

MASTER

WILDLIFE INVESTIGATIONS AT A COAL REFUSE RECLAMATION SITE IN SOUTHERN ILLINOIS

by

Edwin D. Pentecost and Richard C. Stupka

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Prepared for

Surface Mining and Fish/Wildlife Needs in Eastern United States

West Virginia University and U.S. Fish and Wildlife Service

Morgantown, West Virginia

December 3-6, 1978

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED *ED*



ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS

**Operated under Contract W-31-109-Eng-38 for the
U. S. DEPARTMENT OF ENERGY**

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

The facilities of Argonne National Laboratory are owned by the United States Government. Under the terms of a contract (W-31-109-Eng-38) between the U. S. Department of Energy, Argonne Universities Association and The University of Chicago, the University employs the staff and operates the Laboratory in accordance with policies and programs formulated, approved and reviewed by the Association.

MEMBERS OF ARGONNE UNIVERSITIES ASSOCIATION

The University of Arizona	Kansas State University	The Ohio State University
Carnegie-Mellon University	The University of Kansas	Ohio University
Case Western Reserve University	Loyola University	The Pennsylvania State University
The University of Chicago	Marquette University	Purdue University
University of Cincinnati	Michigan State University	Saint Louis University
Illinois Institute of Technology	The University of Michigan	Southern Illinois University
University of Illinois	University of Minnesota	The University of Texas at Austin
Indiana University	University of Missouri	Washington University
Iowa State University	Northwestern University	Wayne State University
The University of Iowa	University of Notre Dame	The University of Wisconsin

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately-owned rights. Mention of commercial products, their manufacturers, or their suppliers in this publication does not imply or connote approval or disapproval of the product by Argonne National Laboratory or the U. S. Department of Energy.

WILDLIFE INVESTIGATIONS AT A COAL REFUSE
RECLAMATION SITE IN SOUTHERN ILLINOIS

Edwin D. Pentecost and Richard C. Stupka

Land Reclamation Program

Argonne National Laboratory

Argonne, Illinois 60439

Abstract. Wildlife studies of a reclaimed coal refuse pile were conducted during the summer months of 1977 and 1978. During the period of May - September 1977 and May - July 1978 live-trap censuses were made. Small mammal species observed in 1977 included the white-footed mouse (Peromyscus leucopus), house mouse (Mus musculus) and meadow vole (Microtus pennsylvanicus). In 1978 the prairie vole (Microtus ochrogaster) was also a common resident of the site. Population density estimates for Mus musculus and M. ochrogaster were 20 (+ 19.4) and 37.5 (+ 20) respectively in June 1978. Evidence of habitat segregation was observed between M. pennsylvanicus and M. ochrogaster with the former species occupying densely vegetated areas of tall fescue (Festuca arundinacea), birdsfoot trefoil (Phalaris arundinacea) and cereal rye (Secale cereale) while M. ochrogaster was more abundant in open areas with similar vegetation. Both the mammalian and avian species observed on site were those typical of early old-field communities in southern Illinois. Four passerine species (killdeer, song sparrow, red-winged blackbird, common grackle) nested on site during the second year following seeding. No onsite nesting activity occurred during 1977. Common amphibians observed around the pond included the southern leopard frog (Rana pipiens sphenoccephala), Blanchard's cricket frog (Acris crepitans blanchardi) and american toad (Bufo a. americanus). Utilization of the pond by these species occurred the first summer after reclamation was completed.

INTRODUCTION

This study is part of an ongoing multiple-disciplined demonstration program to examine the success of reclamation of a coal refuse area in Southern Illinois. The abandoned Mined Land Reclamation Council of Illinois, the Illinois Institute of Natural Resources and the U.S. Department of Energy are providing funding to the Land Reclamation Program (LRP) at Argonne National Laboratory to undertake pre- and post- reclamation studies to determine the success of the program. A major goal of the program, in addition to controlling pollutant runoff from the refuse pile and improving the economics and aesthetics of the area, was to develop, demonstrate and evaluate reclamation techniques of a coal refuse area that would provide the greatest benefit at the lowest environmental and economic costs. The overall program consists of: 1) planning and design, 2) baseline monitoring, 3) site development and, 4) post-construction monitoring and evaluation.

The demonstration site selected is located adjacent to the northwestern corner of the town of Staunton in Macoupin County Illinois. This site was selected from a group of 29 abandoned coal refuse sites in the Macoupin County area created by coal preparation activities from deep mines. All sites were typified by a lack of

vegetative cover and highly eroded surfaces. In addition, the refuse sites were of little or no economic value, and were sources of contamination to adjacent properties and the local watershed. This site was of particular interest because of its proximity to Cahokia Creek and the town of Staunton.

The Staunton Site is the site of the abandoned Consolidated Coal Company Mine No. 14. The mine operated from 1904-1921 mining the Herrin (No. 6) coal seam located approximately 85 m (280 ft) below the surface. The refuse pile and slurry area were generated by the coal washing facility located adjacent to the mine entrance. The site includes about 13.8 ha (34 ac) of which approximately 9.3 ha (23 ac) required reclamation. The refuse pile extended about 25 m (80 ft) above the natural landscape and covered an area of 1.8 ha (4.5 ac). The pile was steep sided, highly eroded and devoid of vegetation both on the pile and in areas affected by the acid runoff and sediment. Prior to the onset of mining a dam was constructed across a natural ravine at the northern edge of the mine property. All drainage from the refuse pile was impounded during mine operation. Following the cessation of mining sediment continued to flow into the impoundment reaching a maximum depth of 9 m (30 ft). The slurry area covered about 4.5 ha (11 ac) and remained intact until the dam was breached approximately 35 years ago. Slurry material was then eroded and resuspended by runoff water and carried down a ravine to Cahokia Creek located approximately 0.8 Km (0.5 mi) northwest of the impoundment.

Engineering plans and specifications were developed by Argonne personnel to meet the proposed final land uses of the area. Site preparation was initiated in the fall of 1976. The initial work involved the disposal of debris and man-made structures and re-contouring the area. A borrow pit was opened adjacent to the refuse pile and suitable cover was removed and stockpiled. The refuse pile was reduced to approximately one-fourth of its original height and rough graded. The refuse pile was then treated with agricultural limestone. "Code L Alkalai" (a mixture of calcium oxide and calcium carbonate) was substituted for agricultural limestone in the slurry area. This material was chosen because of its ability to stabilize and neutralize the acidic, highly saturated slurry material. Agricultural limestone was applied at a rate of 220 t/ha (89.1 t/ac) and "Code L Alkali" at a rate of 153.8 t/ha (62.3 t/ac). These neutralizing agents were incorporated to a depth of 15 cm by disking. The treated areas were then covered by 0.3 m (1 ft) of cover material and treated with an application of agricultural limestone of 11.2 t/ha (4.5 t/ac) and 135 Kg/ha (297 lb/ac) each of nitrogen, phosphorus and potassium. These materials were disked to a minimum depth of 15 cm and the seedbed was prepared. The area was then seeded with a mixture of legumes and grasses (Table 1) with an agricultural grain drill. Seedbed preparation and seeding took place in late April 1977. A detailed site description and preliminary results of other studies are provided elsewhere (Zellmer 1978).

The studies reported in this paper were undertaken to monitor the success of reclamation with respect to wildlife. Attempts were made to determine if wildlife species colonized the site as expected during secondary succession of disturbed sites in southern Illinois. Although other researchers have documented the utilization of strip-mine spoils by wildlife in the midwest (Riley 1954, Verts 1957; Brewer 1958; Arata 1959; Verts 1959; Myers and Klimstra 1963; Riley 1963; Karr 1968; Mumford and Bramble 1973; Decapita and Bookhout 1975; Sly 1976) no studies are known on wildlife usage of revegetated coal refuse piles.

Table 1. Seeding mixture utilized to revegetate the
Staunton Reclamation Site.

Species	Kg/ha	lbs/ac
Reed canarygrass (<i>Phalaris arundinacea</i> L.)	11.2	10
Tall fescue "Kentucky 31" (<i>Festuca arundinacea</i> Schreb)	16.8	15
Birdsfoot trefoil (<i>Lotus corniculatus</i> , L.)	13.4	12
Ladino clover (<i>Trifolium repens</i> L.)	5.6	5
Cereal rye (<i>Secale cereale</i> L.)	22.4	20

MATERIALS AND METHODS

Mammals

Observations of mammalian species utilizing the reclamation site were both qualitative and quantitative. Other documentation was made by direct sighting, and through observations of tracks, scat, etc. In May, June and late August 1977 two 5 x 5 live trap grids were set up on the south area of the site to determine kinds and relative abundance of small mammals invading the site during the first season following seeding. A small mammal live-trap study was conducted in 1978. An octagonal census area was employed using Sherman live traps (9 cm x 9 cm x 23 cm) placed 10 m apart along assessment lines radiating from the center of the south area. The octagonal design was selected since it permitted a better determination of migration corridors of small mammals into the site, was less disruptive to other studies and best suited to the irregular shape of the area. The effective area trapped was approximately 0.9 ha (2.2 ac).

Birds

Two approaches were used to study avian populations of the area. The site periphery and adjacent habitat types were surveyed to establish a baseline necessary to determine which species would be expected to use the site for nesting, foraging or cover. The small size and irregular shape of both the north and south areas were constraints to the use of a standard strip transect survey or quadrat methods of quantifying avian populations. The south area was small enough to permit a systematic search for nests.

The survey of birds in the old-field community consisted of walking through a grassland around the periphery of a sewage treatment pond located adjacent to the south area. A distance of approximately 1200 m (3,940 ft) was walked during each census. All censuses were conducted between 0730-0900 hrs., for two days each in late May, July and September of 1977 and two days each in April and May 1978. The forest edge community was surveyed by walking a distance of approximately 600 m (1970 ft) along the periphery of a woodlot immediately adjacent to the south area.

Amphibians and Reptiles

In general the survey of herpetofauna of the site was mostly qualitative. Drift fences and pit traps were set along each side of the pond on the north area. Censuses were taken in April and May 1977. Species occurrence and location were noted during other phases of the field work throughout the study.

RESULTS AND DISCUSSION

Mammals

Nine species were observed during 1977 and 1978 (Table 2). The live-trapping study in 1978 and preliminary observations in 1977 demonstrated that four small

Table 2. Mammalian species observed at the Staunton
Reclamation Site.

1977	1978
White-tailed deer (<i>Odocoileus virginianus</i>)	White-tailed deer (<i>Odocoileus virginianus</i>)
Meadow vole (<i>Microtus pennsylvanicus</i>)	Eastern cottontail (<i>Sylvilagus floridanus</i>)
White-footed mouse (<i>Peromyscus leucopus</i>)	Prairie vole (<i>Microtus ochrogaster</i>)
House mouse (<i>Mus musculus</i>)	Meadow vole (<i>Microtus pennsylvanicus</i>)
Opossum (<i>Didelphis marsupialis</i>)	House mouse (<i>Mus musculus</i>)
Raccoon (<i>Procyon lotor</i>)	Norway rat (<i>Rattus norvegicus</i>)
Muskrat (<i>Ondatra zibethicus</i>)	Raccoon (<i>Procyon lotor</i>)
	Opossum (<i>Didelphis marsupialis</i>)
	Muskrat (<i>Ondatra zibethicus</i>)

mammal species inhabit the site. The two most common species were the prairie vole (Microtus ochrogaster) and feral house mouse (Mus musculus).

A typical successional pattern of small mammals occurred in 1977 on the south area. The white-footed mouse (Peromyscus leucopus) and M. musculus were captured early in the spring. While M. musculus was captured on both of the 5 x 5 grids, P. leucopus only occurred in the grid adjacent to the small woodlot. These two species also were captured in July and September. In September a pregnant meadow vole (Microtus pennsylvanicus) was captured in a densely vegetated area adjacent to the south woodlot. The numbers captured throughout 1977 were not sufficient for an analysis of population density for any of the species.

Four small mammal species were captured during 1978. Two new species captured included the norway rat (Rattus norvegicus) and prairie vole (Microtus ochrogaster). The latter occurred throughout the south area while the norway rat was taken only on the northwest corner of the trapping area. The white-footed mouse was not captured in 1978.

On the basis of total number of individuals marked M. ochrogaster was the most commonly occurring species, followed by Mus musculus and M. pennsylvanicus. A total of 28 males and 24 females of M. ochrogaster were marked during 1437 trap nights of effort from May through July (Table 3). An increase in numbers of new individuals occurred in each successive month, with the greatest number of total captures and new individuals of each species recorded in July. Age class distribution by month is provided in Table 4.

In general the two most common species M. ochrogaster and Mus musculus were captured on most of the octagonal trap area. No directional pattern of invasion was observed for M. ochrogaster. Mus musculus was captured most frequently in distal portions of the two assessment lines radiating northwesterly from the center of the trap area. This may have been due to the proximity of a farm house and barn located approximately 50 m north of the south area which harbored an established population. For the most part it was not possible to correlate capture success with percent vegetative cover along the various assessment lines or at each trap location. Special mention should be made of trap success along two of the assessment lines. Only three individuals were captured along a line trending in a southwesterly direction from the center of the trap area. This line traversed an area either totally devoid of or very sparsely covered by vegetation. Only one individual was captured at the first 10 trap stations along a line trending in a westerly direction from the center of the trap area. This line also crossed an area generally devoid of vegetation.

Population density estimates on the 0.9 ha (2.2 ac) trap area were determined for Mus musculus and Microtus ochrogaster using a Lincoln-Peterson Index. The estimates and 95% confidence intervals for June and July are:

	<u>M. ochrogaster</u>	<u>M. musculus</u>
June	37.5 (17.5 - 57.5)	20 (0.6 - 39.4)
July	189 (27 - 351)	82.5 (< 0 - 181.3)

The large confidence intervals are the result of few numbers of recaptures, particularly in July. The relatively large number of pregnant females observed in May together with immigration probably accounted for the high numbers of new individuals captured in June and July.

Table 3. Small mammal capture data from live-trapping at Staunton
Reclamation Site during 1978.*

Species	Total Captures**					
	<u>May</u>		<u>June</u>		<u>July</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
<i>Microtus ochrogaster</i>	1	5	14	20	19	17
<i>Microtus pennsylvanicus</i>	-	-	2	-	3	1
<i>Mus musculus</i>	2	5	9	3	14	7

Species	Number of Individuals Marked							
	<u>May</u>		<u>June</u>		<u>July</u>		<u>Total</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
<i>Microtus ochrogaster</i>	1	5	13	8	14	11	28	24
<i>Microtus pennsylvanicus</i>	-	-	1	-	3	1	4	1
<i>Mus musculus</i>	1	4	4	2	10	3	15	9

*Captures are based on a trapping effort (trap-nights) of 364 in May, 637 in June, and 436 in July.

**Numbers refer to total captures recorded including both new individuals and recaptures.

Table 4. Age class distribution of small mammals
captured at Staunton Reclamation Site in 1978.

Species	Number of Individuals Marked								
	<u>May</u>			<u>June</u>			<u>July</u>		
	<u>A</u>	<u>SA</u>	<u>J</u>	<u>A</u>	<u>SA</u>	<u>J</u>	<u>A</u>	<u>SA</u>	<u>J</u>
<i>Microtus ochrogaster</i>	4	2	-	18	2	6	22	1	1
<i>Microtus pennsylvanicus</i>	-	-	-	1	-	-	4	-	-
<i>Mus musculus</i>	3	2	2	5	-	3	10	-	2

A Adult

SA Subadult

J Juvenile

The results of the 1978 study indicate that breeding populations of Mus musculus and M. ochrogaster have become established within the second growing season after final grading and seeding. The high numbers of new individuals captured in June and July are typical of an expanding population. Low moisture conditions resulted in poor vegetative growth during May and June of 1977 which hindered invasion by both M. ochrogaster and M. pennsylvanicus.

Capture locality data for the two Microtus species is suggestive of habitat segregation. M. pennsylvanicus was taken only in areas of dense vegetative cover (> 50%) while M. ochrogaster was captured most often in areas of low vegetative cover. This is in agreement with the findings of other researchers (DeCoursey 1957; Zimmerman 1965; Lewin 1968). Keller and Krebs (1970) however did not find distinct habitat segregation between M. pennsylvanicus and M. ochrogaster in southern Indiana grasslands. Lewin (1968) correlated the distribution of the two species with soil moisture in central Illinois and found that M. ochrogaster was more abundant than was M. pennsylvanicus in dry habitat. Zimmerman (1965) demonstrated a greater abundance of M. pennsylvanicus than M. ochrogaster in fields comprised of 50% grasses and dense vegetative cover in southern Indiana. An increase in herbaceous cover at the Staunton site will afford an opportunity to study interspecific interactions between these species and determine their ultimate distribution on the site.

No population estimates were made of larger mammals inhabiting the site. By mid-summer of 1977 sign of muskrat (Ondatra zibethica), raccoon (Procyon lotor), and opossum (Didelphis marsupialis) were evident around the pond. Cottontail (Sylvilagus floridanus) however, appeared not to utilize the reclaimed areas until late in the first growing season. A cottontail nest with five young was observed on the north area in June 20, 1978 in a densely vegetated area of ladino clover, birdsfoot trefoil and tall fescue.

Common burrowing mammals such as the thirteen-lined ground squirrel (Spermophilus tridecemlineatus) and woodchuck (Marmota monax) are species expected to invade the site. One area of concern is the response of these species to the acidic refuse material contacted during burrowing. A less intensive mammal monitoring program will be carried out during the next 5 to 8 years to examine this concern and to document future wildlife use of the site.

Birds

In 1977 11 species were observed on the south area (Table 5). Of these species only the common grackle nested on the area. At least three nest sites were observed, all confined to the undisturbed woodlot. Killdeer frequented the top of the south area but no nests were located.

In 1978 the number of species observed on the south area had increased to 18. Of these, four species were known to nest on the south area (Table 6). The red-winged blackbird was the most common species utilizing grassy vegetation for nesting sites. Dead pigweed (Amaranthus sp.) plants were used to support two of the three nests observed on the south area. All three nests occurred in a densely vegetative area (> 75% cover visual estimation) of tall fescue (Festuca arundinacea), goldenrod (Solidago sp.) and pigweed (Amaranthus sp.). Considerable red-winged nesting activity took place in late April and May around the pond on the north area. A killdeer nested on an exposed limed-refuse area on the south area.

Table 5. Bird species observed at the
Staunton Reclamation Site.

1977	1978
Barn swallow	American goldfinch
Chimney swift	Barn swallow
Common grackle	Cardinal
Eastern kingbird	Chimney swift
Indigo bunting	Chipping sparrow
Killdeer	Common grackle
Purple martin	Crow
Red-winged blackbird	Field sparrow
Robin	House sparrow
Rough-winged swallow	Killdeer
Tree swallow	Mourning dove
	Purple martin
	Red-winged blackbird
	Robin
	Rough-winged swallow
	Song sparrow
	Starling
	Tree swallow

Table 6. Nesting activity observed on the Staunton
Reclamation Site during April-May 1978.*

Species	No. nests
Common Grackle	4
Killdeer	1
Red-winged blackbird	3
Song sparrow	1
Unidentified active nests	2
Inactive nests (last years?)	1

*Nests counted on 0.9 ha (2.2 ac) grassland.

A comparison of bird species observed during surveys in 1977 and 1978 on the old-field and forest-edge communities along the periphery of the south area indicates that approximately the same number of species utilized the areas each year. Although the number of species observed undoubtedly does not represent an exhaustive listing, particularly of migrants, it does provide an indication of species likely to utilize reclaimed areas as the vegetative structures becomes more complex (Table 7). The relative abundance of bird species observed in old-field and forest-edge communities during the summer of 1977 is shown in Table 8.

The number of nesting species observed on the site in 1978 (3) were comparable to that reported by Karr (1968) on a 3 year old surface mine spoil in Vermillion County, Illinois. Karr (1968) also reported nesting by the song sparrow, killdeer, and red-winged blackbird. In addition horned larks and spotted sandpipers were recorded as nesting species. Although nesting habitat was available for these species on the Staunton Site no individuals were observed either as migrants or breeding species. Although not observed as summer residents at the Staunton site, the western and eastern meadowlark are common nesting species of early old-field communities in southern Illinois (Graber and Graber 1976). Bobwhite, known to nest in grasslands in Williamson County, Illinois (Klimstra and Rotenberry 1975), would also be expected to use the site. Bobwhite inhabit forest-edge and grassland communities adjacent to the south area at Staunton but were not observed on the site. Densely vegetated areas on the site may provide winter cover for bobwhite particularly on the south area which is located adjacent to an agricultural field.

The lack of a developed litter layer during 1977 and 1978 was a major factor attributing to the general absence of typical soil arthropods. This fact may limit use of the site by insectivorous bird species. As dead organic matter accumulates various soil arthropods should invade. The addition of mulch at the time of seeding would have improved the habitat quality for soil fauna.

As the vegetative cover takes on a more three-dimensional structure the number of bird species will undoubtedly increase. No shrub species have been observed on the site. Dense stands of cottonwood seedlings (Populus deltoides) became established on the north area next to the pond. Black locust seedlings (Robinia pseudoacacia) were observed on the south area. Other tree species observed on the north area which may ultimately provide habitat for various passerine species include silver maple (Acer saccharinum), slippery elm (Ulmus rubra) and sassafras (Sassafras albidum). A major concern which warrants study is the growth of tree and shrub species once their root systems have reached the surface material - limed refuse interface. The ability of root systems to tolerate the acidic refuse material located below the limed refuse material will be a major factor in long term plant survival and the creation of a diverse vegetative component in the grassland community. Based on the results of many studies attempting to correlate bird species diversity with foliage height diversity one can assume that bird species diversity of the Staunton site will increase with an increase in foliage height diversity. A study of the site at intervals of 5, 10 and 15 years would permit a comparison of breeding birds of the site with species typical of old field communities.

Amphibians and Reptiles

The number of species observed was essentially the same each year (Table 9). The southern leopard frog (Rana pipiens sphenoccephala) Blanchard's cricket frog (Acris crepitans blanchardi) and American toad (Bufo a. americanus) invaded the pond within one month of its formation. Tadpoles and newly metamorphosed B. americanus

Table 7. Birds observed in typical old-field and forest-edge communities adjacent to the Staunton Reclamation Site in 1978.

Species	Survey Date	
	4-25	5-25
American goldfinch	1	-
Barn swallow	150+	Very common
Black-capped chickadee	1	-
Blue jay	7	5
Brown thrasher	-	2
Cardinal	2	3
Chimney swift	200+	Very common
Chipping sparrow	-	4
Common crow	2	1
Common grackle	55+	Common
Field sparrow	4	5
House sparrow	1	Common
Killdeer	2	3
Lesser scaup*	1	-
Meadowlark	1	-
Mourning dove	2	3
Palm Warbler	1	-
Purple martin	10	2
Red-bellied woodpecker	1	3
Red-headed woodpecker	2	-
Red-winged blackbird	100	15 (nesting)
Ring-necked duck*	1	-
Robin	6	1
Rough-winged swallow	200+	Very common
Rufous-sided towhee	4	1
Shoveler*	-	2
Song sparrow	1	1
Starling	1	-
Tree swallow	-	7
Tufted titmouse	1	-
Yellow-rumped warbler	9	-
Yellowthroat	1	-

*Observed at the Staunton sewage treatment pond adjacent to grassland community.

Table 8. Birds observed in typical old-field and forest-edge communities adjacent to the Staunton Reclamation Site in 1977.

Species	Survey Date					
	5-25	5-26	7-26	7-27	9-27	9-28
American goldfinch	1	-	3	-	8	6
Barn swallow	2	-	7	-	1	6
Black-capped chickadee	-	-	-	-	8	6
Blue jay	1	-	6	1	14	8
Bobwhite	-	2	1	5	-	-
Brown thrasher	3	-	-	-	2	1
Cardinal	3	4	2	1	-	1
Catbird	1	-	-	-	-	1
Chimney swift	-	1	4	2	-	3
Common grackle	9	3	1	1	-	16
Crow	-	-	5	1	-	-
Downy woodpecker	-	-	-	-	2	2
Eastern kingbird	1	-	2	1	-	-
Eastern meadowlark	2	2	-	4	-	-
Eastern wood pewee	-	-	-	1	-	-
Field sparrow	1	3	3	2	-	-
Flicker	4	-	-	1	2	4
Golden-eyed duck	-	-	-	-	-	4
Great crested flycatcher	-	3	-	-	-	-
House wren	-	-	-	-	2	-
Indigo bunting	3	2	3	5	-	-
Least flycatcher	-	1	1	-	-	-
Mockingbird	-	1	-	-	-	-
Mourning dove	2	2	3	1	-	3
Purple martin	-	1	-	4	-	-
Red-headed woodpecker	-	-	-	1	1	4
Red-winged blackbird	2	3	-	-	25	-
Robin	1	2	6	-	2	-
Rough-winged swallow	-	-	4	16	-	-
Rufous-sided towhee	-	-	-	1	-	-
Song sparrow	-	-	-	1	-	-
Sparrow hawk	-	2	-	-	-	1
Starling	-	-	79	6	-	17
Tree swallow	1	-	-	1	-	5
Tufted titmouse	1	1	-	-	1	-
Yellow-billed cuckoo	-	-	-	-	2	-
Yellow warbler	1	-	-	-	-	-

Table 9. Reptiles and amphibians observed
at the Staunton Reclamation Site.

1977	
Six-lined racerunner	<i>(Cnemidophorus sexlineatus)</i>
Eastern box turtle	<i>(Terrapene carolina)</i>
Blue racer	<i>(Coluber constrictor foxi)</i>
Black rat snake	<i>(Elaphe obsoleta)</i>
Southern leopard frog	<i>(Rana pipiens sphenocephala)</i>
Blanchard's cricket frog	<i>(Acris crepitans blanchardi)</i>
Bullfrog	<i>(Rana catesbeiana)</i>
American toad	<i>(Bufo americanus)</i>
1978	
Six-lined racerunner	<i>(Cnemidophorus sexlineatus)</i>
Eastern box turtle	<i>(Terrapene carolina)</i>
Ornate box turtle	<i>(Terrapene ornata)</i>
Blue racer	<i>(Coluber constrictor foxi)</i>
Black rat snake	<i>(Elaphe obsoleta)</i>
Southern leopard frog	<i>(Rana pipiens sphenocephala)</i>
Bullfrog	<i>(Rana catesbeiana)</i>
Blanchard's cricket frog	<i>(Acris crepitans blanchardi)</i>
American toad	<i>(Bufo americanus)</i>

were observed on the north area in late April and May 1977. This was during a time when little vegetation growth had occurred on the site because of the extremely dry conditions.

The use of the pond as a breeding site for amphibians will intensify as the shoreline vegetative cover increases. A pond located offsite approximately 100 m east of the new pond will provide a founder population for various herpetofaunal species such as the common snapping turtle (Chelydra serpentina), painted turtle (Chrysemys picta), bullfrog (Rana catesbeiana), cricket frog (Acris crepitans blanchardi), and spring peeper (Hyla crucifer). These species, as well as B. americanus and R. pipiens spheenocephala, have all been observed at the offsite pond. The extent to which these species utilize the pond may depend on pH and other chemical parameters. Measurements taken soon after seeding showed the pond to be basic, probably the result of erosion carrying lime into the pond. In the fall and throughout 1978 however, pond water had a pH of 4-5.

Three reptilian species were frequently observed on and adjacent to the south area. A population of six-lined racerunners (Cnemidophorus sexlineatus) inhabits a disturbed area along an old railroad spur that once serviced the mine. The blue racer (Coluber constrictor foxi) and black rat snake (Elaphe obsoleta) were observed along the railroad spur and on the south area in May 1978.

The occurrence of C. sexlineatus at the site was not expected. Smith (1961) reports that habitat for racerunners in Illinois is mostly limited to sand prairie and hill prairie communities along the Illinois and Mississippi Rivers. The Staunton site is approximately 20 miles from the known range for C. sexlineatus in this part of Illinois.

ACKNOWLEDGEMENTS

We wish to thank R. A. Lewis and D. K. Johnston for assistance with field work. S. A. Zellmer and B. Diest provided information on wildlife use of the site. We also thank R. R. Hinchman for reviewing the manuscript. The project was funded in part by the Illinois Abandoned Mined Lands Reclamation Council, the Illinois Institute of Natural Resources and the Department of Energy.

LITERATURE CITED

- Arata, A. A. 1959. Ecology of muskrats in strip mine ponds in southern Illinois. J. Wildl. Mgmt. 23(2):177-186.
- Brewer, R. 1958. Breeding-bird populations of strip-mined land in Perry County, Illinois. Ecology 39(3):543-545.
- Decapita, M. E. and T. A. Bookhout. 1975. Small mammal populations - vegetational cover and hunting use of an Ohio strip-mined area. Ohio J. Sci. 75(6):303-313.
- DeCoursey, G. E., Jr. 1957. Identification ecology and reproduction of Microtus in Ohio. J. Mammal. 38(1):44-52.
- Graber, J. W. and R. R. Graber. 1976. Environmental evaluations using birds and their habitats. Biol. Notes No. 97. Ill. Natur. Hist. Surv., Urbana, Illinois. 39 pp.

- Karr, J. R. 1968. Habitat and avian diversity on strip-mined land in east-central Illinois. *Condor* 70(4):348-357.
- Keller, B. L. and C. J. Krebs. 1970. Microtus population biology; III. Reproductive changes in fluctuating populations of M. ochrogaster and M. pennsylvanicus in southern Indiana, 1965-67. *Ecol. Monogr.* 40:263-294.
- Klimstra, W. D. and J. T. Rotenberry. 1975. Nesting ecology of the bobwhite in southern Illinois. *Wildl. Monogr.* 41:1-37.
- Lewin, D. C. 1968. Notes on the habitat of Microtus in central Illinois. *Ecology* 49(4):791-792.
- Mumford, R. E. and W. C. Bramble. 1973. Small mammals on surface-mined land in southwestern Indiana. pp. 369-376 In R. J. Hutnick and G. Davis (eds.). Vol. I, Ecology and reclamation of devastated land. Gordon and Breach, New York. 538 pp.
- Myers, C. W. and W. D. Klimstra. 1963. Amphibians and reptiles of an ecologically disturbed (strip-mined) area of southern Illinois. *Am. Midl. Nat.* 70(1):126-132.
- Riley, C. V. 1954. The utilization of reclaimed coal striplands for the production of wildlife. *Trans. 19th N. Amer. Wildl. Natural Res. Conf.*, pp. 324-337.
- _____. 1963. Revegetation and management of critical sites for wildlife. *Trans. 28th N. Amer. Wildl. Natural Res. Conf.*, pp. 269-283.
- Sly, G. R. 1976. Small mammal succession on strip-mined land in Vigo County, Indiana. *Am. Midl. Nat.* 95(2):257-267.
- Smith, P. W. 1961. The amphibians and reptiles of Illinois. *Bull Ill. Nat. Hist. Surv.* Vol. 28, Art. 1, 298 pp.
- Verts, B. J. 1957. The population and distribution of two species of Peromyscus on some Illinois strip-mined land. *J. Mammal.* 38:53-59.
- Verts, B. J. 1959. Notes on the ecology of mammals of a strip-mined area in southern Illinois. *Trans. Ill. Acad. Sci.* 52:134.
- Zellmer, S. D. 1978. Macoupin County Refuse Reclamation Project, pp. 62-75. In R. P. Carter, et. al., Land Reclamation Program - Annual Report; July 1976 - October 1977. ANL-LRP-2, Argonne National Laboratory, 163 pp.
- Zimmerman, E. G. 1965. A comparison of habitat and food of two species of Microtus. *J. Mammal.* 46:605-612.