SMALL MAMMAL POPULATIONS, VEGETATIONAL COVER, AND HUNTING USE OF AN OHIO STRIP-MINED AREA[1, 2]

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ABSTRACT

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A 1,846-hectare area in Perry County, Ohio, about 60% of which had been strip-mined for coal, was studied in 1973–74 to identify major vegetation types, gather population indices of small mammals, and determine hunter use. Three distinct cover types on unmined land—old field, old field-pine, and woods—and three on mined land—brush-hardwoods, hardwoods, and nonvegetated—were identified. Vegetational changes since 1966 included the loss of dominant black locust (*Robinia pseudoacacia*) and improved growth of other plants. White-footed mice (*Peromyscus leucopus*), cottontail rabbits (*Sylvilagus floridanus*), and shorttail shrews (*Blarina brevicauda*) were the most common of 15 species of small mammals captured in 21,256 trap nights. Woodchucks (*Marmota monax*), also common, may be important on strip-mined areas as a provider of dens. Trapping success for some species, greater than in 1966, could not be attributed to the influence of land reclamation. Cover type may have been related to trapping success for some species, but no clear-cut relationship of a species to stripped or unstripped land was evident. Hunting pressure on small game was light and was largely by local residents, as in 1966. Availability of public, unmined lands in southeast Ohio probably will insure a continued low use of the study area by non-local persons.

Since initiation in 1937 of research on revegetation of surface mined land (Riley, 1957), much has been learned about the botanical aspects of strip-mine reclamation. Until recently, there has been little study of the effects of strip-mining and reclamation on terrestrial wildlife. Successful reclamation should emphasize establishment of a balanced and reasonably diverse community of plants and animals. More quantitative data on wildlife populations following reclamation activities are necessary if acceptable renovation of spoil banks is to be accomplished.

The Secretary of the Interior was directed to survey and study surface mining by the Appalachian Regional Development Act of 1965. As a result of funds made available, the State of Ohio planned reclamation for three publicly-owned tracts of coal strip-mined land in southeastern Ohio. One of these sites, the Perry Reclamation Area, in Perry County, Ohio, was studied by Bookhout *et al.* (1968) from July 1966 to June 1967, before reclamation began. The same area was studied by De Capita (1975) from September 1973 to July 1974, after completion of prescribed reclamation work.

Objectives were to obtain: a description of the vegetational characteristics of the area, population indices of small mammals and their relation to vegetation, levels of recreational use and hunter success, and general indications of the suitability of the area as wildlife habitat. Other personnel of the Ohio Cooperative Wildlife Research Unit examined vegetation from strip-mined areas in southeastern Ohio for nutrient and heavy metals content (Lindsay, 1974), and small mammals for heavy metals content (Tolin, 1975).

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DESCRIPTION OF THE STUDY AREA

The 1,846-hectare Perry Reclamation Area, located in Clayton Township, Perry County, Ohio, lies approximately 70.1 km ESE of Columbus, in the Kanawha section of the Appalachian Plateau. About 60% of the area was strip-mined from 1948 to 1960. Topography is moderately rolling and lightly dissected, and elevation varies from 271 to 338 m. The upper geologic strata are of the Pennsylvanian system and include shale, sandstone, flint, clay, iron ore, and coal (Bowen, 1947). Three coal seams of the Allegheny formation of the Pennsylvanian system were strip-mined. The Middle Kittanning was the thickest (1.2 to 1.5 m) and most important throughout Perry county. The elevation of the Middle Kittanning (305 to 317 m) and the gently rolling topography resulted in mining over extensive areas by a combination of area and contour methods.

Roof shale, directly above the coal seam, and fire clay, located immediately below the coal, were always associated with the coal seams in this area. In addition, the Middle Kittanning coal had shale or clay partings separating it into three layers. The major components of the overburden were silty and sandy shales and massive sandstone. These layers, particularly the partings, roof shale, and the coal itself, contained considerable amounts of pyrites and other acid forming materials. Disruption during the mining operation and exposure to air, water, and bacterial action resulted in formation of sulfuric acid and release of metallic ions. These chemicals had a major influence on the post-mining ecology of the area. The fire clay beneath the coal seam, usually left intact after the coal had been removed, contributed to the problem of acid drainage because it was impervious to water. Thus, water collected along the upper surface of the clay or percolated downward through spoils to the clay and flowed laterally, carrying acid to the watershed.

Most of the mining on the study area occurred after passage, in 1948, of Ohio's first reclamation law, which required grading to a gently rolling topography and planting of spoil banks. The long, parallel ridges common on older "pre-law" spoils were not present, but the topography was quite rugged. The 1948 law did not require filling of final cuts, and these sometimes filled with water, forming long, narrow ponds bordered by a high wall and steep spoil banks. Ponds also formed where water filled depressions in the spoil banks. Some final cuts contained exposed piles of black roof shale, waste coal, and partings.

Aquatic habitat resulting from the mining operation included over 130 ponds, ranging from 0.2 to 7.0 hectares in size. Only 11 ponds had a pH of 5.5 or greater, and fish occurred in 7. Streams were polluted with acid and colored orange by ferrous hydroxide precipitates.

Soils belong to the Gilpin-Dekalb-Strip-mine Spoil Association (Ohio Department of Natural Resources, 1973). These residual soils, having formed over interlayered shale and sandstone, are moderately deep. They are low in natural fertility and organic matter, and have a pH from 4.6 to 5.4 (Bookhout *et al.*, 1968). The strip-mine spoil texture is usually loamy, but varies from clay to sand; pH is sometimes lower than 3.8 and seldom exceeds 5.5. The amount of soil-sized material in the upper 30 cm of spoil ranges from 20 to 70% and averages about 45% (Finn, 1958).

Precipitation is normally abundant and well distributed throughout the year in Perry County; fall is the driest season. Mean annual precipitation is 94 cm and mean annual snowfall is 72 cm (Miller, 1969). The annual mean temperature from 1942 to 1965 at New Lexington was 10.8°C; annual mean minimum was 3.7°C and annual mean maximum was 17.9°C. The crop growing season at New Lexington averages 150 days.

The original vegetation of the unglaciated Appalachian Plateau was the Mixed Mesophytic Forest Association (Braun, 1950). At the time of the earliest land surveys, the vegetation of Perry County was chiefly mixed oak (*Quercus* spp.) forest (Gordon, 1966). Before being mined, the study area was cultivated and grazed; woods were confined to the steeper slopes and were often grazed. General livestock and grain

farming predominates on surrounding unstripped lands today.

METHODS AND MATERIALS

Vegetation Survey. The study area was surveyed systematically to determine principal vegetation types (fig. 1). East-west compass lines 203 m (10 chains) apart were walked, and stops were made at 203 m distances. At each stop, plant species within immediate view were recorded according to the size category and stocking of major overstory and understory species. Locations of any major type changes between sampling points were determined by pacing, and recorded on a base map. Field survey data were supplemented with standard 1:20,000-scale USDA aerial photographs made in 1965 and 1971 to produce a vegetation cover map of the study area. Hectarages of cover types were determined by planimetry.

Mammal Trapping. Four types of live traps were employed to obtain population indices of small mammals: two sizes of Sherman traps (H. B. Sherman, Deland, Florida), 7.6 x 7.6 x 25.4 cm and 5.1 x 6.4 x 17.8 cm in dimensions; wooden rabbit traps 17.8 x 22.9 x 76.2 cm; wooden frame, wire mesh cat traps 30.5 x 30.5 x 61 cm; and Tomahawk traps (Tomahawk Live Trap Co., Tomahawk, Wisconsin) 22.9 x 22.9 x 61 cm. Sherman traps were baited with a mixture of oats, peanut butter, cracked corn, raisins, and bacon grease. Cat and Tomahawk traps were baited with smoked herring, and rabbit traps were not baited.

Plots to be trapped were chosen randomly from 16.2 ha (40 acre) square plots drawn on a topographic map of the study area. Plots were selected within each of five vegetation types in approximate proportion to the percentage of the study area covered by each vegetation type, thus trapping effort (i.e., the number of trap nights) in each cover type was ap-

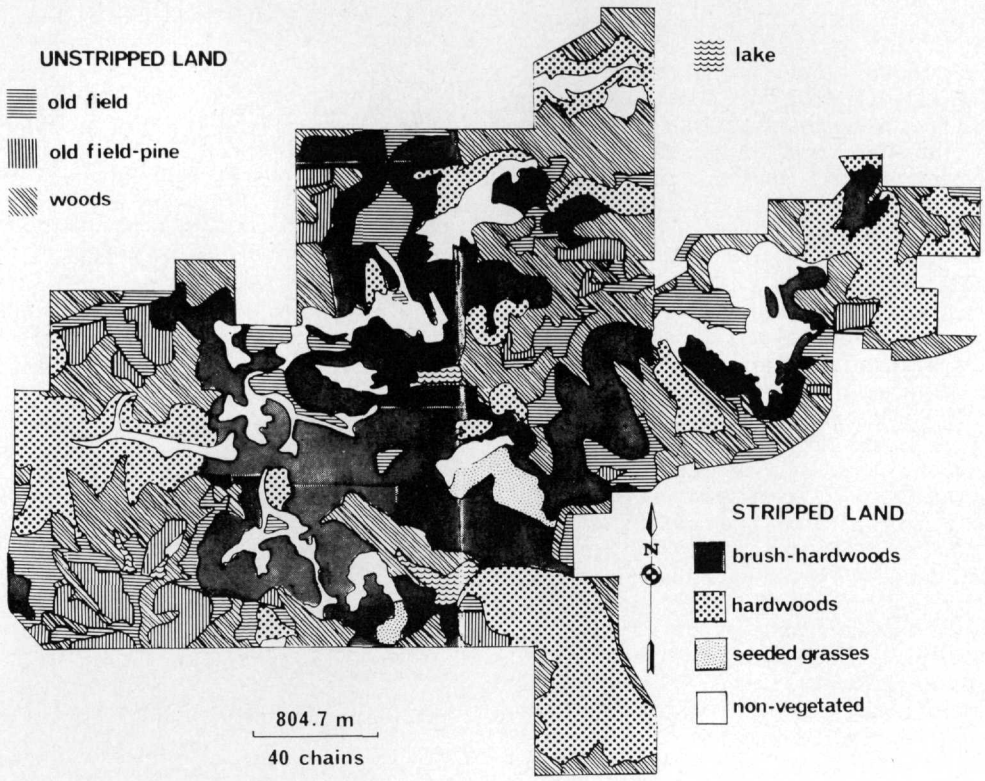

FIGURE 1. Major vegetational cover types on the Perry County study area, 1973–74.

proximately proportional to type hectarage. The same 20 plots trapped during fall 1966 and spring 1967 by Bookhout *et al.* (1968) were trapped during fall 1973 and spring 1974 (because of changes in cover types since the 1966–67 study, we did not trap old fields). Each plot was trapped for six days, and three or four plots were trapped simultaneously. A trapping grid of 25 stations, 5 stations on a side and each about 67 m apart, was laid out in each plot. One rabbit trap, one Tomahawk or cat trap, and four Sherman traps were placed at each of 12 central stations. One rabbit trap and one cat or Tomahawk trap only were placed at each of 13 peripheral stations. All traps were checked daily.

Hunter Survey. Hunters were surveyed by questionnaires placed on the windshields of cars parked on the area during hunting seasons. The questionnaires provided information on small game hunting success, residence, and nonhunting recreational use of the area.

RESULTS AND DISCUSSION

Vegetation Survey. Extensive tree plantings required by Ohio law strongly influenced the character of vegetation in the mined portion of the area. Of approximately 2.1 million tree seedlings planted before 1965 (Bookhout *et al.*, 1968), 48.4% were black locust, 11.2% tuliptree (*Liriodendron tulipifera*), and 9.8% silver maple (*Acer saccharinum*). Natural seeding and establishment of these and some of the other 12 species present also had taken place on the disturbed areas.

Seven recognizable types occurred (table 1 and fig. 1) and probably were typical of the vegetation on mined areas of the unglaciated portion of Ohio. A brief description of types follows.

Old fields (unstripped). These were abandoned, as farmland, during 1948–60 as mining progressed nearby. Although considerable invasion of early successional trees and shrubs, primarily black cherry (*Prunus serotina*), elm (*Ulmus* spp.), red maple (*Acer rubrum*), sassafras (*Sassafras albidum*), and dogwood (*Cornus* spp.), had occurred, the type was dominated by perennial grasses and forbs. Poison ivy (*Rhus radicans*), goldenrod (*Solidago* spp.), blackberry and raspberry (*Rubus* spp.), broomsedge (*Andropogon virginicus*), and other grasses (Gramineae) were common.

Old field-pine (unstripped). A complete canopy, which characterized much of this type, resulted from plantings of red (*Pinus resinosa*) and white pines (*P. strobus*) approximately 12 years earlier. Openings of various sizes were present throughout the plantations, permitting the old field "character" to persist. Most of the natural woody invaders were present.

Woods (unstripped). This habitat was characterized by large, deciduous trees that provided a closed canopy and a relatively open understory. Major overstory species were black cherry, white oak (*Quercus alba*), red oak (*Q. rubra*), red maple, sugar maple (*Acer saccharum*), sassafras, elm, hickory (*Carya* spp.), and beech (*Fagus grandifolia*). These occurred often in the larger diameter classes, some with a dbh to 76 cm.

Brush-hardwoods (strip-mined). This was the most prevalent cover type; common woody species were black locust, silver maple, bigtooth aspen (*Populus grandidentata*), red maple, black cherry, elm, and tuliptree. Blackberry, raspberry, goldenrod, panicgrass (*Panicum* spp.), broomsedge, and poison ivy were common ground species. An interspersion of open and dense stands of small (12.7 cm dbh) trees, dense stands of blackberry and raspberry, clumps of grasses and forbs, and areas of bare ground characterized the type. Black

TABLE 1

Vegetation types present on the Perry County Study Area, 1973–74.

Category and type	Hectarage	% of total
Unstripped		
Old field	131.6	8.9
Old field-pine	76.5	5.2
Woods	387.0	26.1
Stripped		
Brush hardwoods	450.2	30.4
Hardwoods	274.5	18.5
Non-vegetated	143.7	9.7
Totals	1,463.5*	98.8

*Does not include 17.0 hectares seeded to annual grasses in 1973.

locust, although numerically prominent, was not a canopy dominant as in 1966. Most larger trees had been killed by the locust borer (*Cyllene robinae*) since 1966, and black locust was regenerating by sprouts and root suckers.

Hardwoods (striped-mined). This type differed from brush-hardwoods in greater numbers of larger trees (12.7–25.4 cm dbh) with more closed canopy and more open understory. There was similarity, however, in species composition. Precise measurement was not made of the closed canopy in either type, but types could be distinguished readily on aerial photographs. Brushy openings were common, as evidenced by the occurrence of blackberry and raspberry and black locust sprouts in the understory. Most large locust trees were dead, and the dominant overstory species were silver maple, bigtooth aspen, and tuliptree.

Nonvegetated (strip-mined). These areas were essentially devoid of vegetation 14 to 26 years after mining. However, occasional single trees, clumps of trees, or small islands of vegetation were recorded. Plant species were the same as in the previous two types.

Tree plantings were made fairly uniformly throughout the mined area, and it is appropriate to assume that seed dispersal of native invaders was widespread, in view of the extent and interspersion of these species on nearby unmined land. Thus, one of the most characteristic vegetational features of the Perry County area was the interspersion of cover types, ranging from bare area through sparse grasses and forbs, to dense forbs and shrubs, or closed canopy saplings, within a small area. Many physical and chemical factors were known to affect the success of revegetation on strip-mine spoil banks. Physical conditions governing soil aeration and moisture, such as stoniness, texture, and aggretation, were important (Limstrom, 1960). The total disorganization of the overburden material resulting from the mining process was responsible for the variability of site characteristics that occurred. This variability also was reflected in cover establishment.

The limited variety of tree species planted on the spoil banks did not alone provide an adequate plant community for wildlife re-establishment. A variety

TABLE 2

Mammal trapping success on the Perry County, Ohio, study area. Trapping dates were 21 September–2 November 1966, 25 March–22 May 1967, 6 October–24 November 1973, and 29 March–27 May 1974.

Species*	1966–67				1973–74			
	Original captures		Original captures/100 trap nights		Original captures		Original captures/100 trap nights	
	fall	spring	fall	spring	fall	spring	fall	spring
Blarina brevicauda	54	3	0.960	0.053	56	17	1.14	0.33
Didelphis marsupialis	3	6	0.083	0.104	22	16	0.40	0.28
Felis domesticus	1	3	0.028	0.052	2	1	0.04	0.02
Glaucomys volans	2		0.022		6	2	0.06	0.02
Marmota monax	1	10	0.056	0.354	1	25	0.02	0.44
Mephitis mephitis					1		0.04	
Microtus pennsylvanicus	5	7	0.089	0.124	8	12	0.06	0.23
Mus musculus	6	3	0.107	0.053	1		0.02	
Peromyscus spp.**	490	399	8.708	7.092	1,015	355	20.73	6.87
Procyon lotor	2	8	0.112	0.283	12	11	0.46	0.39
Sciurus carolinensis		1		0.017	1		0.02	
Sorex sp.					5		0.10	
Sylvilagus floridanus	17	29	0.468	0.501	115	73	2.09	1.29
Synaptomys cooperi	3	1	0.053	0.018	5	1	0.10	0.02
Tamias striatus	4	2	0.043	0.018	22	3	0.21	0.03

*Scientific names are according to Hall and Kelson (1959).
**Includes *P. leucopus* and *P. maniculatus*.

of plants became established naturally, and these native invaders were most successful on those sites with successful plantings. These sites were the most favorable ones for volunteer vegetation as well; however, Limstrom (1960) felt that natural reforestation of spoil banks alone was inadequate. The presence of the planted trees appeared to enhance the survival of natural invaders and speed up succession; they ameliorated severe conditions such as intense insolation, high surface temperature, and rapid evaporation. The success of spoil bank reclamation after a limited tree planting program, in terms of wildlife food and cover, soil organic matter accumulation, and erosion control, was greatly improved by the establishment of a diverse native flora.

Mammal Trapping. In 21,256 trap nights, 15 species of mammals were captured in the fall of 1973 and 11 species in the spring of 1974 (table 2). The three most commonly captured species were, in descending order, white-footed mice, cottontail rabbits, and shorttail shrews. The same three species also were captured in the same order of abundance in 1966–67 (Bookhout *et al.*, 1968), and with few exceptions, most of the same mammalian species were captured in about the same proportion in both studies. Trapping success for most species decreased from fall to spring in both studies. The major difference in trapping results of the two studies was a significant increase in individuals captured for several species in 1973–74 (De Capita, 1975). White-footed mice, cottontails, shorttail shrews, opossums (*Didelphis marsupialis*), raccoons (*Procyon lotor*), woodchucks, chipmunks (*Tamias striatus*), and flying squirrels (*Glaucomys volans*), were captured more often in 1973–74. The assumption that trapping success adequately reflected population levels and distribution was necessary for meaningful interpretation of these data. It is recognized that many factors affect mammal trapping success and that the stated assumption may be tenuous.

Chi-square tests of vegetation or land type (stripped or unstripped) versus trapping success were made of the 1973–74 data; the number of trap nights logged in each category was used to compute the expected trapping success (tables 3 and 4). Some species were not included because data were insufficient. Trapping success was independent of cover type, for some species, in one or both seasons. For white-footed mice, the largest chi-square contribution came from the brush-hardwoods cover type in the fall ($P \leqslant 0.001$, 4 df). In addition, white-footed mice were captured more often ($P \leqslant 0.001$, 1 df) on strip-mined land (data from the three strip-mine cover types combined) in the fall. Chi-square values were not significant in tests of trapping success versus cover or land type in spring, 1974, for this species. Significant chi-square values may provide some basis for speculation that cover or land type affected trapping success and/or that small mammal populations varied in direct proportion to trapping success. The effects of vegetation, precipitation, and barometric pressure on trapping success for mice and cottontails were investigated (De Capita, 1975) with an analysis of variance procedure; results were inconclusive.

Since the same trapping methods were used by Bookhout *et al.* (1968) and De Capita (1975), increases in population levels of several mammals (table 2) in the 1973–74 trapping periods were considered genuine. Reasons for these increases were not apparent, but we do not believe they resulted from limited reclamation work during the interval between the two studies. The increases in mammal populations could be within the range of normal annual fluctuations, or they could reflect an improvement in food and cover conditions.

Cottontails, woodchucks, and white-footed mice appear to be characteristic residents of strip-mined areas elsewhere. Costley (1936), Yeager (1940), and Verts (1959) found these animals common on strip-mined areas in Illinois. Riley (1954) found cottontails more abundant on some Ohio reclaimed spoils than on adjacent abandoned farmland, and at least as many woodchucks on stripped land as on unstripped land. We captured cottontails more often than expected in the old field-pine cover type (table 3) and captured them equally often on stripped and unstripped land (table 4). Woodchucks were captured more often on unstripped

TABLE 3

Actual numbers and expected numbers, according to trapping effort, of animals caught in each cover type and results of Chi-square analysis for effect of cover type on trapping success on the Perry County, Ohio, study area, fall 1973 and spring 1974.

Species	Season	Old-field-pine	Woods	Brush-hardwoods	Hardwoods	Non-vegetated	Signif. level
Blarina brevicauda	fall	23*	2	25	4	2	$P \leq 0.001$
		5.7	11.6	21.7	11.4	5.6	
	spring	3	1	3	6	4	$P = 0.023$
		1.7	3.5	7.1	3.2	1.5	
Didelphis marsupialis	fall		6	2	12	2	$P = 0.0003$
		2.3	4.5	8.5	4.4	2.3	
	spring	2	4	5	5		$P = 0.506$
		1.6	3.2	6.5	3.1	1.5	
Marmota monax	fall				1		
	spring	5	8	6	5	1	$P = 0.143$
		2.5	5	10.2	4.9	2.4	
Peromyscus spp.**	fall	75	175	527	184	54	$P \leq 0.001$
		103.2	210.2	393.3	206.1	102.2	
	spring	26	87	156	58	28	$P = 0.068$
		35.9	72.0	147.6	67.2	32.2	
Procyon lotor	fall		1	6	5		$P = 0.162$
		1.3	2.5	4.5	2.5	1.3	
	spring	3	1	1	4	2	$P = 0.059$
		1.1	2.1	4.5	2.2	1.1	
Sylvilagus floridanus	fall	23	13	41	36	2	$P \leq 0.001$
		12.0	23.3	44.6	23.2	11.9	
	spring	16	9	31	13	4	$P = 0.008$
		7.4	14.5	29.8	14.3	7	
Tamias striatus	fall	2	10	7	3		$P = 0.045$
		2.3	4.5	8.5	4.5	2.2	
	spring	1	1	1			

*Actual captures shown above expected captures.
**Includes *P. leucopus* and *P. maniculatus*.

TABLE 4

Results of Chi-square analysis on the effect of stripped verus unstripped land on trapping success on the Perry County, Ohio, study area.

Species	Land type	Fall		Spring		Combined	
		Trap succ.*	Signif. level	Trap succ.	Signif. level	Trap succ.	Signif. level
Blarina brevicauda	stripped	0.92	$P = 0.025$	0.36	$P = 0.537$	0.63	$P = 0.091$
	unstripped	1.62		0.25		0.94	
Didelphis marsupialis	stripped	0.42	$P = 0.726$	0.25	$P = 0.511$	0.33	$P = 0.867$
	unstripped	0.35		0.35		0.35	
Marmota monax	stripped	0.02		0.30	$P = 0.016$	0.17	$P = 0.029$
	unstripped	0.00		0.76		0.38	
Microtus pennsylvanicus	stripped	0.14	$P = 0.598$	0.28	$P = 0.300$	0.21	$P = 0.642$
	unstripped	0.21		0.13		0.17	
Peromyscus spp.**	stripped	22.61	$P \leq 0.001$	6.73	$P = 0.545$	14.42	$P \leq 0.001$
	unstripped	16.53		7.19		11.77	
Procyon lotor	stripped	0.61	$P = 0.084$	0.35	$P = 0.619$	0.48	$P = 0.362$
	unstripped	0.12		0.48		0.30	
Sylvilagus floridanus	stripped	2.07	$P = 0.599$	1.21	$P = 0.422$	1.63	$P = 0.526$
	unstripped	2.13		1.47		1.80	
Tamias striatus	stripped	0.14	$P = 0.016$	0.01		0.07	$P = 0.006$
	unstripped	0.37		0.06		0.22	

*Trapping success is given as captures per 100 trap nights.
**Includes *P. leucopus* and *P. maniculatus*.

land. The woodchuck may be a valuable inhabitant of strip-mined areas as a provider of dens for other species. The lack of large trees, logs, or stumps makes ground dens especially important. Trapping success for opossums and raccoons did not differ significantly between stripped and unstripped land, probably attributable to the interspersion of the two land types and the mobility of these species. Relative abundances of these mammals suggested that, for them, the strip-mine habitat is comparable in quality to the surrounding unmined land.

There seems to be ample evidence that some vegetated strip-mined areas can and do support healthy populations of wildlife. Lindsay (1974) found that plants on the strip-mined portions of the Perry Reclamation Area, as well as those on some strip-mined areas in Harrison County, Ohio, contained normal nutrient levels, and that they did not contain harmful amounts of lead and mercury. Tolin (1975) analyzed tissues of small mammals collected on both stripped and unstripped portions of Harrison and Noble counties, Ohio, as well as the Perry Reclamation Area, for mercury, cadmium, and lead. He found levels of these metals in specimens from mined areas to be similar or lower than in those from unstripped land.

Despite some favorable characteristics of strip-mine habitats, we do not feel that the strip-mined portion of the study area offered better wildlife habitat than adjacent abandoned farmland. Abandoned farmland, with an intact soil profile, likely had a more diverse and balanced community of grasses and forbs than did the spoil banks. The strip-mined portions of the study area appeared to exhibit lower overall diversity in both plant and animal numbers than did the unstripped portions; however, our data did not support this judgment. We did not measure plant communities and their compositions. Moreover, several species of mammals probably were not resident only of stripped or unstripped portions, but freely moved from one portion to the other. Management of spoil banks by thinning trees and underplanting more desirable (native) species may help accelerate development of a more diverse flora, and thus improve this habitat for wildlife.

Hunter Survey. On opening day of squirrel season in 1973, only 14 hunters used the area and killed 23 squirrels in 46 hours of hunting in unstripped woods, a success rate of 50 squirrels per 100 hours of hunting. For the first 5 days of the season, 70 hunters shot 54 squirrels in 192.5 hours (28.1/100 hrs), compared with a success rate of 33.9 squirrels per 100 hours in 1966 (Bookhout *et al.*, 1968). No squirrel hunters were contacted after the first five days. Ohio Division of Wildlife (1973) hunter bag checks in Ohio's southeast region, which includes Perry County, reported that hunters on opening day, 1973, required 3.1 hours to kill a squirrel, much longer than the 0.5 hour per squirrel on the study area. For opening day and the first two Saturdays, hunters in southeast Ohio spent 3.1 hours per squirrel killed, somewhat better than the 3.5 hours spent per squirrel killed on the study area during the first five days of the season. Except for opening day, squirrel hunting success, but not pressure, on the study area appeared comparable to southeast Ohio as a whole in 1973.

During Ohio's 1973 rabbit, quail (*Colinus virginianus*), pheasant (*Phasianus colchicus*), and ruffed grouse (*Bonasa umbellus*) hunting seasons, the 85 hunters who returned questionnaires spent 254 hours to harvest 35 rabbits and 4 ruffed grouse (13.8 rabbits and 1.58 grouse/100 hours). Success was about half the rate of 27.0 rabbits per 100 hours reported for southeast Ohio in 1973 (Ohio Division of Wildlife, 1974) but comparable to the 1966 rate of 12.4 rabbits killed per 100 hours hunted (Bookhout *et al.*, 1968). Grouse hunting on the study area was somewhat better in 1973 than in 1966, when no grouse were reported taken, but was poor when compared with Ohio Division of Wildlife survey results for southeast Ohio. White-tailed deer (*Odocoileus virginianus*) were seen frequently. Deer hunters were not contacted, but Ohio Division of Wildlife records indicate eight deer were harvested in 1973, compared with three in 1966.

The pattern of public use on the Perry Reclamation Area had not changed ap-

preciably since 1966. The area was still lightly used, and the majority of the 155 hunters were local residents; 62% lived within 8 km and 85% within 40 km. As in 1966, non-hunting use in 1973 was light and consisted primarily of berry and mushroom picking, with some camping and picnicking. The area is an official state recreational vehicle area and is used heavily by trail bike riders on warm weekends.

Other public lands in southeast Ohio probably attract most recreationists living outside the immediate vicinity of the study area. Of 55 public hunting and fishing areas within an 80-km radius of the Perry County area, 48, totaling 73,148 hectares, are available for public hunting (Bookhout *et al.*, 1968). Twenty-two of the areas are 405 hectares or greater in size, including 23,080 hectares in Wayne National Forest and several thousand hectares in state forests. The availability of these alternate, unmined areas probably will insure a continued low use of the Perry Reclamation Area by non-local persons.

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