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AN UPDATED ASSESSMENT OF  
DEAD COLT CREEK DAM

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## DEAD COLT CREEK DAM

Jay A. Leitch and Herbert R. Ludwig Jr.

The Dead Colt Creek Dam Project in Ransom County was included as an example of water project evaluation in the May 1985 *Guidelines for Economic Evaluation of Public Sector Water Resource Projects* (Anderson et al. 1985). A request was received to update the project's economic analysis to the present. The original report was in 1983 dollars. Since 1994 was the most recent full-year price index available, dollar values were inflated to 1994. An inflation factor of 1.482 was used (Council of Economic Advisors 1995).

In April 1977, the North Dakota State Water Commission entered into an agreement with the Ransom County Water Management District to investigate the feasibility of constructing a recreational dam and associated public use area. The dam would be on Dead Colt Creek located approximately four miles southeast of Lisbon, North Dakota (Figure 1).

The dam and resulting reservoir would provide local residents with opportunities for boating, fishing, picnicking, swimming, and other outdoor sports. In addition, the proposed dam would retain flood waters and would therefore help reduce downstream flooding along the Sheyenne River.

Dead Colt Creek Dam Project was a two-phased effort. The first phase was construction of an earthen dam 80 feet high and 800 feet long. Construction began in May 1983 and was finished in December of the same year. The reservoir is about 1,000 feet wide and one and one-half miles long, and covers approximately 120 acres with an average water depth of 18 feet. The reservoir is large enough to accommodate fishing, boating, and water skiing.

Phase two of the project was development of onshore recreational areas. Facilities include a fishing pier, two boat ramps, swimming beach, picnic shelters and tables, grills, playground equipment, and a camping area.

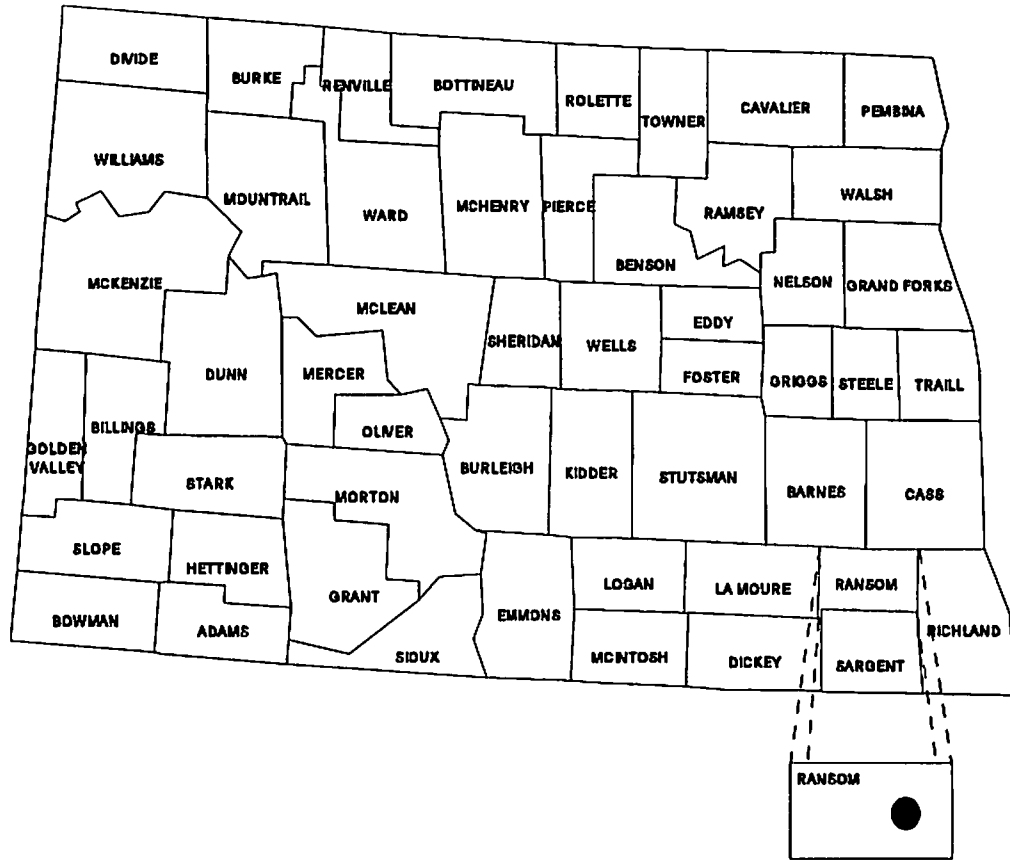


Figure 1. Location of the Dead Colt Creek Dam

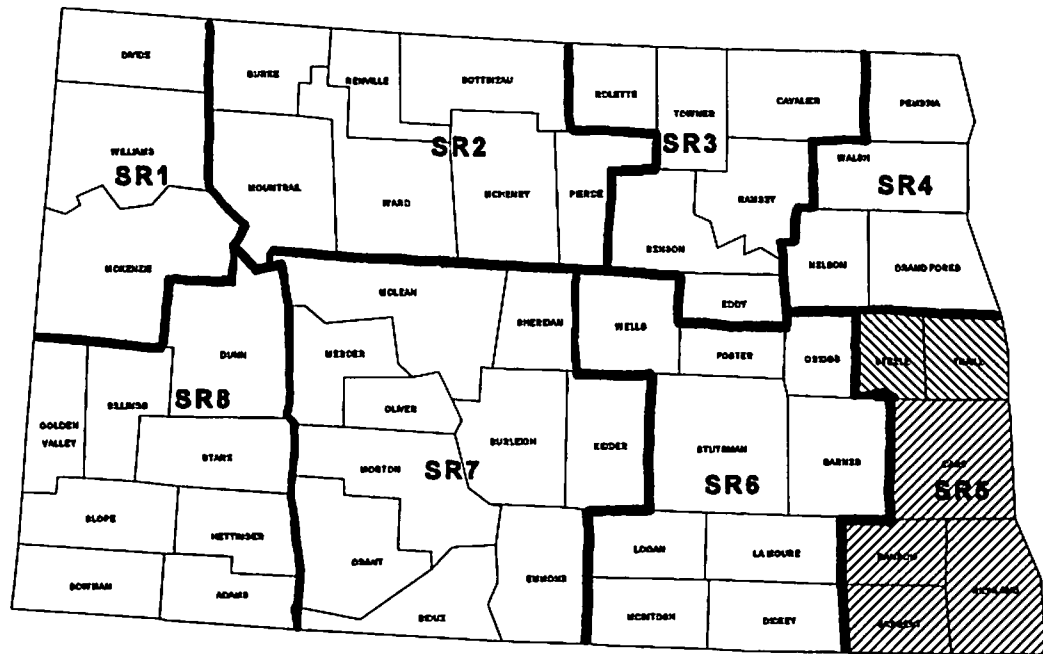


Figure 2. State Planning Region Impacted by the Dead Colt Creek Project

Economic Analysis

This economic analysis compares the beneficial effects with the adverse effects as they relate to the State of North Dakota and the impacted region (Figure 2). The analysis is based on a 7 percent discount rate and a 50-year project life. The year of project construction, 1983, will be considered year 0 and all values are expressed in constant 1994 dollars.

Project Costs. Monetary costs associated with the Dead Colt Creek project are (1) construction costs and (2) operation, maintenance, and replacement costs.

1. Construction Costs -- Total cost for dam construction, recreation facilities, and land was \$2,931,396. Cost was allocated to project participants as shown below.

Federal	265,278
State Water Commission	769,454
State Outdoor Interagency	270,317
Red River Joint Board	741,000
Local	<u>885,347</u>

TOTAL \$2,931,396

2. Operation, Maintenance, and Replacement (OM&R) Costs--OM&R costs were estimated to be \$14,820 per year. Present value of this stream of costs would be \$192,660 over the lifetime of the project (Based on the 50 year project life and 7 percent discount rate). The Ransom County Water Resource District is responsible for project operation and maintenance.

3. Summary of Costs--Total direct costs are \$3,124,056 as summarized below.

-----Summary of Project Costs-----

<u>Item</u>	<u>Capitalized Impact</u>
Construction Costs	\$2,931,396
OM & R	<u>192,660</u>
TOTAL	\$3,124,056

Projects Benefits. Monetary benefits resulting from Dead Colt Creek Dam include (1) direct user benefits, (2) increases from project services, and (3) increases from construction expenditures.

1. Direct User Benefits--Direct user benefits include benefits accruing from recreation and flood control.

A. Direct Recreation Benefits--Recreation benefits are the increases in recreational use value for swimming, fishing, picnicking, and other recreational activities that occur as a result of the project. Two types of information are needed to estimate recreation benefits: (1) an estimate of recreation visitation to the reservoir (user days) and (2) an estimate of the net value of the recreation experience to the user.

An ex ante economic analysis by the North Dakota State Water Commission (1980) estimated the project would generate 58,682 recreation days in 1980, 64,385 in 2000, and 62,500 in 2020 (Table 1). The unit-day value (UDV) method was then used to estimate the value of recreation benefits (Anderson et al. 1985). A recreation day of fishing had an estimate value of \$2.88. All other activities had a recreation day value of \$3.87. Annual benefits were estimated to be \$235,571 in 1980, \$256,994 in 2000, and \$249,419 in 2020.

**Table 1. Estimated Recreation Days Per Activity  
As a Consequence of the Dead Colt Creek Dam Project**

Activity	Year		
	1980	2000	2020
Canoeing	895	1,249	1,204
Fishing	16,695	16,465	15,876
Ice Fishing	4,770	3,407	3,285
Swimming	7,751	9,084	8,759
Camping	14,906	19,871	19,161
Picnicking	8,417	8,417	8,417
Hiking	3,280	3,280	3,280
Sailing	179	341	328
Other	<u>1,789</u>	<u>2,271</u>	<u>2,190</u>
TOTAL	58,682	64,385	62,500

Source: North Dakota State Water Commission, 1980.

In this analysis, recreation visitation to the reservoir is estimated by examining visitation occurring at a similar, established site--Beaver Lake State Park. This park is located on the west shore of Beaver Lake, 17 miles south of Napoleon, North Dakota. Park activities include swimming, fishing, boating, playground, picnicking, and camping. Annual visitation to Beaver Lake State Park is approximately 25,000 "composite" recreation days each year (Mittleider and Leitch 1984). A composite recreation day includes all activities associated with the water project. This figure will be used as the visitation estimate for the Dead Colt Creek Dam Project.

Recreationists visiting Beaver Lake State Park spent an average of \$21.74 per day (Mittleider and Leitch 1984). Eighty-four percent of the expenditures occurred in the retail sector and 16 percent in the business and personal service sectors. In this analysis, the net value of recreation benefits is estimated to be approximately 40 percent of total recreationists' expenditures. There, total direct recreation benefits resulting from the Dead Colt Creek Dam Project are \$217,409 per year ( $0.40 \times \$21.74/\text{day} \times 25,000 \text{ days/year}$ ). The discounted value of this stream of benefits over the 50-year project life would be \$3,000,457.

**B. Direct Flood Control Benefits**--Flood control benefits are the expected damages without the project less the actual flooding damages with the project.

The U.S. Army Corps of Engineers conducted an economic analysis of flood control benefits associated with Dead Colt Creek Dam. They estimated that Dead Colt Creek Dam would provide a 3 percent reduction in total Sheyenne River flood damages. This damage reduction was estimated to be worth \$192,660 per year or a present value of \$2,658,856 over the 50-year life of the project. The lands benefited would include about 23,400 acres of cropland and 100 acres of urban land.

**2. Increases from Project Services**--The secondary economic impact of the Dead Colt Creek Dam Project is the effect of increased levels of expenditures made by recreationists on the regional economy. The effects of increased expenditures were measured in terms of increases in total business activity, personal income, and employment in the regional economy.

Secondary impacts are not estimated for the flood control portion of the project since no increased levels of spending can

be accurately attributed to this component. Secondary impacts are not estimated for OM & R expenditures since these costs are paid by local or regional entities.

Estimated business activity generated each year in each sector of the region's economy as a result of expenditures made by recreationists using the project are indicated in Table 2, along with employment in each sector attributable to these expenditures. Row 12 of Table 2 represents the household sector, which is the personal income generated by recreationists' expenditures. The annual increase in total business activity generated by expenditures of project users is \$1,190,046 (This is assuming that all expenditures represent new money to the region.). This includes total direct expenditures of \$543,524 (25,000 recreation days x \$21.74/day) plus secondary effects. Present value of this stream of benefits would be \$16,423,524 over the life time of the project (based on the 50-year project life and 7 percent discount rate).

The annual personal income generated in the region as a result of recreationists' expenditures is \$246,012 (Table 2, Row 12). The present value of this income stream is \$3,395,262.

Expenditures by project users directly and indirectly contribute to employment in various sectors of the economy. For example, even though recreationists did not spend any money directly in the professional and social service sector (Table 2, Row 11) \$17,784 worth of business occurred in that sector. This amount of business activity in the professional and social service sector is enough to support the employment of one individual. All expenditures by users of the Dead Colt Creek Dam Project would support the employment of 16 people in the economy.

3. Increases from Construction Expenditures--The economic impact of construction of Dead Colt Creek dam project is the effect of an increased level of spending during the construction period on the regional economy. Effects of the additional levels of spending were measured in terms of increases in total business activity, personal income, and employment. Only funds contributed from outside the region are used to estimate these impacts. These impacts occur only once, at the time of construction, unlike the increases from project services which occur throughout the lifetime of the project.

Total construction expenditures by sources outside of the region were \$1,305,049. These expenditures generated \$3,186,300 in total business activity in the region (Table 3).



**Table 2. Total Business Activity and Employment by Sector and Personal Income Generated by Recreationists' Expenditures, Dead Colt Creek Dam Project (1994 Dollars)**

Economic Sector	Total Business Activity	Employment <sup>b</sup>
1. Ag, Livestock	42,978	c
2. Ag, Crops	16,302	c
3. Mining	1,482	c
4. Contract Construction	20,748	1
5. Transportation	5,928	c
6. Communications & Utilities	34,086	c
7. Ag Processing & Misc. Mfg.	22,230	c
8. Retail Trade	620,958	6
9. Fin., Ins., & Real Estate	35,568	c
10. Business & Personal Service	100,776	6
11. Prof. & Social Service	17,784	1
12. Households (Personal Income)	246,012	--
13. Government	<u>25,194</u>	<u>2</u>
	<b>TOTAL \$1,190,046</b>	<b>16</b>

<sup>a</sup>Annual recreationists' expenditures were \$543,524. Eighty-four percent of the expenditures occur in the retail sector and 16 percent in the business and personal service sector (Mittleider and Leitch 1984).

<sup>b</sup>Employment in each sector was estimated using gross productivity ratios.

<sup>c</sup>Less than 1.0.

(This is assuming that all construction expenditures were spent within the region.) The personal income generated as a result of construction expenditures is \$794,352 (Table 3, Row 12). These expenditures were indirectly responsible for employing 50 people in the economy. Most of this employment occurred in the construction sector.

**Table 3. Total Business Activity and Employment By Sector and Personal Income Generated By Construction Expenditures<sup>a</sup>, Dead Colt Creek Dam Project (1994 Dollars)**

Economic Sector	Total Business Activity	Employment <sup>b</sup>
1. Ag, Livestock	\$ 44,460	c
2. Ag, Crops	17,784	c
3. Mining	38,532	c
4. Contract Construction	1,370,850	34
5. Transportation	13,338	c
6. Communications & Utilities	78,546	1
7. Ag Processing & Misc. Mfg.	26,676	c
8. Retail Trade	535,002	5
9. Fin., Ins., & Real Estate	108,186	c
10. Business & Personal Service	37,050	2
11. Prof. & Social Service	53,352	3
12. Households	794,352	c
13. Government	<u>68,172</u>	<u>c</u>
TOTAL	\$3,186,300	50

<sup>a</sup>Construction expenditures by sources outside of the region were \$1,305,049. These expenditures occurred in the contract construction sector.

<sup>b</sup>Employment in each sector was estimated using gross productivity ratios.

<sup>c</sup>Less than 1.0.

### Economic Efficiency and Regional Economic Activity Models

The economic efficiency model estimates the net economic effect on the state. The regional economic activity model measures the increase in regional economic activity as a consequence of the Dead Colt Creek Dam Project.

1. Economic Efficiency Model (EEM)--Total project benefits under the EEM are \$5,659,313 (Table 4). Only the direct user benefits (i.e., recreation and flood control) are considered in this model since any positive secondary impacts in the region may be netted out by negative secondary impacts occurring in other parts of the state.

Total project costs under the EEM are \$3,124,056. This includes all construction, land, and OM & R costs paid by federal, state, and local entities. The benefit-cost ratio using the EEM is 1.8:1.

2. Regional Economic Activity Model (REAM)--One interest in developing recreation projects is to contribute to general well-being. This includes the economic health of communities in addition to providing increased opportunities for citizens to participate in recreation activities. Therefore, another method which can be used to evaluate water projects is to compare the increases in regional economic activity that would be associated

**Table 4. Analysis of Benefits and Costs Using the Economic Efficiency Model, Dead Colt Creek Dam Project (1994 Dollars)**

<b>Direct User Benefits</b>	
Recreation	\$3,000,457
Flood Control	<u>2,658,856</u>
TOTAL	\$5,659,313
<b>Project Costs</b>	
Construction	\$2,931,396
OM & R	<u>192,660</u>
TOTAL	\$3,124,056
<b>Net Benefits</b>	\$2,535,257
<b>Benefit-Cost Ratio</b>	1.8:1

with alternative projects. Total business activity (TBA) generated by the Dead Colt Creek Dam Project is \$19,609,824 (Table 5). This includes direct expenditures plus associated secondary impacts. Total personal income (which is a part of total business activity) generated over the life time of the project is \$4,186,614.

**Table 5. Increases in Regional Economic Activity, Dead Colt Creek Dam Project (Present Value in 1994 Dollars)**

Item	Capitalized Impact	
	Total Business Activity	Personal Income
Increases from Project Services	\$16,423,524	3,395,262
Increases from Construction Expenditures	<u>3,186,300</u>	<u>794,352</u>
TOTALS	\$19,609,824	\$4,189,614

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