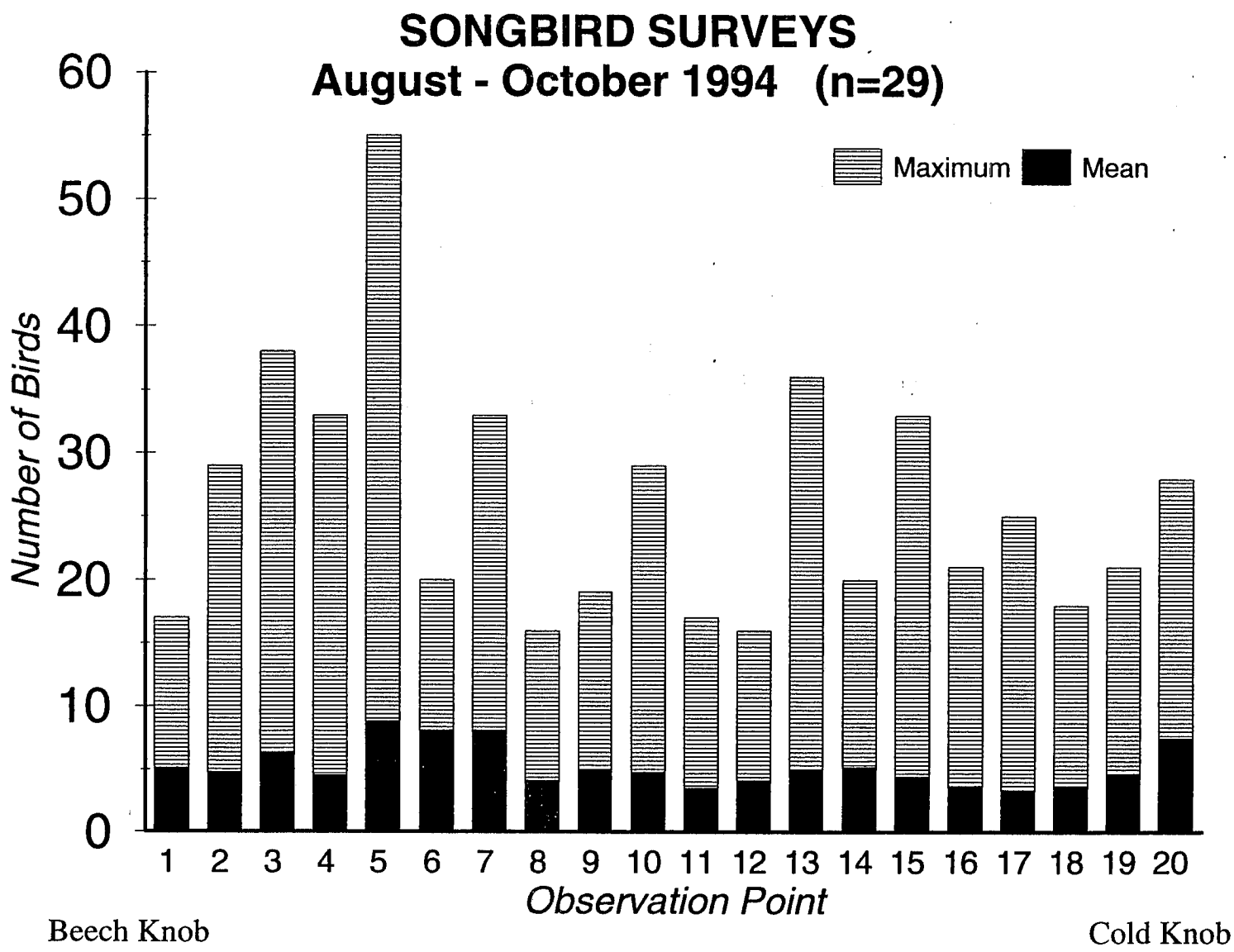

Fig. 11. Number of songbirds observed during 10 minute counts at 0.5 mile intervals along Beech Ridge Road, Aug.- Oct. 1994.

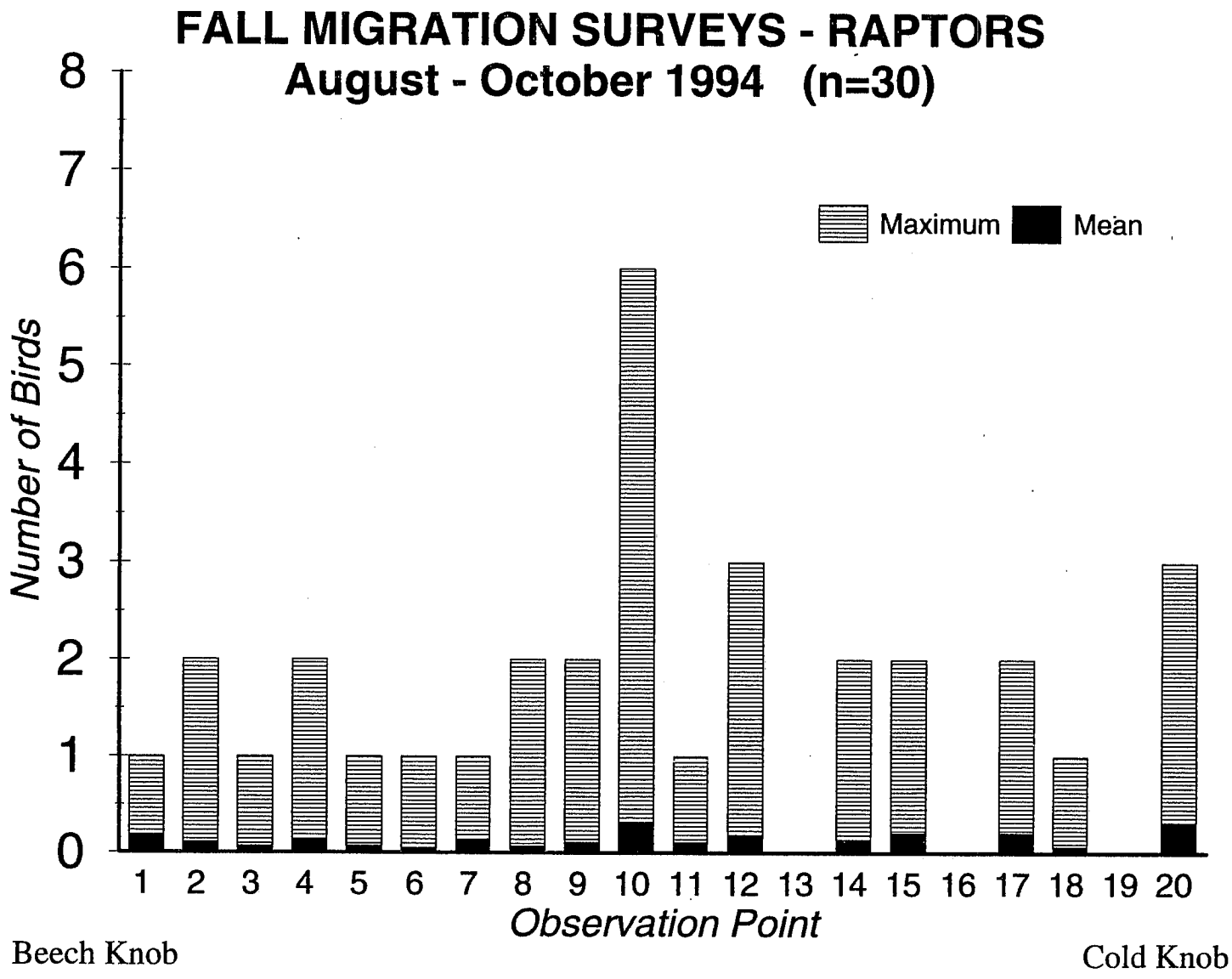

Fig. 12. Number of raptors observed during 10 min. counts at 0.5 mile intervals along Beech Ridge Road.

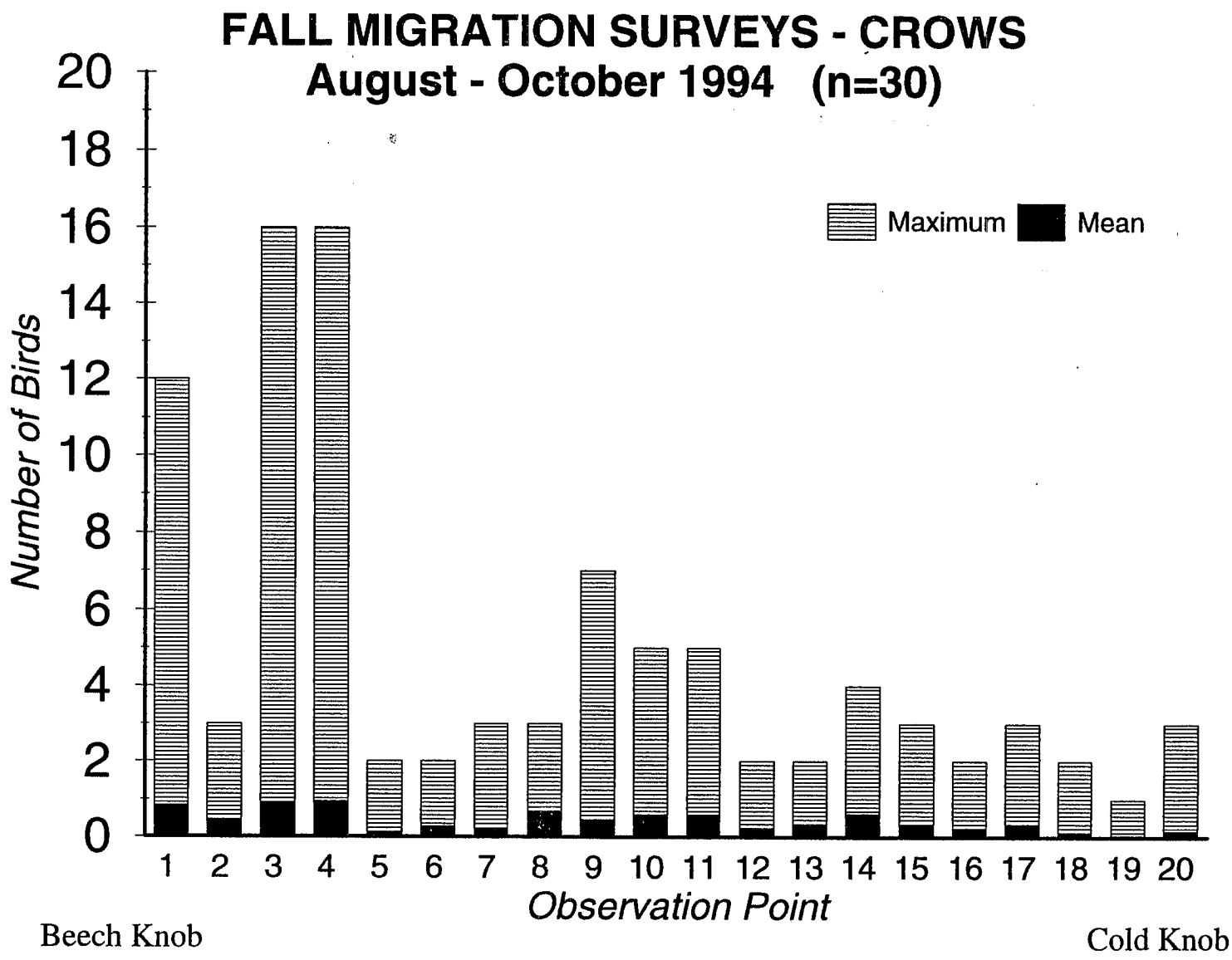

Fig. 13. Number of crows observed during 10 min. counts at 0.5 mile intervals along Beech Ridge Road.

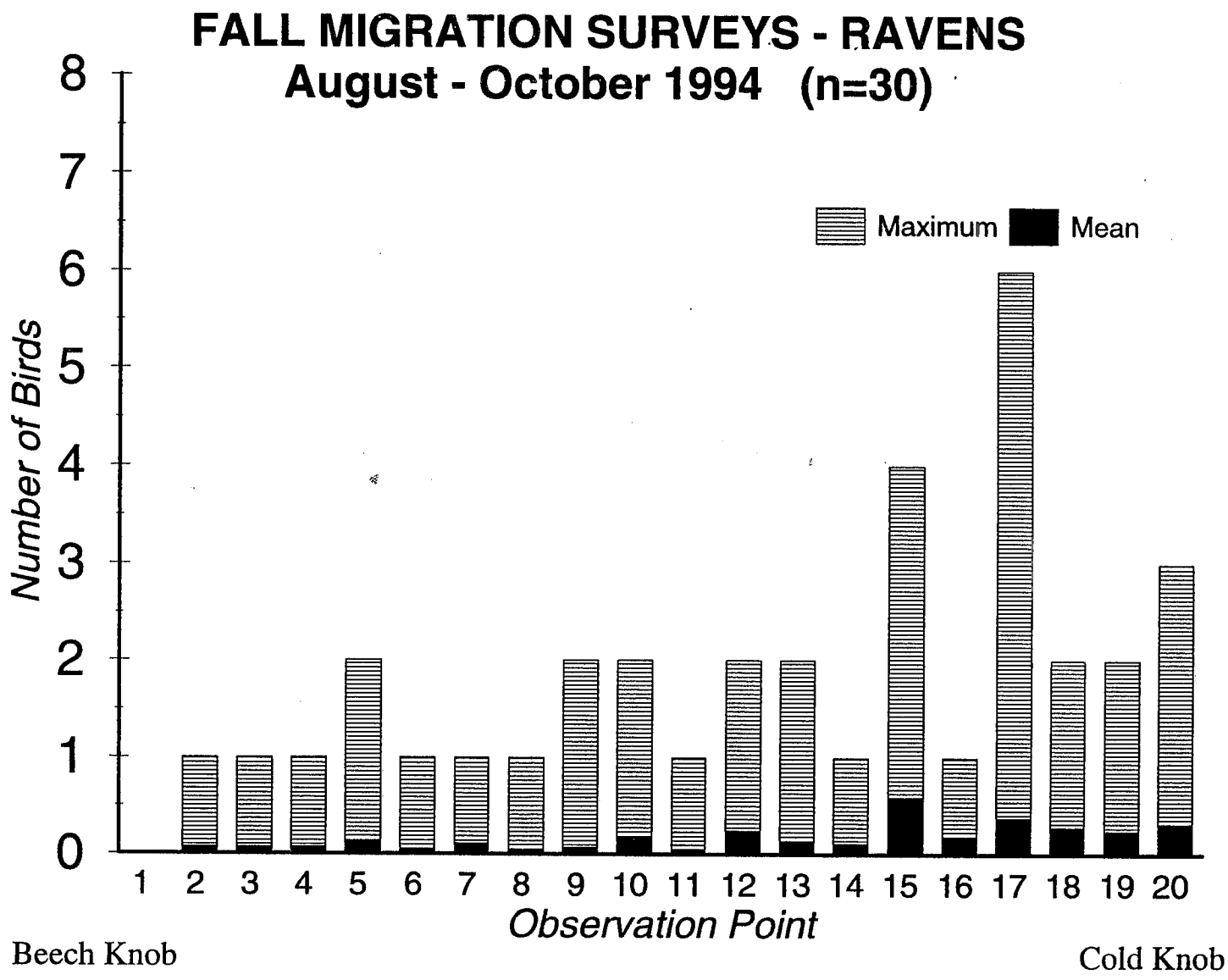

Fig. 14. Number of ravens observed during 10 min. counts at 0.5 mile intervals along Beech Ridge Road.

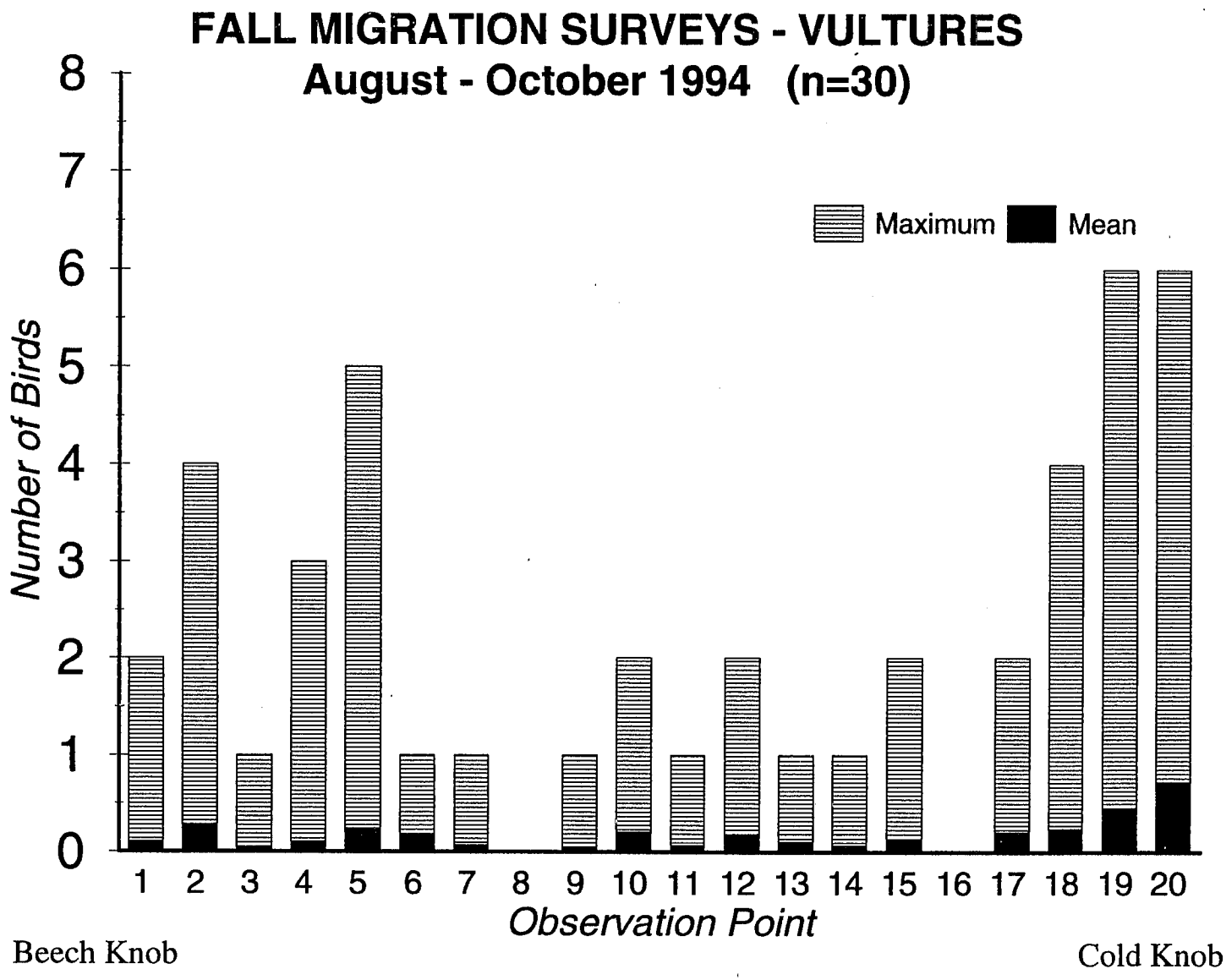

Fig. 15. Number of turkey vultures observed during 10 min. counts at 0.5 mile intervals along Beech Ridge Road.

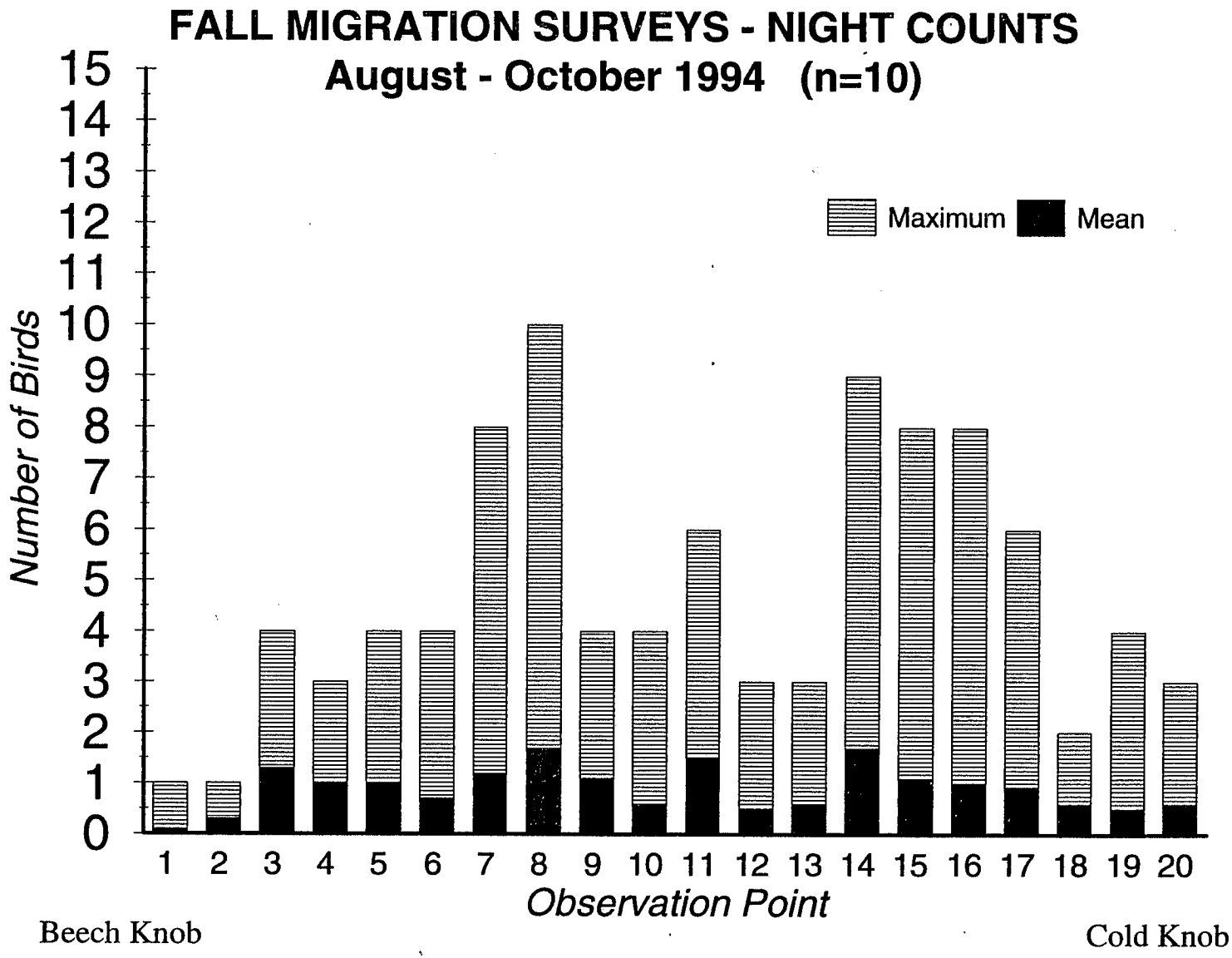

Fig. 16. Number of songbirds recorded during 10 min. counts at 0.5 mile intervals along Beech Ridge Road.