Wildlife Use of Cultivated Fields Set Aside under the Payment in Kind (PIK) Program

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The Payment In Kind (PIK) program was formulated by the United States Department of Agriculture (USDA) to reduce acreages of surplus agricultural crops: corn, wheat, sorghum, cotton, and rice. The primary objective was to decrease excess stores of these crops held by the federal government, and coupled with reduced production in 1983 due to diverted cropland, increase market prices of crops to the benefit of farmers. A farmer participating in the program agreed not to plant a specified acreage in exchange for surplus grain from the USDA in an amount based on a percentage of previous yields. The PIK program was administered by the Agricultural Stabilization and Conservation Service (ASCS) through their county offices. Restrictions on the use of PIK fields varied from county to county, but, generally, establishment of vegetation cover was required and weed control was encouraged. Grazing, haying, and cultivation were restricted, but exceptions could be obtained.

Although the primary purpose of the PIK program was to idle cropland for economic reasons, benefits for soil, water, and wildlife conservation were envisioned. Large scale programs that influence agricultural production and practices may have profound effects on these natural resources. Soil erosion, water quality, and populations of most farmland wildlife generally suffer from high intensity crop production. However, few studies are available that document impacts of cropland diversion programs on wildlife.

The purpose of this study was to determine relative wildlife value of lands entered in the PIK program by documenting use of PIK fields and conventional cornfields by birds and small mammals. Additionally, to better assess impacts of the PIK program on wildlife in Indiana, a statewide inspection of randomly selected fields was conducted. Taken together, these study approaches allow recommendations to be made regarding future set-aside programs to insure maximum benefits for farmland wildlife.

Corn and wheat were the primary crops included in the PIK program in Indiana. Figures compiled by the ASCS show 56.0% of 103,196 farms growing corn participating in the PIK program. The total corn base eligible for inclusion was 6,571,019 acres with 39.0% actually diverted from production. Grain sorghum is included in this amount, but it is a minor component because only 13,000 acres were planted in 1982 (Conservation Tillage Information Center 1983). The rate of participation of 50,827 farms growing wheat was 34.2% with 16.4% of the 1,287,680 acre wheat base actually withdrawn from production. In total, 2,774,377 acres of cropland were set aside under USDA programs in Indiana in 1983. This represents over 20% of the approximately 13 million acres of cropland in Indiana (Conservation Tillage Information Center 1983).

Study Area and Methods

Eight fields were selected to study bird and small mammal use. All were privately operated farms located in Scott County, southeastern Indiana (Figure 1). The topography is flat to moderately rolling with silt loam soils derived from glacial till.

Four study fields were conventional cornfields that had been planted to corn the previous year. Two of these fields had been disced the previous fall, 1 had been plowed,

FIGURE 1. *Location of wildlife use study area (shaded) and number of PIK fields inspected in each Indiana county.*

and 1 had been chiselled. All were tilled in the spring prior to planting. Residue cover (ground cover) after planting averaged 3.5% (range 0.2-7.5%).

The 4 PIK fields had been under corn cultivation in 1982. All but 1 had cover crops (annual ryegrass, crown vetch, or winter wheat/yellow clover) planted the previous fall except for yellow clover which was sown in the spring. Crop residues remained untilled after fall harvest and volunteer annual and perennial forbs and grasses were common in all fields. Plant cover averaged 84.7% (range, 78.4-91.0%) in mid-June 1983.

Fields were trapped for small mammals during 1 of 2 sessions from 12-22 July 1983. Trapping sessions lasted 4 consecutive nights using snap traps baited with a peanut butter/rolled oats mixture. Traps were placed at 10-m intervals along straight line transects beginning at the edge of a field. Transects contained 25 traps, and 4 transects were placed in each cornfield and 2 placed in each PIK field. Traps were checked each morning, rebaited if necessary, and captured rodents collected.

Bird use was quantified by walking each field on 10 separate mornings in July and recording all birds observed. Birds flying overhead were ignored unless they appeared to be searching for prey (i.e., raptors) or actively foraging (i.e., barn swallows [*Hirundo rustica*]) directly above fields.

In order to evaluate the PIK program for wildlife on a statewide level, 11 wildlife biologists from the Indiana Department of Natural Resources (IDNR) were directed to randomly select 5 farms from ASCS offices in their districts. Biologists were provided with standardized forms and asked to inspect most or all of the PIK fields for each farm selected. Initial inspections were made 13-29 June to determine cover crops planted and to rate the cover present from poor to excellent for ground-nesting birds. Second visits were made a month later from 12 July-1 August to ascertain if fields had been disturbed. Procedures to survey diverted cropland were prescribed by the Midwest Association of Fish and Wildlife Agencies. Surveys conducted in 1973, 1974, and 1978 (Berner 1978) in Indiana allowed comparisons with the 1983 PIK data.

Statistical tests used to compare wildlife use consisted of Mann-Whitney tests with significance tested at $P = 0.05$.

Results and Discussion

Five species of small mammals were captured during 2,400 trap-nights of effort (Table 1). Deer mice (*Peromyscus maniculatus*) were the most commonly encountered species and occurred in all fields surveyed. Although deer mice were taken in greater average numbers in PIK fields than cornfields, no statistically significant differences

TABLE 1. *Capture rates (No. individuals/100 trap-nights) of small mammals from study fields in Scott County, Indiana, July 1983.*

Species	PIK	Corn
Deer mouse	4.38	1.50
House mouse	4.38	0.25
Prairie vole	0.63	0.00
White-footed mouse	0.25	0.00
Short-tailed shrew	0.00	0.06
Total	9.63	1.81
No. species/field	3.00	1.50
Species diversity (H ')[a]	0.989	0.546
No. trap-nights	800	1,600

[a] $H' = -\Sigma p_i \ln p_i$.

could be shown. Capture rates varied considerably among fields, with figures ranging from 1.50 to 11.00 individuals/100 trap-nights for PIK fields and 0.75 to 2.75 for cornfields.

House mice (*Mus musculus*) were significantly more common in PIK fields than cornfields with capture rates in individual fields ranging from 2.0 to 7.5 individuals/100 trap-nights. In cornfields, house mice were uncommon and only captured in 1 of 4 cornfields. The remaining mammal species were represented by 5 or fewer individuals taken in all fields. Prairie voles (*Microtus ochrogaster*) occurred in 2 of 4 PIK fields but in no cornfields. White-footed mice (*Peromyscus leucopus*) also occurred only in 2 PIK fields. Short-tailed shrews (*Blarina brevicauda*) were represented by a single individual from a cornfield.

PIK fields supported significantly higher total densities of small mammals, with cornfields containing 19% of the individuals captured in PIK fields. PIK fields provided habitat for 4 small mammal species compared to 3 from cornfields, and individual PIK fields supported an average of 3.0 species, twice that of cornfields. Although species diversity of small mammals was low in these early successional habitats, values for PIK fields were almost double that of cornfields.

Deer mice and house mice are the most common species inhabiting cultivated fields in Indiana (Mumford and Whitaker 1982). Deer mouse populations usually reach higher densities where ground cover is reduced, and this is the only species able to persist under intensive cultivation. The data from this study, however, show that deer mouse can occur at high densities under high ground cover conditions. House mice, on the other hand, reach highest densities in cultivated fields with large amounts of residue, and my data demonstrate this relationship. PIK fields provided suitable habitat for prairie voles which prefer dry fields with a mixture of grasses and forbs. Voles should become more common if soil tillage does not occur. White-footed mice and short-tailed shrews prefer non-cultivated habitats and probably ventured into the study fields to search for food.

Thirty-one avian species were observed using study fields, but only 10 occurred on more than 5% of 80 visits (Table 2). Total bird occurrence and numbers of bird species noted in each field were significantly greater for PIK fields. Eight of the 10 most common birds made greater use of PIK fields than cornfields and differences

TABLE 2. *Occurrence of the most common birds on 10 visits to study fields in Scott County, Indiana, July 1983, Means are given followed by ranges in parentheses.*

	PIK	Corn	Statistical significance[a]
No. species detected	12.0 (10-12)	7.8 (5-9)	*
% visits on which birds			
were detected	100 (100)	68 (40-90)	*
Barn swallow	60 (30-80)	38 (0-70)	NS
Field sparrow	78 (60-100)	0 (0)	*
Indigo bunting	63 (60-70)	15 (10-20)	*
Mourning dove	40 (10-80)	10 (0-40)	NS
Song sparrow	60 (50-70)	5 (0-10)	*
Red-winged blackbird	55 (0-80)	20 (0-50)	NS
Northern bobwhite	48 (30-60)	0 (0)	*
Eastern meadowlark	28 (0-60)	0 (0)	NS
Killdeer	0 (0)	18 (0-50)	NS
Northern cardinal	5 (0-10)	8 (0-30)	NS

[a]NS ($P > 0.05$) or *($P < 0.05$) using Mann-Whitney tests.

were statistically signficant for 4 species. Only killdeer (*Charadrius vociferus*) and northern cardinals (*Cardinalis cardinalis*) occurred more often, although not significantly more, in cornfields.

Patterns of bird use of the study fields can best be explained by habitat requirements for nesting, feeding, and escape cover. Searches for nests were not conducted, but all birds listed in Table 2 probably nested in PIK fields except barn swallows, mourning doves (*Zenaida macroura*), northern cardinals, and killdeer. No birds were believed to nest in cornfields except possibly killdeer. This species requires bare ground or gravel-covered substrates for nesting and moist areas for foraging. Disturbances from tillage operations, however, make successful breeding uncertain. Field sparrows (*Spizella pusilla*), song sparrows (*Melospiza melodius*), northern bobwhites (*Colinus virginianus*), eastern meadowlarks (*Sturnella magna*), and rarely, mourning doves construct ground nests hidded by vegetation. Indigo buntings (*Passerina cyanea*), redwinged blackbirds (*Agelaius phoeniceus*), and field sparrows construct nets above the ground in erect forbs and shrubs. Northern cardinals require woody vegetation to support their nests. Barn swallows breed elsewhere because they build mud nests attached to vertical manmade structures such as bridge supports and barn walls. Mourning doves build nests above the ground in shurbs and trees unless these plants are limiting. PIK fields vary in their suitability for providing nesting habitats due to vegetation composition and structure. Eastern meadowlarks favor sod-forming grasses while the other species require a mixture of grasses, forbs, and semi-woody vegetation.

All birds in Table 2 used the study fields to obtain food. Most of the birds are highly insectivorous during the summer and feed primarily by gleaning arthropods from vegetation, ground residues, or the soil surface. Barn swallows actively pursue flying insects just above the vegetation. The greater occurrence of swallows in PIK fields suggests higher densities of flying insect populations. Mourning doves fed extensively in PIK fields and some cornfields, and this species is unique because of an exclusive diet of annual seeds and residual grains. Although low bird use of cultivated fields may be due to reduced food resources, the lack of sufficient cover in which to search for food may be more important. Low diversity of plant species and vegetative structure makes cultivated habitats less suitable.

Biologists inspected 137 PIK fields on 55 farms in 36 Indiana counties. The average field size was 14.5 ha and a total of 1991 ha was examined. The farms surveyed had diverted 60% of eligible acreage in the PIK program. Although PIK fields were required to be seeded, 21% of the acreage lacked a planted cover crop (Table 3). In most of these cases, farmers were unable to plant a cover crop due to unfavorable field conditions. Unseeded fields do not necessarily provide poor wildlife habitat if previous year's crop residue is present and volunteer vegetation is allowed to grow. Of the acreage without a cover crop, 58% was rated good-excellent as nesting cover. The relative area unseeded is low compared to previous surveys of diverted cropland in Indiana (Table 3).

TABLE 3. *Cover crop establishment (percent of acreage) in PIK fields and set-aside acres surveyed in Indiana. Data for previous years from Berner (1978).*

Year	Unseeded	Newly seeded	Established
1972	29.9	28.8	40.2
1973	15.1	10.1	74.8
1978	41.8	16.6	41.5
1983	21.3	65.6	13.1

TABLE 4. *Cover crops seeded on PIK fields surveyed in Indiana.*

Cover crop	Percent of fields (N = 137)	Percent of area (N = 1919 ha)
Legumes	55	55
Clovers	43	51
Alfalfa	9	9
Unspecified	6	2
Annual grasses	40	45
Oats	21	32
Wheat	14	7
Other[a]	7	8
Perennial grasses	18	23
Timothy	9	13
Other[b]	10	11
Buckwheat	<1	<1
Unseeded	23	21
Corn residue	15	11
Soybean residue	5	3
Fallow	3	8

[a]Includes sorghum, sudan grass, and rye.
[b]Includes orchard grass and bromegrass.

Most PIK acreage (66%) was newly seeded to cover crops indicating farmers were attempting to comply with PIK regulations, and the PIK program was successful in diverting fields from crop production. Fifty-four percent of the newly seeded acreage was rated good-excellent for ground-nesting birds. Only 13% of the PIK acreage was land that had an established perennial cover crop and 91% was rated good-excellent. If the PIK program for corn would have been extended beyond 1983, the amount with established cover would increase dramatically because most farmers seeded perennial plants on their PIK fields (Table 4). A mixture of plant species, usually a grass/legume combination, was seeded on 38% of the PIK acreage. Clover varieties and oats were commonly planted.

Overall, 56% of the PIK acreage inspected was rated good or excellent, which is the best rating in 4 years of surveys of diverted acres (Table 5). Improvement in this amount appears possible, however, by stricter monitoring of participants' land in the program. Reinspection of PIK fields in mid-summer, revealed that 74% of the acreage had been left undisturbed. Mowing was the most common form of distur-

TABLE 5. *Classification (percent of fields surveyed) of the quality of fields for nesting cover for PIK fields and set-aside acres surveyed in Indiana. Data for pervious years from Berner (1978).*

Year	Poor-fair	Good-excellent
1972	46.6	53.4
1973	44.7	55.3
1978	63.0	37.0
1983	44.5	55.5

bance and occurred on 23% of the land while a small percentage (3%) was disced or plowed. Most nesting birds should have been able to breed successfully by the end of July.

Conclusions and Recommendations

Wildlife use data presented in this paper demonstrate a high level of attractiveness of diverted cropland over conventionally tilled cornfields. Plant successional changes from a corn monoculture with large areas of bare soil to a stage dominated by annual forbs and grasses 1 year later are accompanied by a dramatic increase in diversity and population density of the avian and small mammal communities. Due to their mobility, birds respond more quickly than small mammals to these habitat changes. If fields were set aside for more than 1 year, vertebrate communities would continue to change in response to plant succession. Prairie voles would become a predominant species as perennial forbs and grasses become established and additional species of rodents and insectivores would colonize fields. Changes in the bird community would occur in response to changes in plant composition and vegetation structure. Both bird and mammal communities should become more diverse as the plant community becomes more complex and more microhabitats become available.

Statewide inspection of PIK fields revealed several shortcomings that upon correction would greatly enhance the value of diverted cropland for farmland wildlife. Soil cultivation should be strictly prohibited because this destroys wildlife habitat by burying vegetation and plant foods as well as causing direct mortality to sedentary animals. Grazing by livestock should also be restricted. Although usually not as destructive as tilling, grazing also results in reduced plant biomass, plant species diversity, and seed reserves as well as disrupted nesting attempts. Mowing should be prohibited during the nesting season (May through July) to allow successful reproduction. Although late summer mowing may be deemed necessary to prevent encroachment by woody plants and certain weed species, these habitat components are generally beneficial to wildlife and should be encouraged. Farmers entering a cropland diversion program should be required to establish a cover crop. Ideally, a grass/legume mixture should be seeded for maximum wildlife and soil conservation benefits. Weed control should be discouraged except for the most noxious weeds.

Agencies administering cropland diversion programs should inspect set aside fields, enforce restrictions, and penalize noncompliance to insure maximum benefits for wildlife. Programs should be formulated to last more than a single year to insure long-term benefits and to make more efficient use of cover crop plantings. Habitat for wintering wildlife would be provided by multiple year programs by preventing fall plowing and discing practices. Farmers should be encouraged to use minimum tillage to plant subsequent crops when lands are removed from a diversion program.

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