

CROPLAND MANAGEMENT PLAN

Shiawassee National Wildlife Refuge  
Saginaw, Michigan

Submitted by: Joe W. Keady Date: March 6, 1986  
(Refuge Manager)

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Approval: \_\_\_\_\_ Date: \_\_\_\_\_  
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## SUMMARY

The purpose of this Cropland Management Plan is to describe cropland management activities at Shiawassee National Wildlife Refuge and provide the basis for future cropland management operations. The approach of the plan is to work within established policy guidelines and evaluate the program as a whole in terms of resources available, actions needed to achieve wildlife objectives, and alternative means for achieving those objectives. Based on this evaluation the following course of action is proposed:

1. Cropland acreage will be reduced approximately half from the present 1,500-acre amount to about 750 acres. This reduction in cropland acreage will occur in 1988 when Farm Unit 1 (720 acres) will be converted to moist soil (600 acres) and grassland management, and a portion (25 acres) of Farm Unit 5 will be converted to moist soil management.
2. Approximately 750 acres of land will remain in the regular cropland program to be administered as in the past (i.e., farming conducted by local farmers under annual Cooperative Agreements, 25% of crop is Refuge share, Refuge maintains water control facilities; cooperators pay pumping costs for agricultural pumping). Experimental plantings of small grains, legumes and buckwheat will be used on Refuge shares in 1986 and 1987 in order to move toward a crop rotation involving legumes to be implemented Refuge-wide in 1988.
3. After conversion of Farm Unit 1 and completion of Moist Soil Units 3 and 4 rehabilitation, the Refuge will have a total of approximately 1,100 acres of moist soil units. These units will be farmed on an irregular basis (approximately once every three to five years) in order to retard invasion of trees and undesirable perennials such as cattails. Farming of the units will be staggered so that only a portion of the acreage will be farmed in any given year. It is anticipated that corn will be the primary crop grown. Some experimental use of herbicides will be allowed but the overall goal is to conduct this farming without the use of herbicides.

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1. RESOURCES AVAILABLE

1. Topography and soils

The 8,984-acre Shiawassee National Wildlife Refuge is located in the central portion of Saginaw County in the Bay area of east central Michigan. The Refuge lies within a relatively flat flood plain area known locally as the Shiawassee Flats where six major rivers and streams (Cass, Tittabawassee, Flint, Sag, and Shiawassee Rivers and Swan Creek) converge to form the Saginaw River which flows about twenty miles north into Saginaw Bay, an arm of Lake Huron. Topography on the Refuge ranges from approximately 580 to 590 feet m.s.l. with higher elevations in the southeastern portion of the Refuge. Average elevation of Lake Huron is 579.5 feet m.s.l. Flooding of much of the Refuge as well as adjacent areas is a common occurrence.

The Soil Conservation Service in 1976 identified and mapped fourteen different soil types on the Refuge (see Appendix A), all of which are poorly drained and experience high water tables. Cropland management is presently conducted primarily on two soil types, the Saranac silty clay loam - Bono silty clay and the Toledo-Lenawee silty clay loams. These soils are poorly suited for crop production without artificial drainage but with underdraining provided by tile are suitable for farming (Class II and III soils, SCS standards). Each agricultural unit on the Refuge requires some type of protective dike, related tile and ditch drainage, and pumping station.

Soil tests conducted by contract in 1981 showed that Refuge soils in general have a basic pH ranging from 7.0 to 8.0, medium organic content at 3-4% and low phosphorous and potassium levels. The tightly compacted nature of soils here is a factor which heavily influences tillage practices. Soils have poor work ability and a poor capacity to support farm machinery when wet. In most springs, wet weather does not provide sufficient drying to allow deep spring tillage. In order to prevent formation of "plow pans" of very low permeability clays, fall plowing is needed every several years. Without periodic fall plowing, substantial reductions in crop yields usually occur.

2. Cropland Program Relation to Refuge Objectives

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The current Refuge Management Plan, Parts I and II, provides objectives in three basic categories: wilderness area preservation (Michigan Islands), wildlife production and maintenance, and public use. Cropland management's main purpose at Shiawassee NWR is to provide food for migrating waterfowl, particularly Canada geese and mallards; however, it also provides a food source for other wildlife such as summer resident Canada geese and resident deer and pheasants. Farming is also used to periodically rejuvenate moist soil units, setting back succession to retard dominance by plants such as cattails and to prevent encroachment of woody vegetation into the units. Croplands play an important part in the administration of the Canada goose hunting program. Most hunting is conducted in farm fields over green browse. (from birds in adjacent area)

## II. DESCRIPTION OF EXISTING PROGRAM

When the Refuge was established in 1953, roughly 4,000 acres of the present day Refuge was under cultivation and an extensive ditch and dike system had already been constructed. Most Refuge land was purchased from 1954 to 1967. From 1954 until 1965, roughly 1,500 to 2,000 acres of cropland was farmed. After a sizeable land purchase in late 1965, cooperative farmers grew nearly 3,000 acres of crops from 1966 to 1972. Heavy crop losses from flooding during 1972 to 1976 promoted conversion to other land uses and by 1978, cropland production had been reduced to about 1,700 acres. In 1984, a total of approximately 1,651 acres of crops were grown on the Refuge under eight Cooperative Agreements. Nineteen hundred eighty-five acreage has been reduced to approximately 1,495 acres to allow for planting of grass strips along field borders. One cooperative farmer was removed from the farming program and his 26-acre plot will be planted to alfalfa under a Special Use Permit. With the exception of some short-term (1-2 years) agreements associated with land purchases, all farming on the Refuge has been conducted by local farmers under one-year Cooperative Agreements. Normally, as long as conditions of the agreements are met and continued farming of a unit is anticipated, the same cooperator is given first priority in receiving farming privileges in subsequent years. Appendix B shows locations, acreages, and brief notes on drainage facilities for each farm unit. For more in depth information on water management facilities on each of these units, please see the station Water Management Plan.

Cooperators provide all necessary farming equipment, labor, seed, and fertilizer, and conduct normal farming operations in return for the entire crop on 70% of the crop acreage for units not in the hunting program or the crop on 75% of the acreage in hunted farm units. The remaining 30% for non-hunted units or 25% for hunted units is the Refuge's share of the crop and is normally left unharvested. Under this arrangement the Refuge provides land and shares in water management as described in the following paragraph.

The Refuge presently maintains four electric-powered pumping stations along with associated drainage ditches, culverts, etc. which drain farm units. Cooperators are required to pay all electric charges for these pumps which are a result of pumping to benefit crop production. In the case of three of the pumps (Bartel Road pump draining Farm Unit 5; Houlihan Road pump draining Farm Units 9B and 9C; and Houlihan Road pump draining Farm Unit 9D) cooperators are billed directly by the utility company and pay all electric costs as non-agricultural pumping has not been conducted at those locations. In the case of the Trinklein pumps which drain Farm Unit 1 and 2A, non-agricultural pumping which occasionally occurs for drainage of Pools 1A and 1B or for construction projects is paid for by the Refuge. All other pumping costs are divided among the cooperators who pay a proportion of the charges based on the amount of acreage they farm as compared to the total area drained by the pump.

The three dominant crops presently grown on the Refuge are corn, soybeans, and barley. Corn and soybeans each make up about 40% of total acreage planted, while barley makes up about 20% of total acreage. Buckwheat is sometimes planted in lieu of one of the above three crops if flooding or

prolonged rainy periods delay planting. Normal crop yields are roughly 100 bushels/acre for corn, 40 bushels/acre for soybeans, and 60 bushels/acre for barley. Conventional farming practices are used with heavy reliance on chemical herbicides. All herbicides are approved prior to application and are applied according to label instructions. No insecticides have been used in recent years. Crops are rotated whenever convenient; however, no definite rotational pattern has been used.

### III. PROPOSED MANAGEMENT

#### 1. Evaluation of Cropland Needs

Diversity of wildlife and habitats is one of many factors to consider in making decisions concerning habitat manipulation. At present nearly one-half of Refuge acreage is wooded and only about 500 acres of grasslands are established. These grassland areas provide cover which is particularly important for duck production objectives. Present grassland tracts are widely scattered and many have been heavily invaded by woody growth such as willow, cottonwood, and dogwood. In order to meet established duck production objectives, present grasslands will need treatment by prescribed burning and/or mowing and additional grassland areas will need to be established. Conversion of existing cropland to grassland is one tool for increasing duck production.

Conversion of cropland to other habitat types such as moist soil or marsh impoundments offers advantages in the form of increased vegetative and wildlife diversity which must be balanced against any increased maintenance costs and loss of grain or green browse foods for geese. Research at Mingo National Wildlife Refuge in Missouri has documented that average seed production for well managed moist soils units as 1,450 pounds/acre. The energy value in this amount of seeds is equivalent to about 26 bushels of corn/acre. This would result in comparable seed yields for wildlife use whether using moist soil production (all seeds available for wildlife) or cooperative farming using corn as the only crop (30% of 100 bushel/acre average yield). In actuality, however, the cooperative farming program provides considerably less grain available for wildlife as yields from soybean and barley crops (which make up about 60% of total acreage) are lower than corn. It should be noted that the above discussion has been limited to seed production only; moist soil habitats provide additional food items such as plant roots, shoots, and tubers which are heavily consumed by Canada geese and other wildlife.

At present a large proportion of waterfowl use is concentrated in Pools 1A and 1B which have a combined total of approximately 500 acres. The present pattern of a high concentration of waterfowl in a relatively small area poses a threat to the waterfowl in the event of a disease outbreak. This potential disease threat can be greatly reduced by dispersing waterfowl over a larger area by conversion of adjoining cropland in Farm Unit 1 to moist soil or marsh management.

Another factor to keep in mind when considering conversion of agricultural crops to moist soil or marsh management is the nutritional value of foods produced. Recent research has shown that agricultural grains alone do not satisfy waterfowl nutritive requirements because many essential amino acids are lacking. The diversity of plant seeds and green browse present in moist soil areas provides a more balanced diet with higher overall nutritive quality. In addition to plant foods, diverse populations of invertebrates, reptiles, and amphibians regularly occur in moist soil impoundments. These animals are desirable components of wildlife areas and serve as important prey species for a variety of wildlife. In contrast, aquatic invertebrates and cold-blooded vertebrates are virtually non-existent in agricultural areas. Agricultural grains do provide a high-energy food source which is readily utilized by Canada geese and mallards but these grains should be used as a supplement to, not in lieu of, naturally occurring foods.

Since the primary purpose for cropland management here is production of food for migrating Canada geese an important consideration in determining the desired amount of cropland acreage is in determining the amount of agricultural foods necessary to support present Canada goose objectives. This must then be balanced against the influence different habitat management alternatives have on other refuge objectives. A major complicating factor in estimating agricultural food needs for waterfowl is estimating the availability and use of off-refuge agricultural foods. The Refuge is located near the center of Saginaw County (total acreage, 520,000) which contained the following cropland acreage in 1984: 112,000 acres soybeans; 67,000 acres field corn; 40,000 acres small grains (mostly wheat); 39,000 acres of dry beans and sugar beets. The adjacent Shiawassee State Game Area has approximately 1,600 acres of cropland. Canada geese feed mainly on small grains (green browse) early in the fall switching to gleaning of harvested corn fields as they become available later in the fall. Springtime use of agricultural crops is much more variable and difficult to predict; however, both small grain and corn fields are used quite heavily.

The estimation of agricultural food requirements for Canada geese is further complicated by variables such as weather, amount of food consumed per goose, and the availability and regrowth potential of green browse plants. Any site specific estimate of agricultural foods needed must therefore rely on a number of assumptions. We have reviewed the situation specific to Shiawassee NWR and conclude that approximately 750 acres of cropland could provide the agricultural foods necessary to meet maintenance requirements of the goose flock which regularly uses the Refuge. This was based on the following assumptions: (1) the spring migration is the most critical time of need for agricultural foods with green browse becoming increasingly important as spring progresses; (2) <sup>per acre</sup> green browse fields have a standing crop of about 1,000 pounds (dry weight) and the ability to double that amount over a 40-day time period; (3) the Refuge holds an average flock of 15,000 geese for 40 days each consuming approximately

one pound/day; (4) Refuge green browse would supply necessary goose foods early in the fall migration but that geese would switch to gleaning mostly off-refuge corn fields with the arrival of colder temperatures later in the fall; (5) approximately 5 bushels/acre of waste grain left after harvest will be available to geese on Refuge fields; and (6) geese will obtain a sizeable portion of their diets from moist soil units, particularly during the spring migration.

Appendix C provides a summary of historical Canada goose use of Shiawassee NWR (1957-84) and trends and distribution of TVP Canada geese in the Mississippi Flyway (1969-82). Management efforts here have been to retard early southward goose migrations but discourage lengthy delays in migration or overwintering. In recent years, Canada geese have shown a tendency to stay in the Shiawassee area later into the fall and to over-winter. In the winter of 1984-85, for example, a flock of approximately 4,000 Canada geese over-wintered here despite a colder than normal January and February with 50+ inches of snowfall. With this in mind, an examination of Appendix C supports the reduction of cropland acreage in order to encourage earlier fall departures and discourage over-wintering. The impact of cropland reductions on local movements of Canada geese will be monitored in order to determine whether such changes will affect migration timing, increased hunting kills, etc.

Conclusion: Based on the above considerations it is believed that cropland acreage should be reduced to about half the present level. This supports station objectives for Canada geese as well as enhancing use by other wildlife.

## 2. Biological versus Conventional Farming

Administration of the cropland program will continue to be conducted basically as in the past with farming being done by local farmers under annual Cooperative Agreements. Following is an evaluation of whether this farming should be conducted using conventional or "biological" methods. This evaluation is being conducted as part of the Cropland Management Plan and also to satisfy obligations under the FY'85 Annual Work Plan task RF-5 and Action Item V3 from this station's June 1984 Operational Inspection which both called for an evaluation of conversion to biological farming. The Operational Inspection requested review of the Biological Farming Task Force recommendations contained in their memo of 1/11/84.

The Task Force recommended that before considering farming methods, cropland management itself should be justified. As a result of evaluations described above in Section II.1, it has been concluded that cropland acreage should be reduced to about 750 acres, from its present approximate 1,500 acres. This would be accomplished by converting Farm Unit 1 to moist soil plant production (about 600 acres) and grassland (about 200 acres) and converting approximately 25 acres of Farm Unit 5 to moist soil. Advantages of this conversion are:  
(1) increased diversity and abundance of wildlife, particularly



dabbling ducks and other migratory water birds (other than Canada geese); (2) continued maintenance of approximately the same use by Canada geese with the added benefits of providing a more varied and nutritionally complete diet and of dispersing goose use over a larger area thereby reducing disease potential; (3) increased duck production and broodrearing habitat; and (4) other indirect benefits due to converting land use from high-tech crop production involving heavy chemical use to a more natural and ecologically sound system of moist soil management. Disadvantages of this conversion are related to initial costs to construct interior dikes and water control facilities and increased annual costs for pumping water.

The Task Force lists four identifying components to a biological farming program: (1) elimination of insecticides; (2) elimination of inorganic nitrogen; (3) reduction in the use of herbicides with the long-term goal of elimination, if possible; and (4) incorporation of a crop rotation that is partially devoted to soil improvement, as well as crop production. This definition is not intended to be rigid but serves as a useful guide in biological farming efforts.

Item 1: elimination of insecticides has essentially already occurred here with insecticides not having been used for a number of years. Insecticides will be used here only upon advice of the County Extension Agent and as a last resort treatment method.

Item 2: elimination of inorganic nitrogen fertilizers would be a difficult and time-consuming task and is not planned for this station; however, attempts will be made to reduce use of inorganic nitrogen. Inorganic nitrogen has traditionally been heavily relied upon by farmers in this area. Organic nitrogen sources are not readily available and are considerably more expensive than inorganic sources. Cooperators will be encouraged to avoid the more harsh forms of inorganic nitrogen such as anhydrous ammonia and to pay close attention to their soil tests and not overapply nitrogen. The possible incorporation of a legume rotation into the farming program will reduce requirements for adding nitrogen to fields.

Item 3: reduction in herbicide use with the long-term goal of elimination is a goal which will be extremely difficult and time consuming to achieve. Farmers have come to rely heavily on herbicide use and that trend is showing no signs of reversing within the agricultural community. Some reduction in herbicide use can be achieved without a major commitment of Refuge staff time and all herbicide uses will continue to be made only in compliance with label directions and after Chemical Use Proposals have received Regional Office approval. The goal of total elimination of herbicides will not be pursued at this time. Cooperative farming is a method that will be used in management of moist soil units with each unit being farmed roughly once every three to five years. A research project completed here in 1984 documented the adverse effect of herbicide carryover on moist soil plant production. In order to avoid this problem, all farming of moist soil units will be monitored very closely in an effort to minimize use of herbicides or eliminate their use completely.

Item 4: a crop rotation involving planting of legumes will be adopted here on a limited experimental basis. If legumes are not drowned out by wet conditions and if they receive adequate wildlife use, they may then be incorporated into all land being farmed on a regular basis. The use of legumes can be accommodated here only if legumes are considered as the Refuge's share of the crop. Local agriculture is almost completely cash-crop and there is very little demand for hay products. Also, extended periods of wet, cloudy weather which normally occur here in the spring and early fall make hay production in this area very difficult. A positive aspect of not harvesting legumes for hay is that more cover is available for nesting birds. One potential problem with legume plantings that will need to be monitored is the tolerance of the legumes to wet ground. It is hoped that the problem of drowning out of legume stands will be avoided by planting in late spring with legume species more tolerant of wet conditions.

An experimental plot of no-till corn interseeded with crown vetch was established in 1985. This technique will be monitored during 1985 and 1986. It offers the advantage of a legume in corn but the disadvantage of requiring very heavy herbicide use. This or similar legume interseeding efforts may be feasible for incorporation into the farming program in the future but will have to be closely evaluated.

The Task Force recommendations stressed the need for documentation of the specifics of various land treatments. Records will be maintained on yields and herbicide use by crop based on reports from cooperators. Routine monitoring of cropland management efforts and wildlife responses will be conducted but amount of staff time devoted to this activity will be minimized, generally restricted to gross observations.

### 3. Cropland Plan

Cropland management will be discussed in three segments: conversion of Farm Unit 1 and a 25-acre portion of Farm Unit 5 to moist soil and grassland, periodic crops in moist soil units, and the regular cropland acreage to be farmed on a continued basis.

Farm Unit 1 containing approximately 720 acres of cropland is being farmed in 1985 with a mixture of corn, soybeans, and barley being grown. Farming will be continued on the same basis during 1986 and 1987 and will be discontinued at that time. In calendar year 1988, the unit will then be converted to moist soil (600 acres) and grassland production (200 acres). The 200-acre grassland unit will be planted to a legume or a grass/legume mix and will be maintained as a hayfield by a local cooperator. Thus, the primary purpose of this grassland is for goose browse. Approximately 25 acres of Farm Unit 5 will likewise be farmed during 1986 and 1987 and converted to moist soil in 1988.

After conversion of Farm Unit 1 to moist soil, the Refuge will include a total of about 1,080 acres of moist soil areas which can be farmed. This 1,080 acres will be subdivided into three to six units and each unit will be farmed under a Cooperative Agreement approximately once

every three to five years. Farming will be conducted in order to prevent trees and undesirable perennial plants such as cattails, from becoming dominant within the units. Farming of these units will be staggered so that no more than about one-third the total moist soil acreage will be farmed in any given year. Farming would be conducted under the following conditions: (1) Refuge will remove water from unit prior to April 1 and prescribe-burn the unit to remove residual vegetative cover (heavy cattail growth is of particular concern) during the month of April; (2) corn has been identified as the crop preferred by farmers and acceptable to the Refuge; and (3) the long range goal is to farm the units with no use of herbicides; however, some experimentation will be allowed in order to determine if certain herbicides can be used which do not reduce moist soil plant production in the following year. The conversion of Farm Unit 1 to moist soil will result in three cooperators being removed from the existing cropland program. These three individuals would receive highest priority for selection as cooperative farmers in the moist soil farming program.

Aside from the above-described moist soil farming, cropland management will be practiced on a continuing basis on about 750 acres of the Refuge by four cooperators. This includes all croplands in Farm Units 2, 5, 9, and 11. Administratively, this cropland management will be conducted as previously described in Section I.3 (i.e., annual agreements with cooperators, 25% of crop as Refuge share, Refuge maintains water control facilities, cooperators pay pumping costs for agricultural pumping). A crop rotation will be applied on all fields using corn and beans in approximately equal proportions on the cooperator's share of acreage and small grains, legumes, or buckwheat on the Refuge share. During 1986 and 1987, some experimenting will be done on Refuge shares to determine the suitability of legumes and buckwheat. The results of this experimentation will be used to develop a standard crop rotation beginning in 1988.

#### IV. PROGRAM NEEDS ABOVE CURRENT

The above-described cropland management program can be conducted with no additional funding or manpower above current levels. The conversion of Farm Unit 1 from cropland management to moist soil production will require additional funding for construction and operation as described in the station Water Management Plan. Anticipated construction will involve modification of water control structures (cost estimated at \$50,000) and dike erosion protection (estimated cost \$10,000). Increased annual operation costs are estimated at \$4,000-5,000 for pumping and vegetation control (willows and purple loosestrife). The station Water Management Plan also describes water management facilities and histories of each of the farm units.

The Michigan Department of Natural Resources has expressed a concern that additional moist soil units on the Refuge would be so attractive to ducks that hunting success on the adjacent Shiawassee River State Game Area would decline. Emphasizing spring rather than fall flooding of moist soil units will reduce the potential for this occurrence. Waterfowl use of new moist soil units will be monitored and the Refuge will also have the option of opening a portion of the Refuge to duck hunting should this problem develop.

Several area farmers have expressed a concern that reducing cropland acreage on the Refuge will result in increased crop depredations off the Refuge by Canada geese. It is believed that food supplies available from moist soil units and legume fields will be comparable to what has been available in the past and appreciable changes in depredation problems are not anticipated. Refuge staff will need to monitor goose use patterns and depredation complaints as cropland changes are made.

## memorandum

DATE: March 7, 1986

TO: Refuge Manager, Shiawassee NWR, Saginaw, MI

SUBJECT: Cropland Management Plan

TO: Asst. Regional Director, FWS, Twin Cities, MN (RF1)

Attached is the final plan. It addresses RO/RF1 review comments as noted in your memo dated April 11, 1985. Also, in-so-far as we believe practical, it has been modified to address points-of-concern raised at cooperative farmers' meetings and the January Public Information Meeting.

JOE W. HARDY