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Land Management and Conservation

Managing for Wildlife on Agricultural Lands: The Economics of Conservation Alternatives

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Introduction

Rural landscapes, once regarded as primarily agricultural, are becoming increasingly valued as living spaces by many seeking an alternative to urban areas. The increasing value of rural land, to some degree, reflects the growing emphasis that people place on the opportunity to live and recreate in landscapes that include natural areas and wildlife. These landowners, particularly those with limited acreage, may have objectives for their property that substantially vary in degrees of emphasis between agricultural production and natural resource conservation. For many, attracting wildlife to their property may be a primary land management objective; and, because wildlife viewing is a pleasurable activity, agricultural operators may similarly desire to add conservation measures to their land management plan.

We have used an actual Shelby Co. IN farm as a case study to evaluate three conservation management alternatives. The three alternatives range from intensive agriculture as the primary land management objective to an alternative that focuses on conservation as the primary use of the property. We also have evaluated an intermediate alternative that gives both objectives equal weight. For this paper, we would characterize 'Intensive Agriculture' as land management where agriculture is the primary or sole source of income; 'Conservation - Agriculture' as land management where agriculture provides supplemental income but conservation is a land use objective; and, 'Conservation' where management for natural resource values is the primary land use. In each analysis we have recommended land management practices most suited to the primary objective and have analyzed the costs and returns of implementing each option. For the two alternatives that include conservation measures, we have incorporated income derived from the Conservation Reserve Program (CRP), the Wetland Reserves Program (WRP), Environmental Quality Incentives Program (EQIP), and Wildlife Habitat Improvement Program (WHIP) and other conservation programs where applicable. The management alternatives, and the specific practices associated with each, are presented in a spreadsheet format to evaluate the costs to implement each of the three management alternatives: Intensive Agriculture, Conservation - Agriculture, and Conservation.

Farm Description - Historical Land Use

The areas described below correspond to those lettered areas contained in the aerial photo that follows (Figure 1).

A) Upper field (24.8 acres). Historically in row crop production. Contains gentle slopes, has moderate corn yield. This field is subject to moderate erosion.

B) Woodlot. Grazing by cattle has historically occurred in the woodlot though in recent years the woodlot has not been grazed. Existing overstory trees are of low commercial value.

C) Old drainage ditch. The ditch has filled in with silt and trees have grown into the channel. Ditch no longer meets intended purpose of carrying water from woodlot "B" to creek without impacting adjacent field.

D) Trees encroaching in field. Over time, woody vegetation has encroached into a portion of the field previously cleared and used for row crop production.

E) Wetland. This portion of the field was historically a wetland and was previously drained by tile and surface drains to make row crop production possible. Construction of the interstate and tile failure has now made this area too wet to farm effectively.

F) Bottomland field (16.4 acres). This field is bordered to the west by the creek and is currently in row crop production. Tile drainage has become less effective over time resulting in encroachment by trees in wetter parts of the field. Sections of this field may also be subject to scour erosion during high water events.

G) Agricultural field (24.4 acres). This field is currently in crop production. The field is primarily flat with minimal erosion evident. Corn yield is average - to above average for this area.

H) Small isolated field (1.4 acres). This field is bordered by bottomland woods and is currently in row crop production.

I) Small isolated field (1.0 acres). This field is bordered by bottomland woods and is currently in row crop production.

J) Small isolated field (2.8 acres). This field is bordered by bottomland woods and is currently in row crop production.

K) Small isolated field (2.4 acres). This field is bordered by bottomland woods and is currently in row crop production.

L) Small isolated field (2.0 acres). This field is bordered by bottomland woods and is currently in row crop production.

M) Large agricultural field (51.6 acres) This field is currently in row crop production. The field is primarily flat with minimal erosion evident. Corn yield is average - to above average for this area.

N) Large agricultural field (41.0 acres). This field is currently in row crop production. The field is primarily flat with minimal erosion evident. Corn yield is average - to above average for this area.

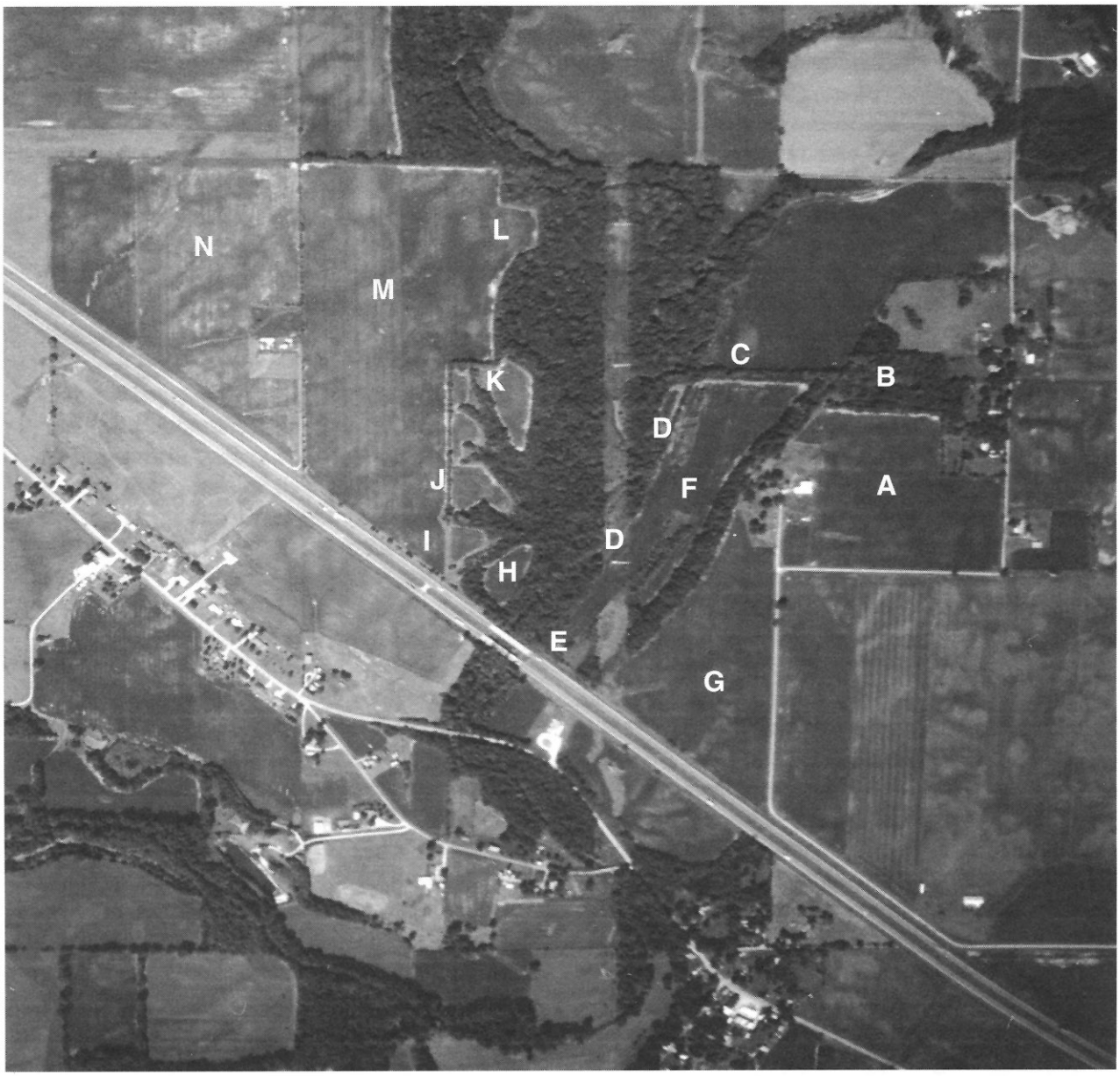

Figure 1. Aerial photograph of case study farm in Shelby, Co., IN. Upper case letters correspond to those describing land areas in the previous text. The surrounding area can be described as a transitional area moving from rural agriculture to developing urban fringe.

Proposed Land Management Practices

Area A:

Erosion control practices are needed in this field in order to sustain row crop production. Under the Intensive Agriculture objective, a grass waterway and a Water and Sediment Control Basin (WASCOB) have been recommended. There is a substantial cost to establish a WASCOB. Under the Conservation - Agriculture and Conservation options a less intensive approach was adopted. A windbreak which borders the field was recommended. This practice will reduce wind erosion, reduce transpirational water loss, and provide excellent wildlife habitat. The windbreak and grass waterway would be eligible for enrollment in the continuous Conservation Reserve Program. The Conservation Reserve Program provides annual payments to the landowner, for 15 years, that equal or exceed the cash rent potential for this acreage. This program also provides a 50% cost-share to defray the costs of implementing conservation practices.

Area B:

This small woodlot currently contains a stand of trees of low commercial value. A well managed woodlot has the potential of generating income which can equal or exceed row crop production. However, to bring this woodlot to a condition that provides that type of return, timber stand improvement (TSI) must be performed. Consulting foresters are available who can remove trees of low quality to make room for trees of higher commercial value. The cost of this practice can be cost-shared (50%) under the IDNR Stewardship Incentive Program. This acreage can also be entered into Indiana's Classified Wildlife Habitat or Classified Forest programs which reduce the property tax assessment on this acreage to $1 per acre. This reduces the cost of maintaining this parcel, improves wildlife habitat, and increases the potential for future productivity of this acreage.

Area C:

Under the Intensive Agriculture alternative, a reconstruction of the ditch was recommended. This practice has a high implementation cost and removes wildlife benefits currently provided. Under the Conservation - Agriculture alternative, reconstruction could be conducted and a vegetative filterstrip planted adjacent to the ditch to replace lost habitat. This would provide a corridor of wildlife habitat between the woodlot and creek. This practice is eligible for enrollment in the continuous Conservation Reserve Program and 75 - 100% of implementation costs could be cost-shared. This parcel could also be included in the Classified Wildlife Habitat program and property tax on the acreage would be reduced. Use of a filterstrip would reduce sediment runoff into the ditch increasing the life of the reconstruction. Under the Conservation option, maintenance of the wooded corridor without reconstruction of the ditch would be recommended. Habitat benefits would be maintained and this acreage would still qualify for the Classified Wildlife Habitat program.

Area D:

Under the Intensive Agriculture objective, the clearing of encroaching trees would be necessary to return these acres to row crop production; there is, however, an associated cost to implement this practice. Under the Conservation - Agriculture option, no clearing would be recommended. A 1.9 acre reduction in total acreage would result, but there would be no associated implementation costs. Under the Conservation option, this acreage could be planted to hardwood trees. In the long-term, a timber crop would be produced on this acreage. In the short term, 100% of the implementation costs could be recovered by entering the acreage in the Partners for Wildlife Program offered by the USFWS. This acreage could also be entered into continuous sign-up Conservation Reserve Program . This would provide supplemental income, paid annually for 15 years, that would offset the costs of retiring this acreage. This acreage could also be included in the Classified Wildlife Habitat program and taxes on the acreage would reduced.

Area E:

A substantial investment is required to restore drainage to this area in order to maintain intensive row crop production. Three practices, namely subsurface drainage, a diversion terrace, and an open drain with lock chute, have been recommended to accomplish this objective. Under the Conservation - Agriculture and

Conservation options, it was recommended that this acreage be entered into the Wetland Reserve Program (WRP). Under this program an easement is purchased on this acreage that does not exceed fair market value of the property and cost-share monies are available to cover 75 to 100% of implementation costs. In addition, the land could be entered into the Classified Wildlife Habitat program and annual taxes reduced. The combination of these practices would reduce the need for a substantial initial investment and would provide some return for retiring this acreage.

Area F:

Tile restoration and removal of encroaching trees are needed to maintain row crop production in this field. Under the Conservation option, the entire field could be planted to native warm season grasses and a 100% cost-share for implementation could be obtained under the Partners for Wildlife program. In addition, since this field is subject to scour erosion, the field could be entered into sign-up Conservation Reserve Program. This would provide annual payments for 10 years and the land could be entered into the Classified Wildlife Habitat program and annual taxes reduced. These programs and the reduced maintenance costs would make this practice an economically viable option for this acreage.

Areas G, M, and N:

Little maintenance is required in these fields to maintain row crop production. This area could be improved for wildlife by leaving a narrow 25 to 60' border around the field that could be planted into a cover crop, planted in shrubs, or allowed to revert to native early successional plant species. Under the Conservation - Agriculture option, implementation costs would be reduced by allowing native plants to naturally develop. Native early successional habitat could be maintained by periodic mowing (approximately every three years). Under the Conservation option, wildlife shrubs could be planted. Cost share funds are available as part of the IDNR Stewardship Incentive Program or under the IDNR game bird habitat cost-share program. The windbreak acreage could be included in continuous Conservation Reserve Program and all retired land coud be entered into the Classified Wildlife Habitat program to reduce annual taxes on the non-income producing land.

Areas H - L:

Fields I through M are small 1 to 2.8 acre parcels thát are difficult to farm with large equipment. Under the Intensive Agriculture option it would still make sense to continue to farm this acreage. Under the Conservation - Agriculture and Conservation options, where income from row crops is less important, other options can be considered. A long term option would be to plant these parcels to hardwood trees; a short term option would be to plant Christmas trees. If the primary land use objective was to manage for wildlife, these areas could be planted as wildlife food plots. The isolated nature of these fields makes them an ideal area for wildlife to congregate and therefore an excellent place to concentrate food plots. Costs of food plots could be cost-shared by the IDNR gamebird habitat cost-share program and free seed could be obtained from IDNR and NRCS offices. In addition, some conservation organizations such as Pheasants Forever and Quail Unlimited are willing to lend planting equipment as well as provide seed for wildlife food and cover plots. Cost-share assistance for hardwood planting and conifer tree plantings (with the exception of Christmas trees) is provided by the IDNR Stewardship Incentive Program. All retired acres could be included in the Classified Wildlife Habitat program or Classified Forest program and annual taxes reduced. Under the Conservation option for field M, income could be derived by planting Christmas trees at an initial 6'x6' spacing. One-half the trees would be gradually sold as Christmas trees. This thinning would provide income to help offset the cost of retiring this acreage. However, this would make this field ineligible for the IDNR Stewardship Incentive Program cost-share funding at planting time.

Table 1. Suggested land use practices for a Shelby Co., IN farm. The suggested land management practices are based on three alternative land use management objectives for primary land use: Intensive Agriculture, Agriculture - Conservation, and Conservation. Farm land areas, designated by upper case letters (A - N) correspond to land areas similarly indicated on the aerial photo of the farm (Figure 1).

Land Area	Intensive Agriculture	Conservation-Agriculture	Conservation
(A) Upper field	WASCOB Grass waterway	Windbreak Grass waterway	Windbreak Grass waterway
(B) Woodlot	No management practice	Timber Stand Improvement (TSI)	Timber Stand Improvement (TSI)
(C) Drainage ditch	Ditch reconstruction	Ditch reconstruction Vegetative filterstrip	No management practice
(D) Encroaching trees	Brush clearing	No management practice	Conservation Reserve Hardwood tree planting
(E) Wetland	Subsurface drain Diversion terrace Surface drain	Wetland Reserve Program	Wetland Reserve Program
(F) Lowland field	Land grading Surface drain	Land grading Surface drain	Conservation Reserve Warm season grass planting
(G) Agricultural field	Row crop agriculture	Wildlife food plot Native plant field border	Native plant field border
(H) Small isolated field	Row crop agriculture	Wildlife food plot	Wildlife food plot
(I) Small isolated field	Row crop agriculture	Christmas tree planting	Hardwood tree planting
(J) Small isolated field	Row crop agriculture	Hardwood tree planting	Wildlife shrub planting
(K) Small isolated field	Row crop agriculture	Wildlife food plot	Wildlife food plot
(L) Small isolated field	Row crop agriculture	Hardwood tree planting	Conifer tree planting
(M) Agricultural field	Row crop agriculture	Native plant field border	Tree and shrub field border
(N) Agricultural field	Row crop agriculture	Native plant field border Grass waterway	Tree and shrub field border Grass waterway

Economic Analysis of Management Alternatives

We evaluated three land management objectives for a moderately sized midwest farm: intensive agriculture where rowcrop production was maximized; land management where agriculture and natural resource conservation were given equal consideration; and, land management where natural resource conservation received greater weight in land use planning. In order to be able to make direct comparisons between the three management alternatives simplifications of the analysis were necessary and are described below. Common to each of the analyses were the following procedures:

- Costs of management practices were straight-line depreciated over 10 years.
- An average cash rental rate of $118.00/acre was used to estimate income from rowcrops grown on upland soils.
- An average cash rental rate of $94.00/acre was used to estimate income from rowcrops grown on unimproved lowland soils.
- An average cash rental rate of $143.00/acre was used to estimate income from rowcrops grown on drainage improved lowland soils.
- Installation of grass waterways, 66' in width, were estimated to cost $1.75 per lineal foot.

Land Use: Intensive Agriculture

The following procedures and values were used to evaluate the land use objective of maximizing rowcrop production:

- Brush clearing was estimated to cost $800.00/acre.
- Subsurface drainage was estimated to cost $400.00/acre.
- Land grading was estimated to cost $400.00/acre.
- Cost to install a diversion terrace was estimated as $1.50 per lineal foot.
- Annual production of unimproved timber was estimated as 200 board feet/acre and valued at $250.00/1000 board feet.
- Cost-share dollars (75%) for the installation of the WASCOB, diversion terrace, and grass waterway were obtained from the Environmental Quality Incentives Program (EQIP).

Land Use: Agriculture and Conservation

The following procedures and values were used to evaluate the land management alternative where agriculture and conservation were given equal consideration:

- Annual production of managed timber was estimated as 220 board feet/acre and valued at $400.00/1000 board feet.
- Cost share dollars for conservation practices were obtained from the Conservation Reserve Program (CRP, 50%), Forest Improvement Program (FIP, 50%), and Stewardship Incentive Program (SIP, 50%).
- A 100% cost-share for wetland restoration was obtained from the Wetland Reserve Program (WRP). Income derived from a permanent WRP easement ($4,000.00) was annualized over 10 years.
- Reductions in property tax assessments were obtained by enrolling eligible lands in either the Classified Wildlife Habitat Program or the Classified Forest Program.
- A 100% cost-share for the establishment of wildlife food plots was obtained from the IDNR Game Bird Habitat Program.
- Income derived from the sale of Christmas trees was based on the production of 600 trees/acre over 10 years sold at $12.00/tree ($720.00/yr/acre). Establishment and maintenance costs were estimated as $416.00/yr/acre.

Land Use: Conservation

Under the conservation management objective opportunities for natural resource conservation were maximized.

- Sources of cost-share dollars, payment for granting of a permanent easement under WRP, and reduced tax assessments were obtained from programs identical to those described under the management objectives of intensive agriculture and conservation agriculture.
- Benefits to wildlife resulting from the planting of conifers (Christmas trees) were maintained by limiting harvest of the trees to one-half of the available trees.

Table 2. Intensive agriculture economic analysis. Costs and economic benefits are determined for a Shelby Co., IN farm managed for intensive agricultural production. Under this management objective the acreage devoted to rowcrop production is maximized. In order to simplify this analysis, the costs of large-scale land management practices, such as grading or ditching, are depreciated over 10 years. For example, if the final cost to install a Water And Sediment Containment Barrier (WASCOB) were $2000.00, then the annual cost would be considered to be $200.00. A detailed discussion of the analysis of each of the three management alternatives considered, that is, Intensive Agriculture, Conservation and Agriculture, and Conservation, is contained in the preceeding text. Costs and revenues were not discounted in order to simplify the presentation.

Land Area	Practice	Acres	Total Cost	Cost Share	Annual Cost	Annual Incentive	Annual Income	Tax Reduction	Annual Net per Area
A	WASCOB	1.00	6500.00	4875.00	162.50				
	Grass waterway	1.00	1155.00	866.25	28.88				2499.02
	Rowcrop production	22.80					2690.40		
B	Woodlot - no management	3.30					165.00		165.00
C	Ditch reconstruction		3000.00		300.00				-300.00
D	Brush clearing	1.90	1520.00		152.00		271.70		119.70
E - F	Rowcrop production	16.40					2345.20		
	Subsurface drain		6560.00		656.00				
	Diversion terrace		1170.00	877.50	29.25				
	Open drain & lock chute		2500.00		250.00				
	Land grading		2400.00		240.00				1169.95
G	Rowcrop production	24.40					2879.20		2879.20
H	Rowcrop production	1.40					165.20		165.20
I	Rowcrop production	1.00					118.00		118.00
J	Rowcrop production	2.80					330.40		330.40
	Rowcrop production	2.40					283.20		283.20
L	Rowcrop production	1.00					118.00		118.00
M	Rowcrop production	52.60					6206.80		6206.80
N	Rowcrop production	41.00					4838.00		4838.00
Total acreage in rowcrop production: 165.8 acres							**Total Net Annual Income**		**18592.47**

Table 3. Economic analysis equally weighting agriculture and conservation. Costs and economic benefits are determined for a Shelby Co., IN farm managed for both agricultural production and natural resource conservation. Under this management objective both land uses are given equal consideration. In order to simplify this analysis, the costs of large-scale land management practices, such as grading or ditching, are depreciated over 10 years. For example, if the final cost to install a Water And Sediment Containment Barrier (WASCOB) were $2000.00, then the annual cost would be considered to be $200.00. A detailed discussion of the analysis of each of the three management alternatives considered, that is, Intensive Agriculture, Conservation and Agriculture, and Conservation, is contained in the preceeding text.

Land Area	Practice	Acre	Total Cost	Cost Share	Annual Cost	Annual Incentive	Annual Income	Tax Reduction	Annual Net per Area
A	Field border	2.40	932.00	466.00	46.60	20.00	80.00	19.24	
	Grass waterway	2.00	2310.00	1155.00	115.50	50.00	200.00		
	Rowcrop production	20.40					2407.20		2614.34
B	Woodlot - TSI	3.30	132.00	66.00	6.60		290.40	26.46	310.26
C	Ditch reconstruction		3000.00		300.00				
	Filterstrip	1.40	672.00	336.00	33.60	35.00	140.00	11.22	-147.38
D	Brush clearing - none	1.90						15.23	15.23
E	Wetland Reserve Program	4.00	1600.00	1600.00	0.00		400.00	32.07	432.07
F	Rowcrop production	12.40					1773.20		
	Land grading		2400.00		240.00				1533.20
G	Rowcrop production	21.70					2560.60		
	Native plant field border	2.70							2560.60
H	Wildlife food plot	1.40	70.00	70.00	0.00			11.22	11.22
I	Christmas tree planting	1.00	660.00		416.00		720.00		304.00
J	Hardwood tree planting	2.80	1344.00	672.00	67.20			22.44	-44.76
K	Wildlife food plot	2.40	120.00	120.00	0.00			19.24	19.24
L	Hardwood tree planting	1.00	480.00	240.00	24.00			8.02	-15.98
M	Rowcrop production	50.40					5947.20		5947.20
	Native plant field border	2.25							
N	Rowcrop production	36.20					4271.60		4271.60
	Native plant field border	2.40							
	Grass waterway	2.40	2772.00	1386.00	138.60	60.00	240.00		161.40
Total acreage in rowcrop production: 141.1							**Total Net Annual Income**		**17972.24**

Table 4. Economic analysis preferentially weighting conservation over agriculture. Costs and economic benefits are determined for a Shelby Co., IN farm managed for both agricultural production and natural resource conservation but maximizing conservation effort. Under this management objective row crop production is maintained, but natural resource conservation measures are given greater weight in land use planning. In order to simplify this analysis, the costs of large-scale land management practices, such as grading or ditching, are depreciated over 10 years. For example, if the final cost to install a Water And Sediment Containment Barrier (WASCOB) were $2000.00, then the annual cost would be considered to be $200.00. A detailed discussion of the analysis of each of the three management alternatives considered, that is, Intensive Agriculture, Conservation and Agriculture, and Conservation, is contained in the preceeding text.

Land Area	Practice	Acres	Total Cost	Cost Share	Annual Cost	Annual Incentive	Annual Income	Tax Reduction	Annual Net per Area
A	Field border planting	2.40	932.00	466.00	46.60	20.00	80.00	19.24	
	Grass waterway	2.00	2310.00	1155.00	115.50	50.00	200.00		
	Rowcrop production	20.40					2407.20		2614.34
B	Woodlot - TSI	3.30	132.00	66.00	6.60		290.40	26.46	310.26
C	No management practice								
D	Tree planting - CRP	1.90	912.00	456.00	45.60	47.50	190.00	15.23	207.13
E	Wetland Reserve Program	4.00	1600.00	1600.00	0.00		400.00	32.07	432.07
F	Warm season grass planting	12.40	1488.00	744.00	74.40	310.00	1240.00	99.41	1575.01
G	Rowcrop production	21.70					2560.60		
	Native plant field border	2.70	1057.00	528.50	52.85			21.65	2529.40
H	Wildlife food plot	1.40	70.00	70.00				11.22	11.22
I	Hardwood tree planting	1.00	480.00	240.00	24.00			8.02	-15.98
J	Wildlife shrub planting	2.80	1344.00	672.00	67.20			22.44	-44.76
K	Wildlife food plot	2.40	120.00	120.00	0.00			19.24	19.24
L	Conifer tree planting	1.00	660.00		241.00		360.00		109.00
M	Field tree - shrub border	2.25	884.00	442.00	44.20	37.50	150.00	18.04	
	Rowcrop production	50.40					5947.20		6108.54
N	Field Tree - Shrub Border	2.40	952.00	476.00	47.60	30.00	120.00	19.24	
	Grass waterway	2.40	2772.00	1386.00	138.60	60.00	240.00		
	Rowcrop production	36.20					4271.60		4554.64
Total acreage in rowcrop production: 128.7							**Total Net Annual Income**		**18410.11**

Conclusions

Every land management decision has some economic consequence. It is reasonable and appropriate for any landowner, regardless of their commitment to natural resource management, to consider those consequences when making land management decisions. We illustrated this process by considering three broad management objectives for an Indiana farm. We evaluated management of the property for intensive agriculture, for a combination of agriculture and natural resource conservation, and for natural resource conservation where this was given priority over agriculture but agriculture was maintained. What is notable about these analyses is the lack of substantial difference in income derived from the property under the three management objectives. For example, income from the property managed for agriculture was estimated as $18,592.47; managed for conservation, the farm netted $18,410.11. This amounts to approximately a 1% decline in net income. However, at the same time, the acreage devoted to rowcrops was reduced by 22%. This is possible because the full complement of cost-share and incentive programs were utilized on particularly those parcels with high natural resource potential or marginal cropping potential.

There are numerous sources of assistance for landowners who are interested in implementing conservation practices on their properties. We have demonstrated the use of only some of these programs. Additional assistance, cost-share dollars, and incentive payments for conservation practices are available from agencies such as the U.S. Fish and Wildlife Service and private organizations such as Pheasants Unlimited and Quail Unlimited. Readily available assistance for natural resource conservation can make managing for wildlife economically feasible, improve environmental quality, and add to the enjoyment derived from owning and managing the land. Your County Extension Educator or NRCS District Conservationist can provide you with the information you need to begin conservation planning or to enroll in conservation programs.

For additional information on assistance for conservation planning, cost-share opportunities, and incentives programs, see the following publications:

McCreedy, Clark D. and Brian K. Miller. 1997. Farm income through conservation: The wetlands reserve program. Hoosier Farmland Wildlife Notes Vol. 3 No. 2. FNR 158, Dept. Forestry and Natural Resources, Purdue University, West Lafayette, IN.

Miller, Brian K. and Clark D. McCreedy. 1997. New CRP provisions provide good return on marginal acres while managing for wildlife. Hoosier Farmland Wildlife Notes Vol. 3 No. 1. FNR 157, Dept. Forestry and Natural Resources, Purdue University, West Lafayette, IN.

Miller, Brian K. and John R. Siefert. 1994. Forestry and wildlife management assistance available to Indiana landowners: Providers, organizations and programs. FNR 87, Dept. Forestry and Natural Resources, Purdue University, West Lafayette, IN.

Wildlife habitat cost share project. Indiana Dept. of Natural Resources, Division of Fish and Wildlife, Indianapolis, IN.

Classified wildlife habitat act. Indiana Dept. of Natural Resources, Division of Fish and Wildlife, Indianapolis, IN.

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Additional information concerning natural resource management in Indiana may be obtained by visiting the Purdue University Department of Forestry and Natural Resources site on the World Wide Web at the following address: http://fnr.purdue.edu.