

Flooding Harvested Crop Fields in Winter: Effects on Crop Production and Opportunities for Waterfowl Management

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Flooding
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fields

in winter to attract waterfowl and other wildlife is a management tool that has been used for several years. Ducks and geese are attracted to waste grain and weed seeds, while shorebirds, wading birds and mammals visit flooded fields in

search of fish and/or invertebrates. Landowners are interested in this management practice because flooding fields in winter provides a place to hunt (or lease) and is visually pleasing with a variety of wildlife species using the property. In addition, there is evidence that flooding crop fields is actually cost-effective for the producer by providing increased weed control and decreased sedimentation rates.

While wildlife benefits from flooding crop fields are obvious, the effects of winter flooding on agricultural interests need to be evaluated. Several issues deserve investigation, including the impact of winter crop flooding on crop production, pest weeds, soil fertility and erosion. Also, additional information on how soon waterfowl are attracted to flooded fields and the opinions of landowners who have flooded crop fields in the past will be helpful for producers who are interested in this management technique.

A study designed to answer these questions was implemented in 1994 – 1999 by The University of Tennessee's Department of Forestry, Wildlife and Fisheries at the West Tennessee Agricultural Experiment Station at Jackson, Tennessee. The study was conducted at the station's wetland study units, where low-level terraces and water-control structures allow crop fields to be flooded and drained. A low-level terrace was built around each of nine four-acre soybean fields, and a water-control structure was installed at the low end of each field so water could be held or drained from the field. Six fields were flooded with about 18 inches of water for either 60 days (December – January) or 120 days (December – March) following harvest. Control gates were left open on three fields, allowing them to flood and drain according to rainfall patterns as a comparison with natural conditions. Waterfowl use of the fields, soil fertility, weed growth, soil retention and crop production were monitored throughout the study.



Low-level terraces and water-control structures enable crop fields to be flooded for waterfowl and other wetland wildlife.

To evaluate opinions of landowners implementing winter crop flooding, 35 landowners who previously had enrolled in the Tennessee Partners Programs were contacted by phone. The Tennessee Partners Program is a cooperative effort by the Natural Resources Conservation Service, Tennessee Wildlife Resources Agency, US Fish and Wildlife Service, Ducks Unlimited, Tennessee Department of Agriculture and The University of Tennessee Agricultural Extension Service to promote winter flooding of harvested crop fields for wildlife. A questionnaire was given to assess landowners' opinions of this program. Results of the study are as follows:

1. Winter flooding did not affect crop production in the seasons following flooding. Crop yields did not differ among flooded and non-

flooded fields. In fact, yields from flooded fields were slightly greater than county-wide averages in those years.

2. Fields where water was held until April 1st (just before planting season) had significantly fewer spring weeds than fields drained February 1st and fields that were not experimentally flooded.
3. Winter flooding had no effect on soil fertility. No differences were found in flooded or non-flooded fields before, during or after the study.
4. There were no short-term differences in sedimentation or soil loss rates between flooded or non-flooded fields. It is reasonable to assume, however, that over several years, soil would be retained, or even added, in fields surrounded with terraces on the down-slope side.
5. Even though fields were not managed specifically to attract wetland birds, 57 bird species were observed using the study fields during winter. Bird use of the 36-acre wetland complex increased by 332 percent during the length of the study with no difference in use among study units. Bird groups observed included waterfowl (ducks and geese), wading birds and shorebirds, gulls and terns, and various upland birds (e.g., songbirds, blackbirds and doves). More than 15,460 birds were counted using the complex while the six fields were flooded during the winters of 1996-1999 (Table 1).

Table 1. Birds observed using flooded crop fields during winter at the West Tennessee Experiment Station, Jackson, Tennessee, 1996–1999.

	1996–97	1997–98	1998–99	Total
Waterfowl	1,050	1,380	2,898	5,328
Wading birds and shorebirds	655	1,255	1,028	2,938
Gulls and terns	8	48	48	104
Various upland birds	625	921	5,547	7,093

6. The questionnaire given to landowners enrolled in the Tennessee Partners Program indicated:

- 97 percent grew soybeans and corn on flooded acreage;
- 91 percent believed herbicide and fertilizer costs decreased and soil erosion was less on fields with winter flooding;
- 100 percent enjoyed having ducks and other wildlife on their property;
- 91 percent wanted a place to hunt;
- 19 percent leased their property for hunting;
- 86 percent believed winter crop flooding benefitted farming.

This study supports the conclusion that flooding harvested crop fields in winter is a suitable technique to provide habitat for waterfowl and other water birds. In addition, winter flooding of harvested fields at the Jackson Experiment Station had no effects on soil fertility or crop yield. Most of the farmers surveyed flooded harvested crop fields in winter to have a place to hunt waterfowl and believed flooding benefitted farming.



Field at full flood, showing water-control structure.

Recommendations for using winter crop flooding

A low-level terrace can be built around a relatively flat crop field with a water-control

structure placed at the lowest end of the field. The terrace should be capable of holding 2 – 18 inches of water over most of the field. The terrace can be designed so that row cropping can be conducted directly on the terrace. Design of the terrace and size of the water-control structure should be determined with help of the Tennessee Partners Project biologist (see below for address and phone number). Water for flooding may be rainwater runoff draining naturally through the field or it may be pumped from a nearby creek or well. Flooding should be initiated when ducks begin migrating through – between mid-November and early December.



Terraces can be designed so that crops may be planted along them.

Field crops offering the most energy for waterfowl include corn, milo and soybeans. However, some grains deteriorate faster than others when flooded. After 90 days of flooding, 86 percent of soybeans, 50 percent of corn and 42 percent of milo is deteriorated (Waterfowl Management Handbook, USFWS). Because milo and corn last longer and produce high energy, they are recommended over soybeans. To prevent excessive seed deterioration, fields should not be flooded well in advance of waterfowl arriving. In addition, fields should be flooded gradually (over a period of 2 – 3 weeks), not all at once. Gradual flooding provides food over a longer period and helps ensure the food supply does not deteriorate before the season is over. Preferably, more than one field should be flooded to provide a different crop or to make food available over a longer period. Flooding larger acreages (or more fields) will attract more

waterfowl and other wetland-associated birds. Leaving some of the crop unharvested will provide more food and also attract additional waterfowl.



Flooding crop fields provides feeding and resting areas for migrating and wintering waterfowl.

Manipulating and flooding wetland weed fields, called *moist-soil management*, complements flooding crop fields for waterfowl. Many weeds stimulated in moist-soil management regimes (e.g., smartweeds, fall panicum, barnyardgrass, various sedges, pigweed and duck potato) are excellent waterfowl foods and are cheaper to produce than special plantings for waterfowl. In fact, some weed seeds are higher in energy and/or protein and more nutritionally complete than grain crops. Because of the wide diversity of weeds and associated invertebrates, moist-soil management can produce more pounds of food per acre than harvested crop fields. Invertebrates are needed by ducks for reproductive conditioning and are more abundant in moist-soil fields than harvested crop fields.

Managing fields normally too wet for row cropping as moist-soil weed fields, in combination with adjacent flooded crop fields, provides quality habitat for migrating and wintering waterfowl and should attract a wider array and number of wetland-associated birds than flooded crop fields alone. Managing moist soil fields is accomplished through various flooding and draining schedules, along with discing, prescribed fire and/or herbicides to produce the desired combination of weeds. For more information about flooding crop fields and moist-soil management techniques, contact your county Extension office. For technical assistance and cost-

share opportunities, contact the Tennessee Partners Project Biologist, Natural Resources Conservation Service Project, 235 Oil Well Road, Jackson, Tennessee 38305 (731) 668-0700, ext. 107.

Suggested Readings

Eldridge, J. 1992. Management of habitat for breeding and migrating shorebirds in the Midwest. Fish and Wildlife Leaflet 13.2.14. Gaylord Laboratory, Puxico, Missouri 63960.

Fredrickson, L.H. 1991. Strategies for water level manipulations in moist soil systems. Fish and Wildlife Leaflet 13.4.6. Gaylord Laboratory, Puxico, Missouri 63960.

Nassar, J.R., W.E. Cohen and C.R. Hopkins. 1993. Waterfowl management handbook. Publication 1984. Mississippi State Cooperative Extension Service. Mississippi State University. Mississippi State, Mississippi 39762.

Pruitt, T. D. 2001. Agronomic and wildlife impacts from winter flooding of agricultural fields for waterfowl in western Tennessee. M.S. Thesis. University of Tennessee. Knoxville, Tennessee 37996.

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