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ILLINOIS NATURAL HISTORY SURVEY

CENTER FOR WILDLIFE ECOLOGY

Effects of Traditional Habitat and Ecosystem Management on the Population Ecology of the Northern Bobwhite

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Annual Federal Aid Performance Report

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Executive Summary

In 2000-2001, we continued a comprehensive study of the population ecology of the Northern Bobwhite at the Jim Edgar-Panther Creek State Fish and Wildlife Area (formerly known as "Site M") in Cass Co. IL. The primary objectives of this project are: 1) to estimate and compare local densities in different habitat types where active management for quail is occurring and on untillable sites where ecosystem management is being employed, 2) to evaluate bobwhite nesting ecology 3) to investigate bobwhite brood movements, and 4) to investigate how other components of avian biodiversity react to different management strategies and land-use.

Fieldwork was conducted during the entire segment. Fall, 2001 was devoted to trapping of quail throughout the study site using techniques that were developed in Segment 1. To date (since initiation of the study), 109 quail have been trapped. Of these, 69 have been fitted with radio collars and tracked. In Segment II, 71 quail-(18 subadult female, 1 adult female, 49 subadult male, 3 adult male) were captured. Overall trapping effort through the end of Segment II includes 5000 trap hours using decoy traps and 18,500 trap hours using bait (i.e. corn) traps. The efficiency of decoy trapping (which is effective only during the near or during the breeding season) was considerably greater than that for bait trapping.

Birds fitted with collars yielded over 1,800 telemetry locations by the end of Segment II (we attempted to locate each bird every 3 days and 1 night / week; all

locations were triangulated). In cases where we lost contact, we conducted overflights to assess whether birds had dispersed unusually long distances.

Preliminary analyses of habitat use during the breeding season were complex, but clearly indicated that permanent pasture and cropped fields were preferred habitats for quail. Conversely, habitat dominated by woodland and cool season grasses appeared to be used less than that expected based on availability. Patterns of habitat use during the non-breeding or covey season were similar, but cropped fields were the most frequently utilized cover-type.

A major challenge for analysis of habitat use by quail (and by non-game birds or predators) is modification and ground truthing of the GIS habitat classification maps. At present, in collaboration with cooperators from the Illinois Department of Natural Resources, we are modifying the cover maps. The process of modifying cover types will also be relevant to future analyses non-game birds and potential predators in different types of habitat.

Annual survival of quail (age classes and sexes pooled) is estimated to be approximately 20-25%. Severe winter weather, fall hunting, or both appear to be especially influential during the non-breeding season. Predation on adults by birds or mammals appears to be an important source of mortality during the breeding season.

To date, only 6 quail nests have been located. Despite intensive searching by experienced field crews, the most productive mode of locating nests is through location of radio-collared birds that are incubating. All 6 nests were successful in terms of hatch, but in 3 cases adults were preyed upon while they were leading young broods. The first year of a two-year artificial quail nest experiment was also carried out to assess the

relationship between habitat structure and probability of predation. This experiment suggested differences by habitats and over the course of the breeding season, but another year of replication is needed to reach conclusions about these patterns.

Censuses of non-game birds and predators revealed assemblages that are typical of Illinois where there is considerable edge and diverse cover types. Over 400 nests of non-game birds (239 in Segment 2) have been located and monitored; rates of loss to predation have been notably high for nearly all species in both Segments I and II.

STUDY 101: Estimation of northern bobwhite densities in different habitat types.

Job 101.1 - Selection of focal study sites.

Selection of focal study sites was accomplished in Segment I and we continued to use these sites that cover the 3 primary management units on the area and virtually all habitat types. Our original objective to compare of tillable and untillable areas will be somewhat hampered owing to the small amount of untillable acreage on the site. As commented upon on in the Executive Summary, the cover maps supplied to us by Illinois Department of Natural Resources (IDNR) will need to be modified and ground truthed. The modification process has been initiated in consultation with John Cole of the IDNR

Job 101.2 - Censuses and population studies of quail in different habitats during the breeding and non-breeding season.

Estimation of quail abundances throughout the site was accomplished in three ways. First, point counts were conducted on 40 of the 70 sites discussed above. Each point was visited twice during June. Each visit consisted of a five minute census during which all quail vocalizations and visual registrations were recorded. Estimated distance (we used unlimited distance counts) and direction of each registration were recorded. Second, in cooperation with IDNR we continued roadside quail counts that have been conducted for several years. Each census point was visited twice during June (one or two points could not be visited during each round owing to limited access from road maintenance). Third, all quail observations made during the course of trapping and tracking birds (see below) were mapped. Estimated quail abundances on the different

management units is presented in Table 1. Subsequent to census efforts in Segment III, detailed analyses will be carried out to assess variation among the management units and variation owing to differences in habitat structure and land use. Again, close analyses of habitat effects on local abundances will need of follow modification of the cover maps. Roadside quail counts indicated similar patterns of variation in quail abundance.

Table 1. Estimated abundances of Northern Bobwhites on the three major management units in Segments I and II.

Management Unit	Estimated Abundance (Avg. detections/ 10 points)
Quail Management	8.3
Controlled Hunting	6.5
Open Unit	4.4

Data on the frequency of quail encounters were collected via a survey form given to hunters in covey season 00-01. About 25 surveys were collected and these data are currently under analyses We believe the best estimates of spatial and temporal variation in abundances of quail during the non-breeding season will derive from the longer-term information on reported hunter harvest and reported hours afield. These data will be analyzed in Segment III.

Job 101.3 - Characterization of habitat structure on focal study sites.

The recent landcover classification was utilized in Segment II (see Fig. 1). Personnel were trained in the use of these cover maps using ArcView GIS software. Habitat analyses will be conducted in detail during Segment III subsequent to revision of the cover-types.

Job 101.4 - Management and analyses of population data

Format and entry forms for all datafiles (census, telemetry, and habitat structure) were identified. The standard file format will be a ".dbf" file (most likely using Visual FoxPro software). Data entry was initiated during the segment and virtually all the telemetry data has been entered in to GIS software databases for spatial visualization and analysis (all telemetry locations were determined via portable GPS units).

STUDY 102: Determination of survival, nest and reproductive success, nest predators, and habitat use of the northern bobwhite .

Job 102.1 - Locating and monitoring the success of quail nests.

Considerable effort (200 person hours in Segment I, 500 person hours in Segment II) has been devoted to locating quail nests. Based on 2 years of experience, we have determined that the most efficient mean of locating nests is through nocturnal telemetry location of males or females that are incubating. Standard search cues such as flushing hens and other behavioral cures have proved to be unproductive. To date we have monitored 6 quail nests (see Table 2). We have also monitored quail nests with field video-infrared cameras.

Nest initiation	*Nest found*	# eggs	*# hatched*	4 week flush count	*6 week flush count*
7/22/00	8/8/00	10	?		5
8/7/00	8/15/00	12	12	8	6
8/2/00	8/25/00	15	15	0	Adult dead
5/5/01	5/9/01	15	15	Adult dead	Adult dead
7/1/01	7/3/01	13	12	Contact lost	Contact lost
7/9/01	7/15/01	12	12	9	pending

Table2. Summary of fates for 6 Northern bobwhite Quail nests and broods.

Job 102.2 - Trapping and fitting bobwhites with radio transmitters.

New or refitted radios were purchased and new project personnel were trained for telemetry tracking in Segment II, during which 71 quail-(18 subadult female, 1 adult female, 49 subadult male, 3 adult male) were captured. Overall trapping effort through the end of Segment II includes 5000 trap hours using decoy traps and 18,500 trap hours using bait (i.e. corn) traps. The efficiency of decoy trapping (which is effective only during the near or during the breeding season) was considerably greater than that for bait trapping. Overall, 102 quail have been captured and banded; of these, 69 have been fitted with transmitters and released. To date, we have 25 mortality events of known cause (Table 1). We have experienced 15 cases of radio failure and in 12 cases the cause of mortality could not be determined. Natural mortality owing to avian and mammalian predators has, to date, been the most prevalent cause of death.

Annual survival of quail is estimated to be about 25% based on preliminary analyses using Kaplan-Meier estimation procedures (Fig 2.).

Table 3. Summary of quail mortality events (lost birds and radio failures not listed).

Likely Cause of Mortality	Number of Birds
Avian predator	12
Mammal	10
Hunting	3
Unknown	12

Job 102.3: Experimental investigation of nest predation.

In Segment II, we conducted the first round of an experiment to investigate predation rates on artificial quail nests in different habitats sites with different recent land-use. We could not assess rates of predation in all habitat-types that are present on the site (Fig. 1). Rather, we examined nest predation in five grassland dominated habitat that had or had not been burned recently. The five habitat types were: warm season grasses, cool season grasses, permanent pasture, CRP, and "borders." We identified the burn history of each individual field and categorized it as recently burned (those within units burned the current or previous year) or successional. For each treatment combination we randomly selected 3 fields. Within each field selected, we placed 5 artificial quail nests, each containing 10 quail eggs. We placed a total of 300

artificial nests in the fields, 150 in May and 150 in July. We monitored these nests every 3 days for 10 days. We observed predation events on the artificial nests. We observed a total of 8 predation events in May (5.5%) and 24 in July (14.1%; 3 nests were predated more than once). Fourteen predation events occurred in recently burned fields, 18 in successional fields. Results are summarized in Table 4.

Table 4. Predation Events on Artificial Quail Nests at Jim Edgar Panther Creek State Fish & Wildlife Area.

		Recently Burned Grasslands		Successional Grasslands	
		MAY	JULY	MAY	JULY
Warm Season Grasses	FULL	0	2	0	0
	PARTIAL	0	0	0	1
Cool Season Grasses	FULL	0	4	0	0
	PARTIAL	1	1	0	3
Permanent Pasture	FULL	1	1	1	3
	PARTIAL	0	1	1	1
Conservation Reserve Program	FULL	0	1	1	1
	PARTIAL	0	1	1	0
Borders	FULL	0	1	2	2
	PARTIAL	0	0	0	1

Predation events ranged from the removal of a single egg to the destruction of the nest and its contents. On 6 occasions, a single egg was removed cleanly from the nest; on 4 occasions a single egg was crushed or punctured in the nest. One nest had 4-5 eggs removed twice during the 10-day exposure period. Of the 20 nests that were fully predated, we found shell remains in or around the nest at 13. Of those same 20 nests, the nest itself was moved from its original location or otherwise damaged on 11 occasions. One nest was found dumped over with 8 of the 10 eggs punctured but none eaten.

While inconclusive, it is possible to infer predator identity based on nest remains. Mammals generally leave shell fragments behind and are capable of tearing apart the nest itself. Snakes generally swallow eggs whole and therefore tend not to leave shell fragments. Birds often puncture eggs with their beaks leaving obvious clues. Based on these generalizations, we can infer that of the 32 predation events recorded, mammals predated 13-25 nests, snakes predated 6-13 nests, and birds 1-4 predated nests. We also found a carrion beetle in one of the nests with a single punctured egg.

Job 102.4: Estimation of species diversity and abundances of nest predators

As in Segment I, predator abundance and distribution was sampled using baited sand track stations at the 70 focal census stations. We alternated bait between fatty acid scent (FAS) tablets and salmon-flavored cat food. We recorded tracks present for 2-3 consecutive nights at all 70 sampling points during May, June, and July. Track stations were active for a total of 560 nights. We recorded 5 times as many raccoons as opossums, the second most common species, and more raccoons than all other predator species combined. Raccoons were recorded at 46 of the 70 sampling points and were evenly distributed across the site. Results for all species surveyed are summarized in Table 5. In Segment III, These data will be used to analyze habitat use by these species at a variety of spatial scales.

Table 5. Abundance and Distribution of Mammalian Predators.

	Total # of tracks recorded	Track stations visited (x/70)
Raccoon *Procyon lotor*	118	46
Opossum *Didelphis virginiana*	23	16
Long-tailed weasel *Mustela frenata*	20	10
Fox *Vulpes vulpes* and *Urocyon cineoargenteus*	16	11
Fox squirrel *Sciurus niger*	15	12
Striped skunk *Mephitis mephitis*	10	8
Coyote *Canis latrans*	4	4
Domestic cat *Felis catus*	1	1
Domestic dog *Canis familiaris*	0	0
Badger *Taxidea taxus*	0	0
Mink *Mustela vison*	0	0

Job 102.5: Characterization of habitat use by quail using GIS.

As of this writing approximately 1,800 telemetry fixes have been recorded, georeferenced, and into the GIS data. These data have been summarized in two ways. First, home range maps for were constructed from data collected during the breeding and non-breeding (i.e., covey) seasons. Visual summaries of day to day movements of individual birds were also derived. Samples of these graphical summaries for covey are presented in Figs. 3-4. Habitat use in relation to weather, time of year, and other environmental factors will be assessed in Segment III subsequent to modification of covermap. To date, we have collected comprehensive data on 13 coveys.

Preliminary analyses of habitat use during the breeding season were complex, but clearly indicated that permanent pasture and cropped fields were preferred habitats for quail (Figs 5-6). Conversely, habitat dominated by woodland and cool season grasses appeared to be used less than that expected based on availability. Patterns of habitat use during the non-breeding or covey season were similar, but cropped fields were the most frequently utilized cover-type. Comprehensive analyses of habitat use at different spatial scales will be completed in Segment III.

Study 103: Effects of habitat structure and different land-use practices on reproductive ecology and local abundances of nongame birds.

Job 103.1: Characterization of nesting success of nongame birds in sites undergoing traditional quail management versus and ecosystem restoration.

To date, 454 nongame bird nests have been located and monitored (239 nest were detected in Segment II). This sample consisted of 32 species. As in Segment I, the sample was dominated by Red-winged Blackbirds, which was the most common nesting songbird on the area (forest habitat was not sampled). A breakdown of the nests by select species is presented in Table 6.

Table 6. Rates of success of selected species for the 2001 breeding season.

Species	Number of Nest Located	Number of Nests Successful and Estimated Daily Success Rate(%)
Red-winged Blackbird	31	3 / 89%
Field Sparrow	38	6 / 89%
Dickcissel	18	1 / 87%
Indigo Bunting	8	2 / 98%
American Goldfinch	20	7 / 95%
Gray Catbird	16	5 / 91%

Job 103.2: Censusing of nongame birds in different habitat during the breeding and non-breeding season.

Non-game birds (including raptors) were censused during the point counts discussed above. As in Segment I, 40 points distributed throughout the site were visited 4 times each from late may through early July. To date over 80 species of birds have been detected during these counts. This comparatively high diversity reflects the mix of

habitat types at the site (grassland, savanna, woodland, shrubland). The bird community at the site is dominated by Red-winged Blackbirds, Dickcissels, Indigo Buntings, and Field Sparrows. Community and population analyses regarding habitat structure and patterns of co-variation between abundances of quail and non-game birds will be conducted in Segment III.

Prospects for Segment 3.

The major objectives for Segment III will be to implement GIS analyses of habitat structure and develop models to associate habitat with quail activity and demography, increase samples sizes for quail telemetry tracking and habitat use, increase the number of located quail nests by allocating more resources to this effort, and conduct another round of artificial nest experiments. Based on Segment II, we expect that samples sizes will be sufficient to provide robust analyses for all the studies and jobs. An exception is the location and monitoring of quail nests. For Segment III, we intend to somewhat de-emphasize the study of non-game bird nesting biology and devote more time and personnel to looking for quail nests.

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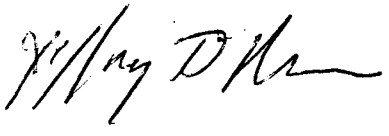

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DATE: 21 September, 2001

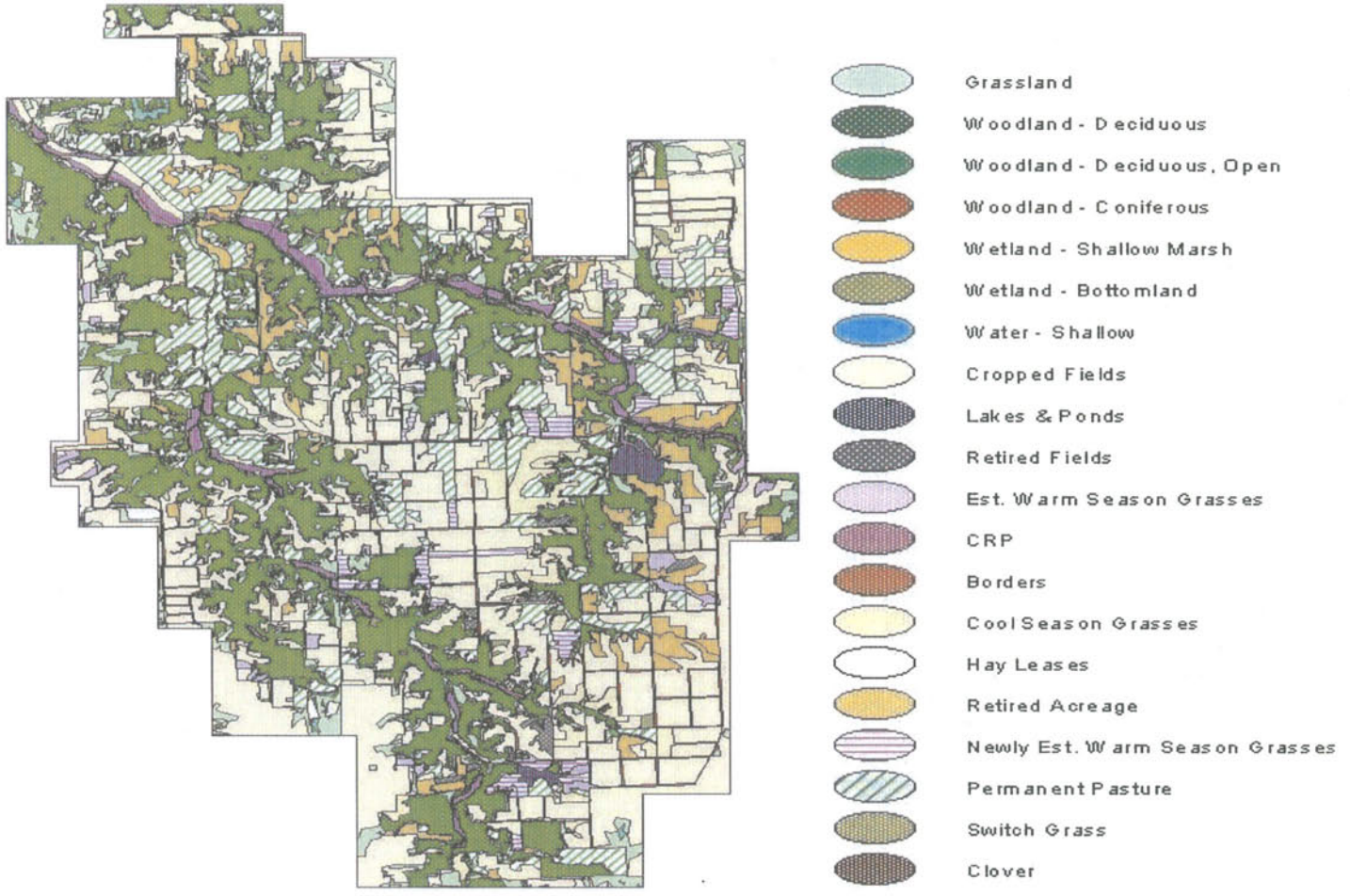

Figure 1. GIS (ArcInfo) habitat cover types on Jim Edgar-Panther Creek State Fish and Wildlife Area.

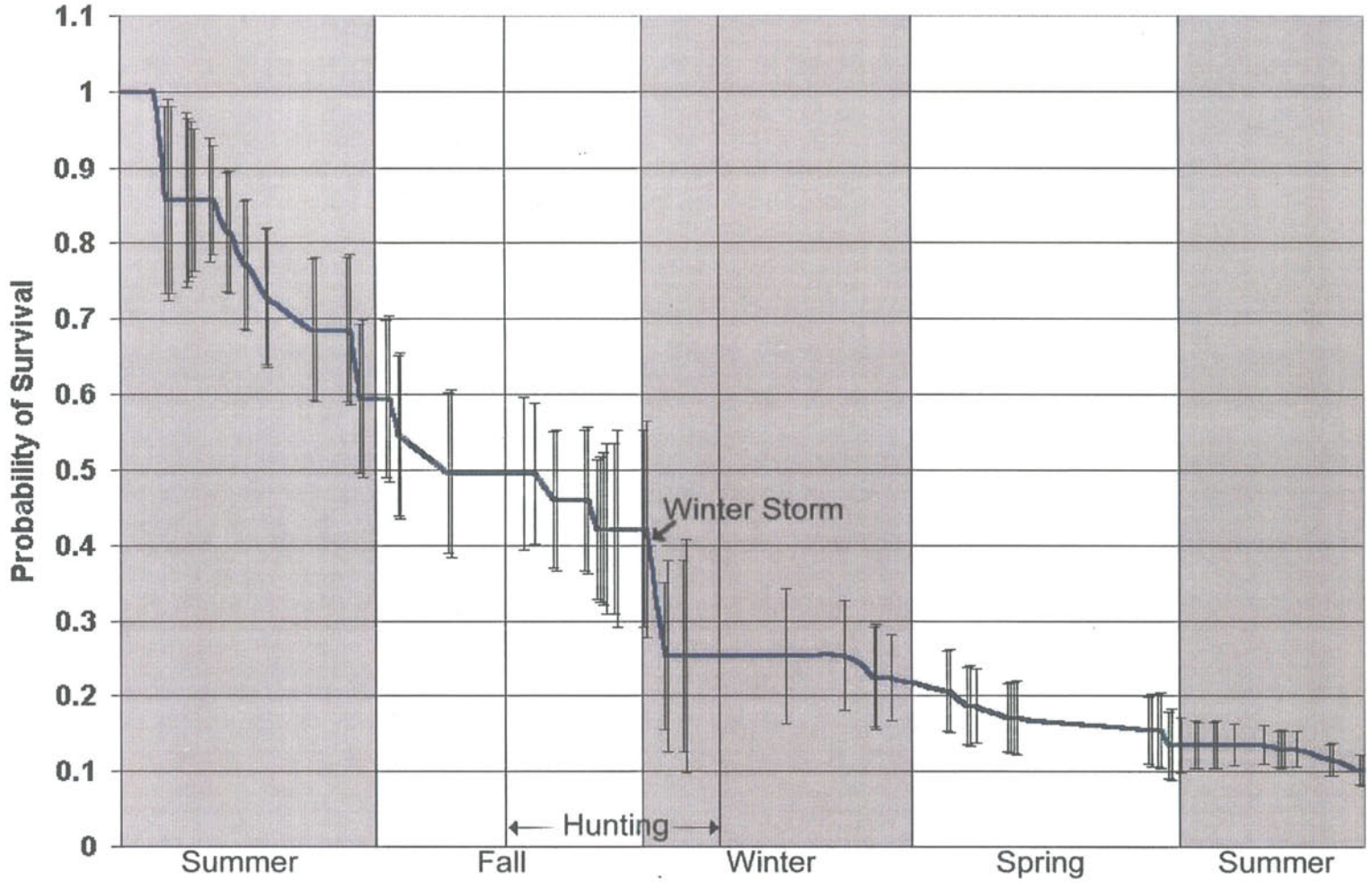

Figure 2. Northern Bobwhite survival curve derived from Kaplan-Meier estimator with staggered entry and censoring. This curve spans a little more than a year, and is for all quail radioed and any banded quail recovered or recaptured.

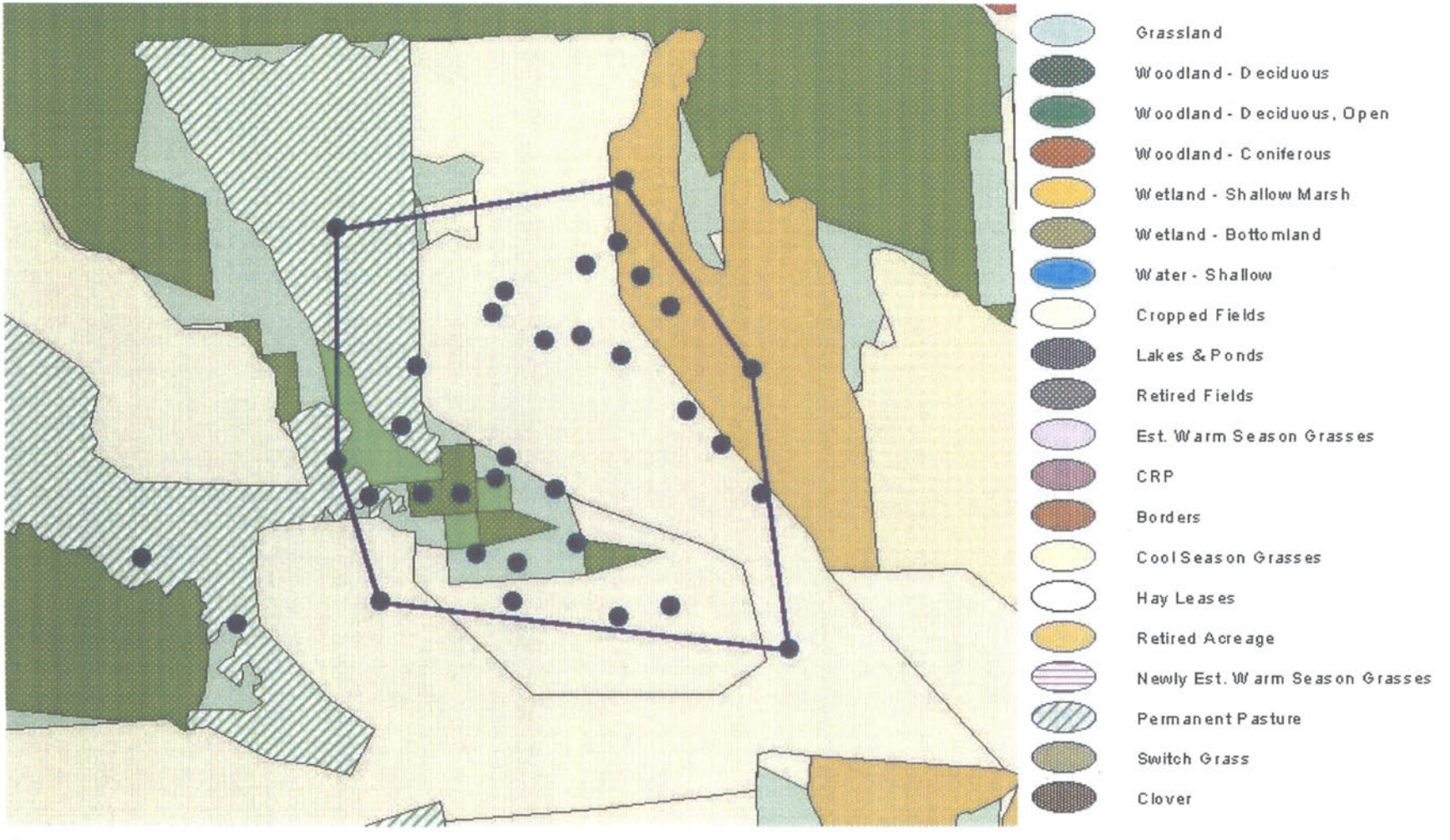

Fig 3. Home range of a covey based on habitat use in early winter, 2000-2001. The home range was calculated with the 95% minimum covex polygon method using a floating mean to exclude 5% of the locations.

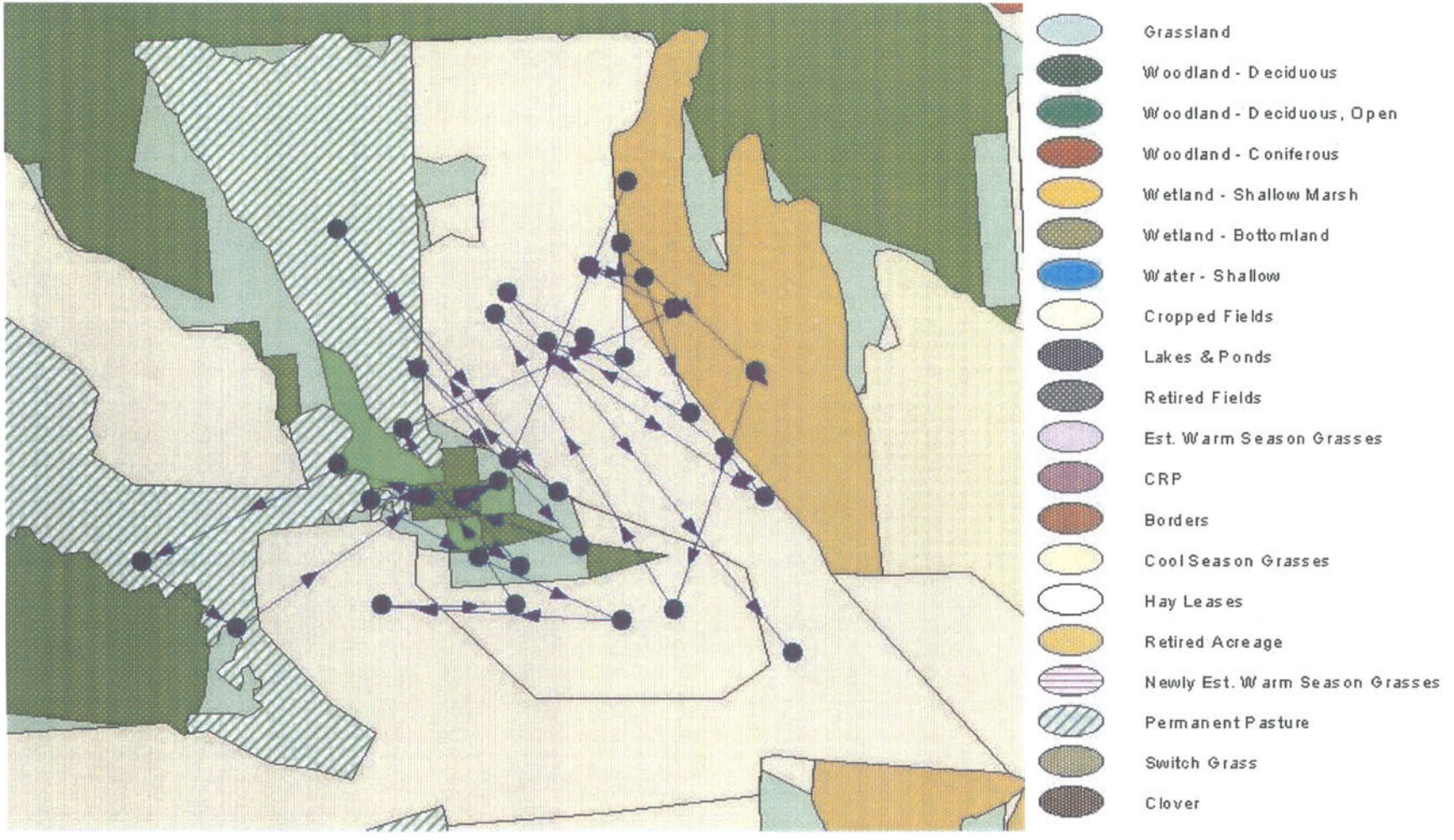

Fig 4. Movements patterns of quail in the early winter of 2000-2001.

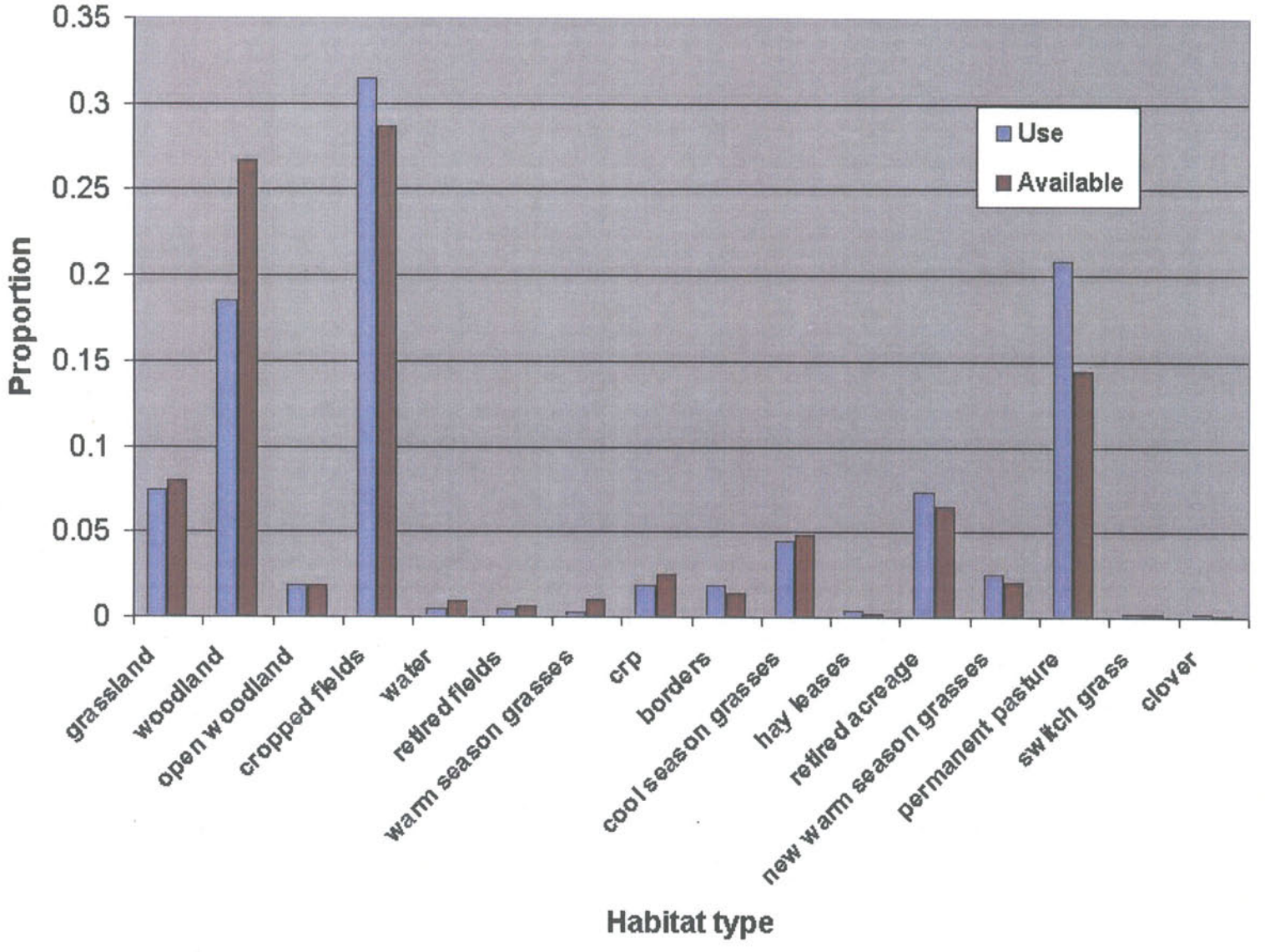

Fig. 5. Habitat use vs. availability for quail during the 2001 breeding season (based on 24 birds)

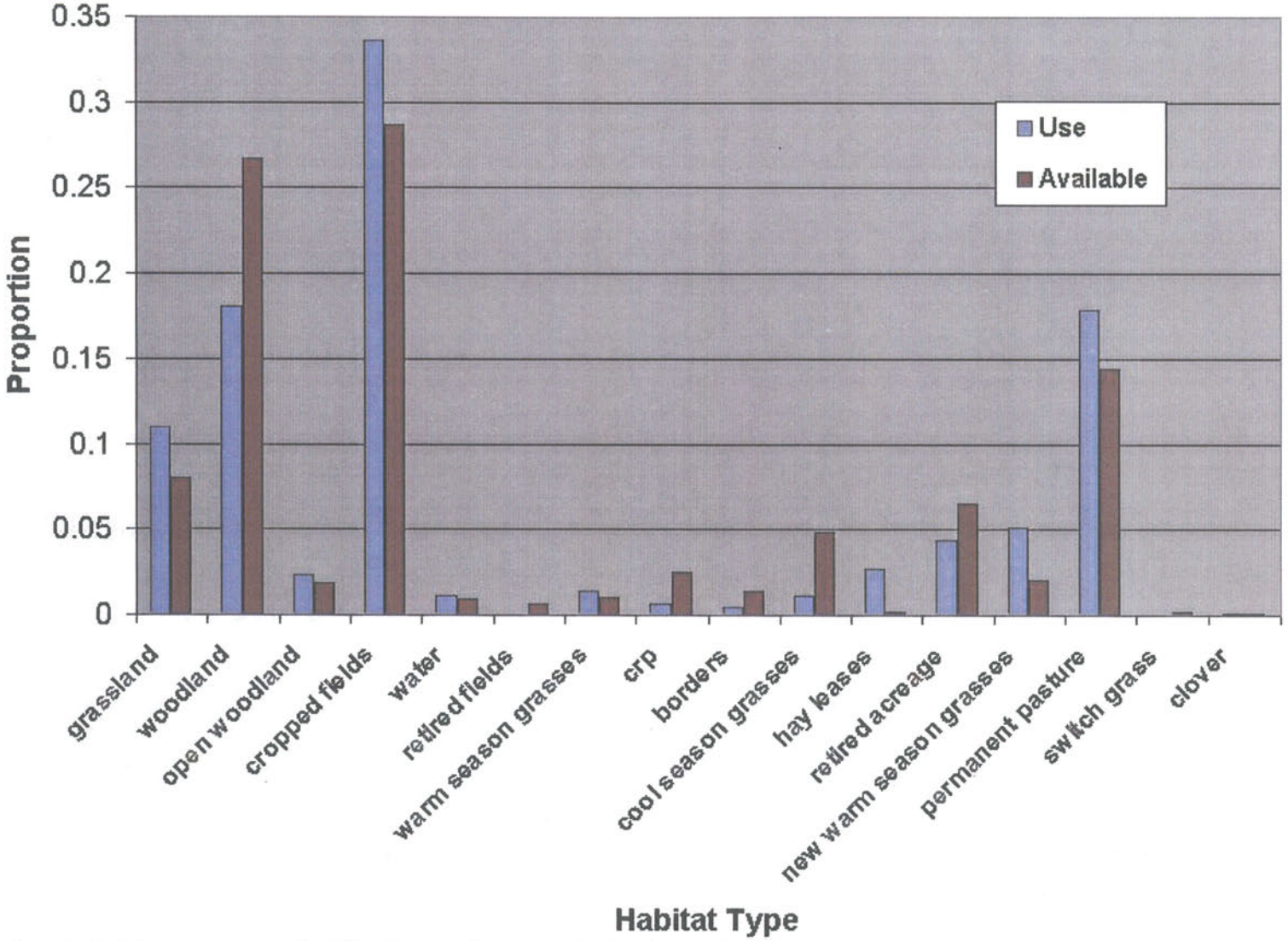

Fig. 6. Habitat use vs. availability for quail coveys during the 2000-2001 non-breeding season (based on 27 birds and 13 coveys).