



Figure 1. Location of Devils Lake Basin.

Benefits of Floodwater Management In the Closed Devils Lake Basin

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The Devils Lake Basin is a 3,814 square mile area in north central North Dakota. The drainage pattern of the basin, which is a closed basin, includes numerous streams, some of which interconnect shallow lakes along their lower reaches. The flowage finally empties into Devils Lake in the southern part of the drainage area.

Damage to agricultural crops and land is the main flood problem in the Devils Lake Basin (Fig. 1). Floodwaters during the spring overflow the banks of low capacity channels and inundate thousands of acres of adjacent cropland. Summer rainstorms also produce streamflows in excess of channel capacities, causing sheetwater flooding. The floods result in serious damage to agricultural production which depresses economic growth of the Devils Lake Basin region.

A number of damaging floods have been recorded in recent decades. Various groups and agencies have attempted to develop flood damage

reduction plans for many of the subwatershed areas in the basin, but none of these attempts has been completely successful.

Opposition by various groups and agencies who oppose plans that would be detrimental to wildlife production and habitat in the basin is one reason for the lack of success in developing flood damage reduction plans. The Devils Lake Basin is one of the nation's prime waterfowl production areas and is very important to waterfowl migration during the spring and fall.

There is a need, therefore, to develop a comprehensive plan for water and land use management for the basin that will take into account the interests of all those concerned. The North Dakota State Legislature recognized this need, and in 1975

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passed House Bill No. 1587 to create a Devils Lake Basin advisory committee. This committee is responsible for developing and recommending to the governor a comprehensive plan for land and water management and related resource conservation for the basin.

A study to analyze the economy of the Devils Lake Basin and to assess the economic impact of alternative plans for water and land management in the basin is in progress in the Department of Agricultural Economics.

Data related to a number of economic dimensions are being collected to provide an overview of the region and subregion economies and trends that have been occurring. The dimensions include employment, income, land use, transportation networks, agricultural production patterns, recreation activities, the location of trade centers, and state and federal expenditures.

Analysis of the Devils Lake Basin regional economy includes both historic and current perspectives. Projections of the future level of economic activity in the basin will also be made on the basis of proposed alternative land use management plans.

The structure of the Devils Lake Basin regional economy and the subregion economies is being analyzed for the period from 1950 to 1975. Several economic dimensions including employment, income and gross business volume by sector form the basis for analyzing the economic base of the regional economy. The share of the economic base accounted for by each sector will be determined for each county in the basin and for the total basin for selected years within the study time frame. Comparisons will be made to determine if shifts have occurred in the economic base of each county and the regional economy over time.

Estimates of personal income, gross business volume, and employment within the regional economy are being made. The future economic structure of the basin's regional economy and subregion economies will be estimated for selected years between 1975 and 1990. Trends based on historical patterns of economic growth and change will be used to estimate the value of agricultural production, recreation expenditures, federal outlays and value of manufacturing output. These trends will be used to estimate future levels of personal income, gross business volume and employment.

Analysis of the economic impact of alternative plans for land and water management in the Devils Lake Basin is based on estimates of the economic benefits and costs of alternative plans. The analysis emphasizes the impact on the agri-

culture and recreation sectors in the basin and takes into account the trade-offs in land use that arise between agriculture and recreation activities in considering alternative land use plans.

Information on flood damages, costs of drainage, wildlife losses and attitudes towards wetlands and drainage have been obtained through two farm operator surveys. Estimates of hunter activity days associated with different levels of flood plain management have been obtained, and expenditures associated with hunter activity days in the basin have been estimated.

The economic benefits and costs of three alternative plans for reducing flood damages in the basin have been estimated. The plans included varying levels of structural measures and non-structural measures which include both land treatment and wetlands restoration.

Future work will include refinement of the estimates of benefits and costs associated with reducing flood damages. In addition, economic analyses of some aspects of water quality and wildlife habitat will be undertaken.

Results to Date

Employment in the Devils Lake Basin centers around agriculture, retail trade, services and education. It is estimated that those four sectors accounted for about 72 per cent of the basin's employment in 1975. Since 1950, there has been a substantial decline in employment in agriculture while employment in the retail trade, service and education sectors has increased significantly.

Personal income of basin residents was estimated to be \$154 million in 1974. Of that total, the farm sector accounted for about \$90 million, or 58 per cent of personal income received in the basin.

Expenditures by fishermen in the basin in 1974 were estimated to be \$3 million. Expenditures by hunters in the basin were estimated to be approximately \$2 million in 1974.

The average annual loss as a result of flood damages to agriculture is estimated to be \$11.50 per acre for agricultural land affected by flooding in the basin. The total average annual dollar loss due to flooding of agricultural land in the basin is estimated to be \$2.5 million.

Three alternative plans to reduce flood damages in the basin have been analyzed using benefit-cost analysis. In each instance, the benefit-cost ratio is greater than 1.0 for both structural measures and land treatment measures, but less than 1.0 for wetlands restoration. However, with adequate compensation to the landowner some wetlands restoration could be justified.