

**CONCEPTUAL PLAN FOR THE
TURTLE LAKE IRRIGATION AND WILDLIFE AREA**

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ABSTRACT

The Turtle Lake Irrigation Area (TLIA) is located in near the town of Turtle Lake in central North Dakota. The TLIA is adjacent to the McClusky Canal, a project feature of the Garrison Diversion Unit (GDU), which transports Missouri River water into the area. The GDU Reformulation Act of 1986 authorized the development of 13,700 acres (5,500 hectares) of irrigation in the TLIA.

The conceptual plan presented in this paper is the first step in a process to develop a water delivery project, which places equal emphasis on wildlife, irrigation and economic development in the Turtle Lake area of North Dakota. The planning process and the conceptual plan emphasize sharing of wildlife and agricultural benefits on the same parcels of land, avoidance of environmental impacts, development of wildlife and agriculture enhancement features, and on-site mitigation. The process and concepts are unique relative to normal project-planning efforts and project features.

The plan is the result of a cooperative effort by local landowners, with assistance from an interagency planning team, comprised of federal, state and local agencies to envision a multipurpose water development project. The project has not been developed as of 1996; however, planning and implementation efforts are proceeding.

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INTRODUCTION

General

The Turtle Lake Irrigation Area (TLIA) is located in McLean County near the town of Turtle Lake in central North Dakota (Figure 1). The TLIA is adjacent to the McClusky Canal, a project feature of the Garrison Diversion Unit (GDU), which transports Missouri River water into the area.

This paper presents an innovative, conceptual, and integrated land-use development plan which enhances the Turtle Lake area for wildlife, irrigated agriculture, and economic development (Figure 2). The plan recommends development by a combination of groundwater management, use of Missouri River water from the already completed McClusky Canal, and land management practices. Please see Reference 1 for more details of the conceptual plan.

Agriculture and wildlife coexist at all levels in North Dakota. However, extensive agricultural development, while increasing the food base for some species of wildlife, is often at the expense of wildlife habitat. Conversely, increased wildlife production in an area can result in problems for landowners. For example, increased crop depredation, loss of production on lands dedicated to wildlife habitat, and potential trespass and property damage problems may occur as a result of increased wildlife populations.

Development of the TLIA allows a unique opportunity for utilizing land for its best suited and most easily developed purpose. Proper planning, design, and construction practices will permit development of a balanced project. Lands that lend themselves to irrigation development, with minimal effect on wetlands and other habitats, would be developed for that purpose. Lands requiring extensive modification to allow for successful irrigation would be used for other purposes such as wildlife habitat and/or dryland farming. This plan was prepared as a cooperative effort to determine the advantages which might be realized by including wildlife, recreation, and irrigation as **equal partners** in area development planning and thus enhancing irrigation development in North Dakota.

Factors Affecting Traditional Irrigation Development

It is felt that the location of the TLIA, combined with the implementation of the concepts included in this plan, will address and alleviate many of the following issues which affect traditional irrigation development on other portions of the GDU and North Dakota:

- The TLIA lies entirely within the Missouri River basin, therefore, development will not impact Canada.
- Two national wildlife refuges (NWRs) are associated with the TLIA. Audubon NWR is impacted by current GDU operations, and efforts are underway to mitigate those impacts. Development of the TLIA would not cause additional impacts to Audubon NWR or Lake Nettie NWR located within the boundaries of the TLIA. Some enhancement features are included for the Lake Nettie NWR.
- Off-site mitigation for wetland impacts requires purchase of four acres of land for each wetland acre lost. Experience, to date, indicates acquisition and development costs of approximately \$800 for each acre (\$324 per hectare) purchased in addition to a continuing O&M cost of \$13 per acre (\$5 per hectare).
- In October 1990, the cost for off-site mitigation for potential wetland impacts in the TLIA was estimated at \$7,656,000. Most of these costs would be eliminated if development would proceed as recommended in the Conceptual Plan.
- A goal of the Conceptual Plan is to eliminate the need for off-site mitigation and, therefore, land acquisition which removes land from county tax roles.

THE PROJECT AREA (EXISTING)

Existing project features are described below:

Water Quantity

The Turtle Creek basin encompasses about 310 square mile (80,000 hectares). Turtle Creek is an intermittent stream which was formed by glacial

meltwater erosion and redeposition and normally flows only in the spring from snowmelt and after spring rains. Most of the surface water infiltrates the sand and gravel deposits and is stored in the soil or becomes groundwater.

The quantity of usable groundwater in the Turtle Creek basin is variable. Most of the buried major aquifers are confined or partially confined and often are under artesian pressure. Unconfined water table aquifers near the ground surface are found in most of the glacial outwash deposits in the TLID. Large areas of wetlands are supported by this near surface water table.

Water Quality

The quality of the surface water varies and reflects the amount of seasonal inflow/outflow and the geologic landform. Fresh water is found in areas where there are greater amounts of inflow and outflow and less evapotranspiration. Saline and slightly saline water occurs in enclosed basins and areas with small amounts of outflow.

The first 21 miles (34 kilometers) of the McClusky Canal, a GDU project feature completed in 1975, are within the Turtle Creek basin. The canal is the major source of water for the uses described in this paper. The quality of the water in the McClusky Canal (600-650 ppm) is excellent for all proposed uses.

Farm Practices

Both livestock and cultivated crops are important to the agricultural economy of the Turtle Lake area. Dryland farming is dominant. About 50 percent of the total farm income in the TLIA is derived from livestock and livestock products, and about 6,000 head of livestock are produced annually. The main dryland crops being grown in the Turtle Lake area are wheat, barley, corn, and hay crops.

Approximately 1000 acres (400 hectares) are currently being irrigated in the Turtle Lake area. About 150 acres (60 hectares) are irrigated with water from the McClusky Canal under temporary water service contracts with the Bureau of Reclamation and the remainder is irrigated with groundwater. Irrigated yields are 2 to 3 times greater than dryland yields.

Wetlands and Wildlife

The TLIA is a glacial outwash area located within the Prairie Pothole Region (PPR) of North Dakota. The average density of wetlands to uplands within the boundary of the TLIA is approximately 14 percent wetlands. Wetlands and wetland complexes are a vital part of the environment and are a link in the continuous hydrologic cycle. Wetlands provide temporary storage of runoff and flood flows which are gradually released either into the atmosphere or groundwater. They are also beneficial to agriculture, especially for animal production and many wetland grasses and sedges annually yield high quality forage for grazing and haying.

Many recreational values are also associated with wetlands. Hunters, trappers, birdwatchers, artists, photographers, cross country skiers, canoeists, and many other people enjoy the benefits of wetland complexes, and their activities contribute to the North Dakota economy.

The prairie wetland complex is the most important wildlife habitat in the TLIA. Nearly all wildlife in the area benefit directly or indirectly from this type of habitat. Wetland habitat, with associated uplands, is essential to breeding, nesting, rearing, feeding, and protection of various species of waterfowl, shorebirds, fish, and furbearers (mink, muskrat, beaver). Other upland wildlife which utilize the wetland habitat for food and cover include the white-tailed deer, pheasant, sharp-tailed grouse, Hungarian partridge, raccoon, songbirds, raptors, and fox.

Lake Williams, a 1000 acre (400-hectare) saline wetland, located within a chain of wetlands near the TLIA is a very important wetland complex which has been listed as a natural fall staging area for the California gull, piping plover, Caspian tern, lesser sandhill crane, and whooping crane.

Land Use Summary

Land uses in the TLIA have been divided into two general categories - wetlands and uplands. Please refer to reference 1 for specific details and descriptions of these land uses.

Fisheries

The North Dakota Game and Fish Department (GFD) currently manages Crooked Lake and Brush Lake for sport fishery purposes. Crooked Lake is a 650 acre (260-hectare) lake located 10 miles (17 kilometers) north of the town of Turtle Lake. Fishery investigations in Crooked Lake date back to 1953. The primary species present at that time included northern pike, walleye, yellow perch, and black bullhead.

Brush Lake is a 200 acre (80-hectare) lake, which has a maximum depth of 19 feet (6 meters) and about 12 miles (19 kilometers) of shoreline. The GFD actively manages Brush Lake as a sport fishery for species such as northern pike, walleye, and bluegill. Management is, however, complicated by periodic low lake levels, nutrient loading, and the threat of winter-kill.

In periods of prolonged drought, Crooked and Brush Lakes usually experience drops of several feet in water elevations. This results in winter-kill and destruction of the fisheries. A supply of high quality water, which would be available under the project plan would greatly alleviate this problem.

THE CONCEPTUAL PLAN AND ITS COMPONENTS

The **planning process** itself is unique relative to traditional water project planning efforts in North Dakota and the United States. An interagency planning team was formed to aid in preparation of this document. Representatives of interested agencies and organizations held numerous planning meetings and were involved throughout the study process.

The following statement was agreed upon to describe the group's purpose:

"To formulate and present an innovation, conceptual, land-use development plan which enhances the Turtle Lake project area equally for wildlife, irrigated agriculture and economic development."

The Agricultural Component

The agricultural objectives of the plan are (1) the development of 13,700 acres (5500 hectares) of irrigation to provide opportunities for diversification of farm enterprises and stabilized

production of farm products (2) implementation of BMPs (best management practices) for irrigated agriculture (3) development of subirrigation on approximately 3200 acres (1300 hectares) of land for both agricultural and wildlife benefits, and (4) development of irrigable lands with minimal impacts to wetlands (Figure 3).

The various aspects which will be considered and implemented under the agricultural component include:

- Classification of lands to determine irrigability for various crops and conditions
- Types of irrigation systems (the center pivot is the most popular)
- Implementation of Best Management Practices
- Research related to ongoing practices
- Cultural practices
- Irrigation management
- Fertility management
- Pesticide management
- Extension programs

The Wildlife Component

The wildlife objective for the TLIA is a net increase of wildlife habitat and augmentation of food and water sources in such a manner as to substantially increase wildlife abundance and diversity. The particular objectives for wetlands are to prevent a net loss of wetlands, maintain wetland diversity, enhance existing wetlands, and create and/or restore additional wetlands.

The primary issues which will be considered relative to the wildlife component consist of:

- Identification of wetlands
- Dedication of wildlife lands
- Adoption of wildlife management practices
- Development and Maintenance of wildlife cover
- Identification of practices to provide food for wildlife
- Structural practices
- Agricultural practices which benefit wildlife
- Utilization of available programs to enhance wildlife

Class 4 Lands-The Combined Agricultural/Wildlife Component

Perhaps the most unique feature of this plan is the proposed management of approximately 3200 acres (1300 hectares) of Class 4 lands (see figure 2) for the benefit of both wildlife and agriculture. These class 4 lands are lands that normally have groundwater within 2 feet (0.6 meter) of the ground surface and often contain wetlands. They are designated Class 4, indicating limited irrigation capability, because crops would be limited to hay and pasture. These Class 4 lands are often too wet to provide usable hay or pasture, or too dry to provide high quality waterfowl habitat.

The groundwater management concept would provide water to the wetlands in the spring and early summer, for waterfowl habitat, and would control the water table for improved hay and pasture production in late summer and fall. Water for maintaining wetlands in the spring would be natural waters, plus project water added from the McClusky Canal or the groundwater control system if necessary. Water would be delivered to the wetlands from turnouts along the distribution system, and would flow overland to flood wetland areas to the desired level. The groundwater removed in July, August, and September to control the water table for hay and pasture will be discharged into the water supply system for delivery for irrigation or other uses.

The Fisheries Component

Fishery enhancement features of the project would be largely related to stabilization of water levels. Provision of in stream flows in Turtle Creek from near Crooked Lake to the Missouri River would provide fish habitat and improve fish spawning areas in the creek. The North Dakota Game and Fish Department and cabin owners support the delivery of water to Brush and Crooked Lakes to stabilize water levels and prevent winterkill.

The Recreation Component

The recreational opportunities of the TLIA attract visitors throughout the year for sightseeing, photography, hunting, fishing, and other activities. The Lakes Brekken-Holmes area currently provides many hours of fishing and other recreation. Reclamation and cooperating agencies would coordinate with the

Turtle Lake Park Board to identify additional development opportunities in the Brekken-Holmes area.

Improvements such as improving access, parking areas, boats ramps, rest rooms, picnic, fishing piers, and boats ramps would be developed and installed.

The Project Features

The conceptual plan of development includes the delivery of water to irrigate 13,700 acres (5,500 hectares) of land, wildlife and fisheries enhancement, and stabilization of certain lakes and streams for recreational purposes. The objectives can be accomplished by the construction of a series of pumping plants, open channels, pipeline distribution systems, horizontal well/pipe drain systems, low-head dikes, and screening facilities. The source of water for the project will be Audubon Lake (Missouri River).

Economic Analyses

No economic or financial analyses have been completed at this time; however, it is anticipated that the preliminary economic feasibility study, comprehensive economic feasibility study and financial analysis will be completed during the next phase of this study.

The Development Sequence

Most of the project area can be divided into three blocks, each served by an individual distribution system and intake from the McClusky. Each block includes both irrigation and wildlife features. It is recommended that development take place by blocks and by farm units within the blocks. This would provide an opportunity to demonstrate and evaluate the effectiveness and benefits of irrigation and wildlife enhancement features. It would also allow adjustments to be made to project features as development proceeds, and would allow time for landowner to become familiar with benefits of various project features.

FINDINGS AND RECOMMENDATIONS

Findings and Recommendations

The interagency planning team agreed upon the following findings and recommendations:

- A project can be formulated which would develop irrigated agriculture in the TLIA and, at the same time, enhance wildlife, fish, recreation, and regional economic growth. Additional cost estimates, cost allocations, economic analyses, and financial analyses need to be completed.
- Development within each of three blocks should proceed by farm unit based on landowner interest. Development by blocks, and by farm units within individual blocks, would provide an opportunity to demonstrate and evaluate the effectiveness and benefits of irrigation and wildlife enhancement features. It would also allow adjustments to be made to project features as development proceeds, and would allow time for landowners to become familiar with benefits of various project features.
- Formation of an interagency planning team allowed an earlier and greater public involvement in the planning process and proactive rather than the traditional reactive agency participation.
- Project development would result in greater use of existing GDU features. Additionally, development of the wildlife enhancement features would complement existing public wildlife areas in the vicinity.
- Implementation of the TLIA Conceptual Plan would result in an increase in wildlife habitat and habitat management capabilities, and an increase in agricultural productivity and diversity.
- The plan recommends formation of an Irrigation and Wildlife Advisory Team (Advisory Team), with federal, state, and local representation. This Team, in consultation with the Soil Conservation Service, would work with landowners who have direct significant input to develop wildlife and irrigation plans for individual farm units.
- Mitigation is proposed to be accomplished by avoidance and by on-site mitigation features within the TLIA. This eliminates the need for acquisition and development of lands in other areas of North Dakota for mitigation.
- Avoidance of impacts would be accomplished, in part, by managing the groundwater table on

approximately 1300 hectares of Class 4 lands for the benefit of both agriculture and wildlife.

- Horizontal well and drain systems would be used to manage the groundwater in conjunction with surface water from the project supply system to maximize water use for the benefits of both wildlife and agriculture. The open canals provide a means to deliver water to the project areas, deliver and store water for wetland habitat, control the water table, and remove excess water during wet periods.
- Best Management Practices for irrigated agriculture would be developed for the TLIA and implemented through a cooperative Advisory Team.
- Recreation and fisheries benefits would be derived from stabilization of Brush and Crooked Lakes. Joint use of supply systems will increase efficiency by utilizing the system during off-peak periods to provide water to Crooked Lake. The pipeline constructed to supply water to Brush Lake could potentially deliver water to hundreds of acres of wetlands along the pipeline route in dry years.
- Water would be delivered to the Lake Nettie NWR and plans are to develop a long-term water management plan for Lake Williams, which is part of a large saline wetland complex that supports the United States largest concentration of piping plovers, a threatened species.

CONCLUSION

The TLIA Conceptual Plan discusses multi-use water resource development and utilizes concepts which have been implemented on a somewhat fragmented basis under traditional development. This comprehensive approach envisions optimum benefits for irrigated agriculture, wildlife and economic development within the project, including mitigation. The economic analysis procedures for this project will be similar to those normally used by Reclamation and other federal agencies in the United States. It is expected that a favorable benefit cost ratio will result from such a study since mitigation, recreation development and drainage costs will be lower than in traditional irrigation projects.

Although this concept has not been implemented in the United States as a whole, it is believed that optimum benefits can be achieved and perhaps, more importantly, it appears to be a more acceptable approach to future water resource development.

REFERENCES

Bureau of Reclamation et al, September 1993, "Turtle Lake Irrigation and Wildlife Area" U.S. Department of the Interior, Bureau of Reclamation.

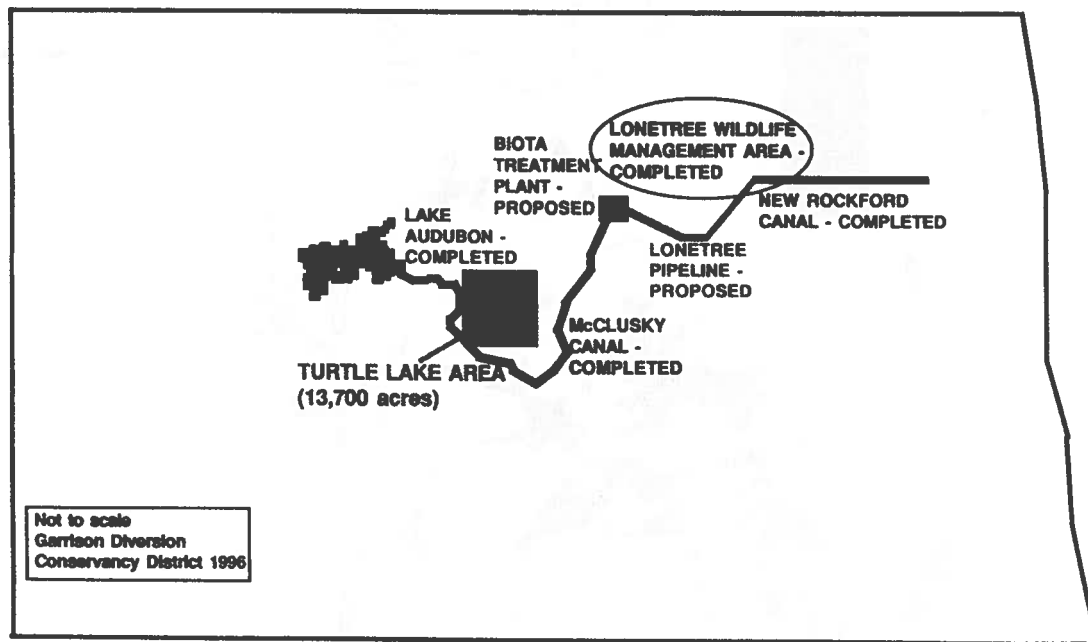


Figure 1. Map of North Dakota showing the Garrison Diversion Unit and the Turtle Lake Irrigation Area

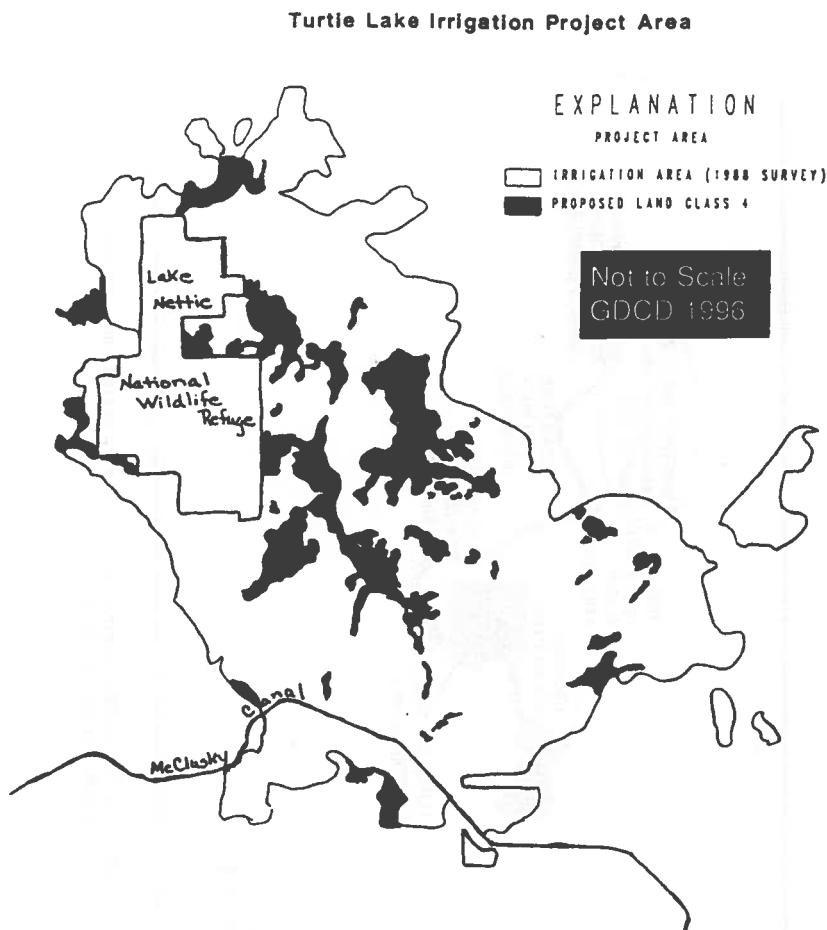


Figure 2. Project area of the Turtle Lake Irrigation Area showing proposed irrigation and Class 4 areas

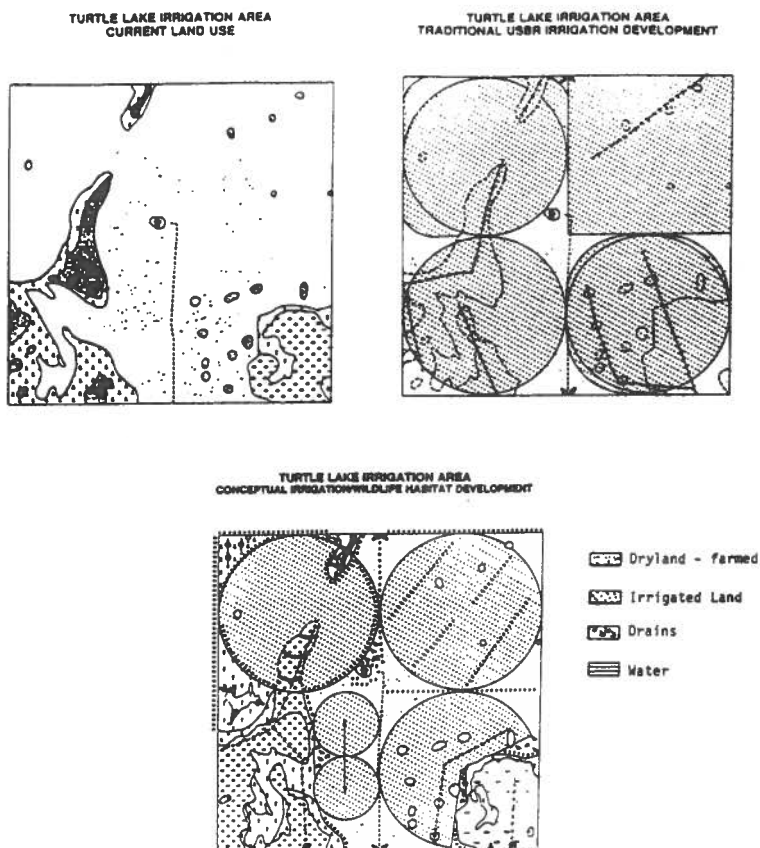


Figure 3. Comparison of impacts to wetlands from development of irrigable lands