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BARDWELL LAKE

WAXAHACHIE CREEK, TEXAS

## REVISIONS AND UPDATES

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TRINITY RIVER BASIN, TEXAS

DESIGN MEMORANDUM NO. 7C (REVISED)

# REVISED MASTER PLAN

# FOR BARDWELL LAKE

# WAXAHACHIE CREEK, TEXAS

This report, prepared by the Recreation-Resource Management Branch of Operations Division, Fort Worth District, has been coordinated with Engineering Division and Real Estate Division, and is recommended for approval.

D. L. Dendy 22 Jan 74

Chief, Engineering Division Date

Michael B. Cottrell 21 Jan. 74

Chief, Real Estate Division Date

RL-R

DAEN-CWP-V (21 Feb 74) 2nd Ind
SUBJECT: Bardwell Lake, Waxahachie Creek, Texas
Design Memorandum No. 7C, Revised Master Plan

DA, Office of the Chief of Engineers, Washington, DC 20314 4 Dec 74

TO: Division Engineer, Southwestern
ATTN: SWFOD-M

Subject DM is approved subject to comments of the Division Engineer and the following:

a. Reference paragraph 2c, 1st Indorsement. Adjustments in the number of camp sites in a fee collection area should be considered. Operational studies of camping areas show that generally a minimum of 150 sites in one area are required to recover O&M&R costs from user fee revenues.

b. Plate 2.1. In future master plan submissions the land use allocation map should show graphically the land grid for the locality. The land grid or jurisdictional subdivision lines are essential in making the plan a useful tool in handling management problems and correspondence.

FOR THE CHIEF OF ENGINEERS:

Norman E. Jackson
for IRWIN REISLER
Chief, Planning Division
Directorate of Civil Works

wd all incl

SWDPL-R (SWFOD-M 21 Feb 74) 3rd Ind
SUBJECT: Bardwell Lake, Waxahachie Creek, Texas, Design Memorandum No. 7C, Revised Master Plan

DA, Southwestern Division, Corps of Engineers, 1114 Commerce Street, Dallas, Texas 75202 20 DEC 1974

TO: District Engineer, Fort Worth

Subject DM is approved subject to comments in previous indorsements.

Barry G. Rought

BARRY G. ROUGHT
Chief, Planning Division

CF:
DAEN-CWP-V (dupe)

# INTRODUCTION

The objective of resource planning is to obtain proper utilization and adequate stewardship of resources in their operation, maintenance, and management. Accomplishment of this objective, through sound planning principles, coupled with proper resource and operational management plans, will enable public use of the resource while preserving the qualities of the environment.

The Institute for Water Resources has stated four environmental objectives for the Corps of Engineers. These have now been incorporated into Engineer Regulation 1165-2-500. These objectives form a foundation for master planning and resource management philosophy and will be implemented to the fullest extent possible. They are:

"1. To preserve unique and important ecological, aesthetic, and cultural values of our national heritage.

2. To conserve and use wisely the natural resources of our Nation for the benefit of present and future generations.

3. To enhance, maintain, and restore the natural and man-made environment in terms of productivity, variety, spaciousness, beauty, and other measures of quality.

4. To create new opportunities for the American people to use and enjoy their environment."

All resources will be managed for multiple use in accordance with current policy guidelines and applicable Engineer Regulations. These resources are the property of both present and future generations. Given these valuable resources, it is our duty as stewards to protect and provide proper management while they are in our care. Proper management is defined as planning, organizing, directing, and controlling the use of the project resources. Measures such as limiting or denying the use of all or part of a resource will become part of the management program when such use becomes detrimental or permanently damaging to that resource.

"Ecological" management of both natural and created resources will become the goal of all personnel involved in the management program. In seeking this goal, managers at both the field and district level should recruit professional personnel and provide continued in-service training in resource management principles in order that the objectives outlined above are attained. Management at all levels must be alert to changing technology, new management methods, and changing user preferences as they may affect the development and use of the resource. Through the application of this general philosophy we can insure that short-term uses or gains shall not take the place of long-term goals.

# I. BACKGROUND INFORMATION

## 1.01 Pertinent Data

### A. Authority:

| | Type | Authority | Date |
|---|---|---|---|
| 1. | Project | Public Law 86-399<br>86th Congress, 2nd<br>Session | 31 Mar 1960 |
| | | House Document No 424<br>85th Congress, 2nd<br>Session | |
| 2. | Recreation | Flood Control Act<br>Section 4<br>(Public Law 534)<br>78th Congress,<br>2nd Session | 22 Dec 1944 |
| | | Amended by:<br>Flood Control Act<br>Section 4<br>(Public Law 526)<br>79th Congress,<br>2nd Session | 24 Jul 1946 |
| | | Amended by:<br>Flood Control Act<br>Section 203<br>(Public Law 780)<br>83rd Congress,<br>1st Session | 3 Sep 1954 |
| | | Outdoor Recreation<br>Act<br>(Public Law 88-29) | 28 May 1963 |
| | | See "Cost-Sharing"<br>on page 1-02 | |
| 3. | Fish &<br>Wildlife | Fish & Wildlife<br>Coordination Act | 10 Mar 1934 |
| | | Amended by:<br>Public Law 732<br>79th Congress | 14 Aug 1946 |

| | | | |
|---|---|---|---|
| | | Amended by:<br>Public Law 85-624<br>(72 Stat. 563) | 12 Aug 1958 |
| | | Public Law 89-669 | 15 Oct 1966 |
| | | See "Cost Sharing"<br>on page 1-02 | |

| | Type | Authority | Date |
|---|---|---|---|
| 4. | Land Acquisition | Rivers & Harbor Act<br>(Public Law 14)<br>79th Congress,<br>1st Session | 2 Mar 1945 |
| | | Engineer Regulation<br>405-1-1, Planning and<br>Project Authorization | Oct 1952 |
| 5. | Permits | Engineer Regulations<br>405-1-800 and 405-1-830 | 10 Mar 1972 &<br>24 Mar 1964 |
| | | Southwestern Division<br>Regulation 1130-2-7 | 25 Sep 1968 |
| | | Fort Worth District<br>Regulation 1130-2-78<br>(O&M Manual) | 1969 |
| 6. | Leasing | Engineer Regulation<br>405-2-835 | 24 Mar 1964 |
| | | Amended | 9 Nov 1964 |
| | | Amended | 30 Aug 1965 |
| | | Engineer Regulations<br>405-1-800 and 405-1-830 | 10 Mar 1972 &<br>24 Mar 1964 |
| 7. | Cost-Sharing | Federal Water Project<br>Recreation Act<br>(Public Law 89-72) | 9 Jul 1965 |
| 8. | Vegetation | Public Law 86-717 | 6 Sep 1960 |
| | | Public Law 89-298<br>Section 302 | 27 Oct 1965 |
| 9. | Water Storage | Public Law 85-230 | 30 Aug 1957 |

B. History

1. Master Plan:

The Master Plan for Bardwell Reservoir, Waxahachie Creek, Texas, was transmitted to the Office, Chief of Engineers, by letter dated 31 March 1964, and was approved by the Chief of Engineers by 2nd Indorsement dated 28 Dec 1964. This action was followed by an Updated Master Plan titled "Bardwell Dam & Reservoir, Waxahachie Creek, Texas, Design Memorandum No. 7C, Updated Master Plan," which was submitted 16 May 1969 and approved by Office, Chief of Engineers, by 2nd Indorsement dated 9 Oct 1970.

2. Status of Project:

Construction of the project was initiated in September 1963, with deliberate impoundment of water initiated 20 November 1965. To date, a total of $941,300 has been spent at Bardwell Lake* for providing recreational facilities such as gravel and bituminous roads and parking areas, boat launching ramps, sanitary facilities, potable water supply, and picnic and camping facilities.

C. Scope

1. Project Purpose:

Bardwell Lake is operated principally for flood control and water conservation. The Trinity River Authority, a state agency, has entered into a contract with the Department of the Army to purchase the conservation storage space below elevation 407.0 as a source of water supply. The contract was approved by the Secretary of the Army 24 June 1963. The original contract was later revised to add storage space between elevations 407.0 and 421.0 and this revision was approved by the Secretary of the Army 9 October 1969. The Trinity River Authority has negotiated a contract with the City of Ennis for the use of water from the lake for municipal purposes. The City of Waxahachie has expressed an interest in obtaining water for future industrial and municipal uses.

* Previously called Bardwell Dam and Reservoir.

2. Purpose of the Master Plan:

The purpose of the Master Plan is to provide a comprehensive plan which is concerned with effective conservation, protection, development, use, enhancement, and/or management of visitors, water, land, vegetation, and wildlife in the broad public interest. It augments and complements all other existing and contemplated Federal, State, and local public recreational and conservation development within the region.

3. Purpose of This Revised Master Plan:

This design memorandum presents a Revised Master Plan for development and management of the resources at Bardwell Lake in accordance with current policy and philosophy. The concept of the plan, including optimizing the overall project management objectives, is to obtain the optimum utilization of the project area for public use and provide proper stewardship of the natural resources.

4. Purpose of the Plan of Development:

The purpose of the plan of development is to:

a. Indicate and guide the planned development for the life of the project.

b. List the accomplished development to date.

c. Indicate areas in need of upgrading such as vegetation, soil conditions, facilities, etc.

d. Provide a guide for budgetary submissions for future recreational development.

The plans, cost estimates, and recreational analyses will be reviewed as necessary. Revised drawings, estimates, and pages of the text will be submitted to Southwestern Division (SWD) and Office, Chief of Engineers, (OCE) for approval and insertion into the basic Revised Master Plan document herein. Field personnel will aid in the development of a detailed

site plan of the proposed management areas to establish the location of roads and facilities at the time construction funds are allocated. A resource management area will not be developed without a detailed site plan approved in advance by SWD and coordinated with field and district office personnel.

D. Region Utilization

1. Region Served:

North Central Texas is the major area from which visitors are attracted to Bardwell Lake.

2. Transportation:

The primary mode of transportation of visitors to Bardwell Lake is vehicular.

3. Population:

See Section III, page 3-04, for projected population data.

4. Economy:

Areas within the zone of influence, located generally north and west of the project, are devoted primarily to agriculture with livestock operations and farming the major enterprises. Metropolitian areas of Dallas, the Mid-Cities Region, and Fort Worth, located immediately to the north and northwest, comprise a heavily populated residential, business and industrial complex.

5. Related Recreational Areas:

The nearest Corps of Engineers project is Navarro Mills Lake, approximately 42 miles southwest of Bardwell Lake. Also, there are at least 27 state, city or privately owned recreation parks within 70 radial miles of the project (See Table 1, page 1-10). More than 9 years of operation has shown that the recreational development at this project has complemented rather than competed with surrounding recreational areas. It is expected that this same relationship will continue under the development plan included in Section III.

TABLE 1

PARKS, RESERVOIRS, AND LAKES WITHIN 70 MILE RADIUS OF BARDWELL LAKE



| Index Number | Name | County | Approximate Road Miles From Bardwell Dam | Administering Agency | Purpose | Available Recreation Facilities | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Fishing | Swimming | Boating | Picnicking | Camping | Historical Structures |
| Land Oriented | | | | | | | | | | | |
| 26 | Ft Worth Parks System | Tarrant | 64 NW | City of Ft Worth | Recreation | | X | | X | | X |
| 27 | Dallas Parks System | Dallas | 41 N | City of Dallas | Recreation | | X | | X | | X |

TABLE 1

PARKS, RESERVOIRS, AND LAKES WITHIN 70 MILE RADIUS OF BARDWELL LAKE

| Index Number | Name | County | Approximate Road Miles From Bardwell Dam | Administering Agency | Purpose | Available Recreation Facilities: Fishing | Swimming | Boating | Picnicking | Camping | Historical Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Land Oriented | | | | | | | | | | | |
| 18 | Cleburne State Park | Johnson | 59 W | State of Texas | Recreation | X | X | X | X | X | |
| 19 | Dinosaur Valley State Park | Somervell | 85 W | State of Texas | Scenic Park | | | | X | X | X |
| 20 | Acton State Park | Hood | 92 NW | State of Texas | Historical | | | | | | X |
| 21 | Six Flags Over Texas | Tarrant | 58 NW | Private | Recreation | | | | X | | |
| 22 | Meridian State Park | Bosque | 79 SW | Texas Parks and Wildlife | Recreation | X | X | X | X | X | |
| 23 | Pioneer Village | Navarro | 26 SE | Navarro County Historical Society | Historical | | | | | | X |
| 24 | State Fair Park | Dallas | 41 N | State | Exhibits | | | | | | X |
| 25 | Greer Island Nature Center & Refuge | Tarrant | 72 NW | City of Ft Worth | Conservation | X | | | X | | |

## TABLE 1

## PARKS, RESERVOIRS, AND LAKES WITHIN 70 MILE RADIUS OF BARDWELL LAKE

| Index Number | Name | County | Approximate Road Miles From Bardwell Dam | Administering Agency | Purpose | Available Recreation Facilities: Fishing | Swimming | Boating | Picnicking | Camping | Historical Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Oriented | | | | | | | | | | | |
| 14 | Whitney Lake | Bosque and Hill | 59 SW | Corps of Engineers<br>Brazos River Authority | Flood Control<br>Hydroelectric Power<br>Water Conservation | X | X | X | X | X | X |
| 15 | Waco Lake | McLennan | 79 W | Corps of Engineers<br>Brazos River Authority<br>City of Waco | Flood Control<br>Water Conservation | X | X | X | X | X | |
| 16 | Tradinghouse Creek Reservoir | McLennan | 85 SW | Texas Power and Light Company | Industry | X | X | X | X | | |
| 17 | Lake Mexia | Limestone | 62 S | Bistone Municipal Water District | Municiple<br>Industry | X | X | X | X | X | |

TABLE 1

PARKS, RESERVOIRS, AND LAKES WITHIN 70 MILE RADIUS OF BARDWELL LAKE

| Index Number | Name | County | Approximate Road Miles From Bardwell Dam | Administering Agency | Purpose | Available Recreation Facilities: Fishing | Swimming | Boating | Picnicking | Camping | Historical Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Oriented | | | | | | | | | | | |
| 7 | Grapevine Lake | Tarrant and Denton | 63 NW | Corps of Engineers | Flood Control Water Conservation | X | X | X | X | X | |
| 8 | Lake Worth | Tarrant | 69 NW | City of Ft Worth | Municiple | X | X | X | X | | |
| 9 | Eagle Mountain Lake | Tarrant and Wise | 79 NW | Tarrant-Wise | Municiple | X | X | X | X | | |
| 10 | Benbrook Lake | Tarrant | 76 NW | Corps of Engineers | Flood Control Conservation Navigation | X | X | X | X | X | |
| 11 | Arlington Lake | Tarrant | 58 NW | City of Arlington | Municiple Industry | X | X | X | X | | |
| 12 | Lake Granbury | Hood | 88 W | Brazos River Authority | Water Supply | X | X | X | X | X | |
| 13 | Pat Cleburne | Johnson | 59 W | City of Cleburne | Water Supply | X | | X | X | X | |

# TABLE 1

## PARKS, RESERVOIRS, AND LAKES WITHIN 70 MILE RADIUS OF BARDWELL LAKE

| Index Number | Name | County | Approximate Road Miles From Bardwell Dam | Administering Agency | Purpose | Available Recreation Facilities: Fishing | Swimming | Boating | Picnicking | Camping | Historical Structures |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Oriented | | | | | | | | | | | |
| 1 | Navarro Mills Lake | Navarro and Hill | 42 SW | Corps of Engineers | Flood Control Water Conservation | X | X | X | X | X | X |
| 2 | Cedar Creek Lake | Henderson and Kaufman | 49 E | Tarrant County Water Control and Improvement District # 1 | Water Supply Recreation | X | X | X | X | X | |
| 3 | Lake Tawakoni | Rains, Hunt, and Van Zandt | 60 NE | Sabine River Authority | Water Supply Irrigation Recreation | X | X | X | X | X | |
| 4 | Lake Ray Hubbard | Collin, Dallas, Kaufman, and Rockwall | 65 N | City of Dallas | Water Supply | X | X | X | X | X | |
| 5 | Lavon Lake | Collin | 73 N | Corps of Engineers | Flood Control Water Conservation Recreation | X | X | X | X | X | |
| 6 | Lewisville Dam | Denton | 69 NW | Corps of Engineers | Flood Control Water Supply | X | X | X | X | X | |

## 1.02 Project Description

### A. General

#### 1. Physical Data:

The lake area is characterized by a broad valley bordered by fairly steep slopes rising to gently rolling upland areas covered with sparse growths of oak and other scattered trees. The surrounding lands outside the Government property are used principally for grazing or cultivation.

#### 2. Location:

Bardwell Lake is located entirely within Ellis County on Waxahachie Creek, 5.0 river miles upstream from its confluence with Chambers Creek. The dam is located about 3 miles southwest of Bardwell and 41 miles south of Dallas. Location of the project is shown on Plate 1.1 following page 1-10.

#### 3. Accessibility

##### a. Roads:

Interstate Highway 45 extending south from Dallas, skirts the city of Ennis which is located approximately 7 miles northeast of the dam. State Highway 34 spans the lake about 2 1/2 miles upstream from the dam. This is the only state highway in the project area. U.S. Highway 287 crosses Mustang Creek in the extreme upper reaches and provides access to the project lands with utilization of existing county roads.

##### b. Railroads:

The nearest railhead is at Bardwell, Texas, and is located about 2 1/2 miles from the project.

##### c. Air:

There is one airport in a 10 mile radius of Bardwell Lake. The airport is the Ennis Municiple Airport which is 6 miles north of

the dam, and 1 mile west of Ennis. The airports elevation is 490' and has a lighted 3200' hard surface runway with a rotating light.

4. Lake Watershed Provisions:

The watershed above Bardwell Lake has a length of 23 miles along the axis of the river and a maximum width of 8 miles. The drainage area covers approximately 178 square miles. At elevation 421.0 msl, the lake has a maximum width of approximately 1.2 miles, a maximum length of approximately 5.4 miles, and has a shoreline of approximately 25 miles. For additional information, see Table 2 page 1-13 and the Pool Elevation Probability and Duration Curves, page 1-14.

TABLE 2

POOL ELEVATIONS, AREAS, AND STORAGES

| | Elevation Feet msl | Reservoir Area (Acres) | Reservoir * Capacity (Acre-Feet) |
|---|---|---|---|
| Top of Dam | 460.0 | | |
| Maximum Design Water Surface | 455.9 | 9,480 | 268,400 |
| Top of Flood Control Pool and Spillway Crest | 439.0 | 6,040 | 140,000 |
| Top of Conservation Pool | 421.0 | 3,570 | 54,900 |
| Streambed | 377.6 | | |
| Average Pool Elevation During Peak Recreation Seasons ** | 420.0 | | |
| Five Year Pool Floodline | 432.0 | 4,950 | 101,500 |
| Ten Year Pool Drawdown | 417.0 | 3,050 | 41,600 |
| Five Year Pool Drawdown | 419.0 | 3,325 | 48,000 |

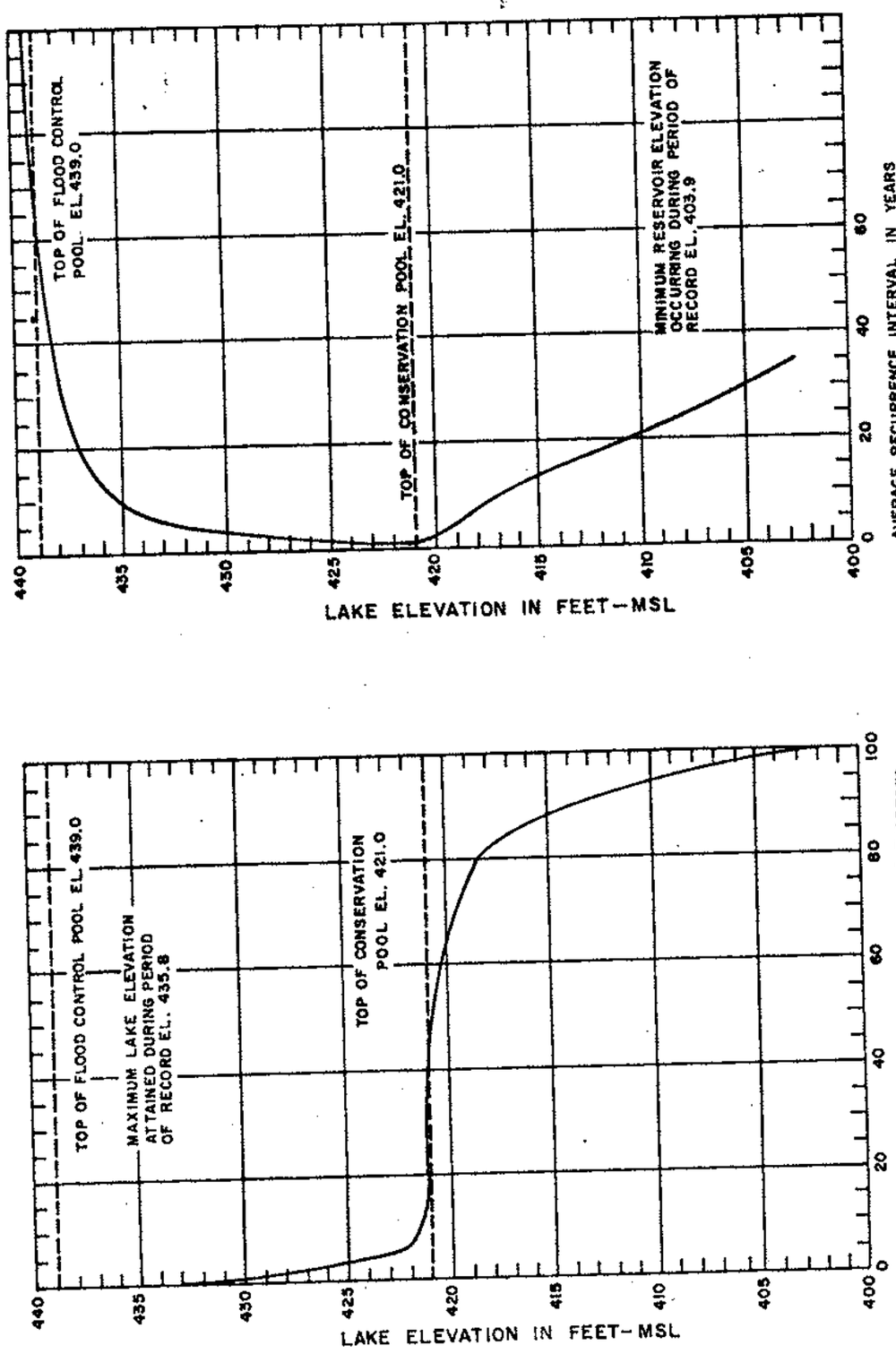
Note: All elevations in this report refer to mean sea level datum of 1929.

* Includes 17,600 acre-feet + of storage for estimated 100 years of sediment disposition with 12,100 acre-feet below elevation 421.0 and 5,500 acre-feet between elevations 421.0 and 439.0

** Average elevation during prime recreation season, June through August.

CHART 1

## POOL ELEVATION—PROBABLY AND DURATION CURVES*







NOTE:
* Curves based on hypothetical reservoir routing during period of record March 1938 through September 1959 after 100 years sedimentation.

5. Climate:

Bardwell Lake lies in a region characterized by short winters and long summers. The mean annual temperature at Bardwell, Texas, is 65 degrees Fahrenheit, varying from an average minimum of 35 degrees in January to 96 degrees in July. The average growing season, between killing frosts, extends from mid March to early November. The prevailing winds are from the south except during the winter months when they are from the north. The mean annual precipitation over the watershed is approximately 35 inches.

## B. Project Features

### 1. Park Areas:

There are 6 park areas at Bardwell Lake. Of these, 5 contain various degrees of physical development. Prior to enactment of the Federal Water Project Recreation Act of 1965 (PL 89-72) recreation facility development at reservoir projects operated and maintained by the Corps of Engineers was 100% federally funded. After 1 July 1973 new recreation development at Corps of Engineers projects will be determined to a great extent by local sponsors. Generally, such areas will not be developed without 50% non-federal cost sharing. It is proposed that non-federal agencies will pay 50% of the costs of recreation development and assume all costs for operation and maintenance of the park facilities. Administration policy requires that starting with the Fiscal Year 1975 program, all further recreation development at Corps operating projects will be under one of the two methods of development:

(1) The first method is that prior to construction there will be a written agreement with local interests to pay 50% of the recreation development costs and to assume all costs for operation and maintenance, including replacement of recreation facilities.

(2) Under the second method, the Corps could proceed with recreation projects with 100% federal financing and Corps operation only if a system of user charges is put into effect to recover all operation and maintenance and replacement cost.

2. Structures:

The following structures exist at Bardwell Lake:

a. Earthen embankment section (15,050 feet)

b. Uncontrolled concrete spillway (350 feet) crest elevation 439.0

c. Outlet works:

(1) Concrete outlet works - 10 feet diameter conduit with invert at elevation 391.0 msl.

(2) Low flow outlets - 2 (5 X 10 feet) sluice gates

d. Plant structures

(1) Project Office

(2) Maintenance Building

3. Archeological and Paleontological Resources:

The National Park Service has the primary responsibility for coordinating the inventory and removal of the archeological and paleontological resources on the project. The Corps of Engineers has the responsibility to participate in salvage activities by furnishing available manpower and equipment for the removal of overburden and artifacts, protection of the sites, restoration of the sites after excavation, and other minor services as required. The Corps of Engineers had the primary responsibility to investigate areas prior to any construction to insure such historical sites will not be damaged or destroyed. A field reconnaissance was made in March 1961 by representatives of this office and the National Park Service. The Schuler Museum of Paleontology, Southern Methodist University, published a report in 1965 entitled, "Geological and Paleontological Survey of the Bardwell Reservoir Basin, Ellis County, Texas." The survey was made under the sponsorship of the NPS. Also, Southern Methodist University submitted to the Corps of Engineers on 31 January 1971, a report titled "Environmental and Cultural Resources within the Trinity River Basin," describes archeology and paleontology of the Trinity River Basin.

4. Other Land Uses:

Government lands are used as recreation intensive, low density use, wildlife areas, natural areas and special use areas, as well as for project operation and maintenance for flood control and water supply. See Section II, Land and Water Use Planning and Zoning, for detailed location and description of these areas.

5. Concessionaire

General:

There is one concessionaire area located within the land and water areas of Bardwell Lake at High View Park. This concessionaire provides bait, fishing supplies, refreshments, wet boat storage, gasoline, and a fishing barge. Several private facilities along State Highway 34 also provide recreational supplies to meet the visitor requirements, therefore, the need for an additional concession at Bardwell Lake will not be considered at the present time.

C. Resources

1. General:

Natural resources are identified as those assets of nature such as water, soil, vegetation, wildlife, scenic areas, etc. The development of the natural resources is most important toward reaching the carrying capacity of the lake and its surrounding lands for public use. The degree of carrying capacity at a project is classes as either ultimate or desired. The ultimate carrying capacity is defined as the final stage of development of the natural resources at a project which will enable the most people to visit, use, and enjoy the resources at the project but not necessarily protect the natural resources. The desired carrying capacity is the development and management of the natural resources which will enable the most people to visit, use, and enjoy the resources without endangering these same resources. For greater detail, see Section III, Plan of Development, of this Revised Master Plan.

2. Natural

a. Soils

(1) General Conditions:

Soil conditions within this area lend themselves to a variety of uses. However, care should be taken to provide rest periods for vegetative growth when deemed necessary. The desired carrying capacity of this project will be based primarily on the soil series, its ability to endure certain uses as determined from information provided by the Soil Conservation Service, the slope of the land, and a Soil Conservation Service interpretative report relating these aspects in a carrying capacity for each management area.

(2) Specifics:

(a) Soils Table 3, pages 1-22 through 1-26

(b) Soils Map, Plate 1.2 following page 1-26

b. Vegetation:

Vegetation consists of both land and aquatic plants. These resources can be better analyzed and managed with respect to the project needs when both types of vegetation are considered.

(1) Land Plants

(a) Grasses:

The principal grasses native to this region (known as Blackland Prairie Complex) are various bluestems, Indiangrass, switchgrass, dropseed, buffalograss, several gramas, Texas wintergrass, Canada wildrye, sand lovegrass, and Texas bluegrass. Where the native grasses have been overused, annual weeds, less desirable grasses, forbs, and woody plants (such as cactus and mesquite trees) have invaded. Introduced grasses predominant in the area are Johnsongrass, King Ranch bluestem, and bermudagrass. Bermudagrass or buffalo grass is recommended for planting at the lower elevation because it can tolerate periods of water inundation. A native mixture can be planted at higher elevations.

(b) Woody Vegetation:

The dominant tree species in the area are pecan, willow, hackberry, blackjack oak, live oak, post oak, and cottonwood. The bottomlands are characterized by elm, hackberry, pecan, walnut, burr oak, ash, cottonwood, willow, osage-orange, honey locust, green briar, sumac, and grape. The uplands are characterized by post oak, blackjack oak, winged elm, greenbriar, mesquite, hackberry, osage-orange and honey locust.

(2) Aquatic Plants:

Aquatic plants are scarce in Bardwell Lake. The lake receives a significant amount of runoff from nearby agricultural land practices that keeps the lake in a turbid situation, not complimentary to supporting high aquatic vegetative growths. The only aquatic plants found in the lake are common duckweed and cattails. Most obvious plants found in the lake are land oriented forms of black willow and cottonwood, which become inundated on lake rise around the shoreline margins. The spillway channel, in addition to the above vegetation, also supports shrubby saltcedar trees.

c. Fish and Wildlife:

(1) Fish:

The waters of Bardwell Lake consists of the following rough, game, and forage fish:

(a) Rough:

| | |
|---|---|
| Spotted gar | Smallmouth buffalo |
| River carpsucker | Carp |
| Freshwater drum | Black bullhead |

(b) Game:

| | |
|---|---|
| Striped bass | White bass |
| Channel catfish | Blue catfish |
| Largemouth bass | Bluegill |
| White crappie | |

(c) Forage:

Gizzard shad

Results of the total fish composition study done in April of 1973 by the Texas Parks and Wildlife Department is summarized as follows; 52.5 percent of the total catch during the survey was composed of rough fish, whereas, 62 percent of the total weight in pounds was composed of game fish. River carpsucker dominated in the total catch of both rough and game fish with 30.7 percent of the total number and 29.0 percent of the total weight. White crappie dominated the total catch insofar as game fishes netted, representing 20 percent of the total game fish catch, but only 5.4 percent of the total weight. Although striped bass and largemouth bass only amounted to approximately 10 percent of the total catch, they did represent a significant 46.5 percent of the total weight of all the fishes netted.

(2) Wildlife:

Wildlife at Bardwell Lake includes such resident species as bobwhite quail, fox squirrel, cottontail, swamp rabbit, jack rabbit, beaver, raccoon, gray fox, skunk, coyote, bobcat, nutria, and armadillo. Non resident waterfowl use the lake for feeding and resting during migration. The predominate migrating species present are mallard, pintail, greenwinged teal, and mourning dove. Present game populations support moderate to heavy hunting pressure. Habitat improvement measures aimed primarily at quail will benefit most wildlife including popular game species. A management plan is given in greater detail in Appendix D to this Revised Master Plan.

d. Water:

Surface waters, with specific and limited exceptions, should be suitable for water contact sports and other human uses in recreation activities not involving significant risk of ingestion. Lakes now receive the most concentrated and varied recreational use of any waters and provide enjoyment to a great number of people. Lakes serve as settling basins which intensify the many problems associated with water and water use. They are the center of many divergent and conflicting interests and desires.

Competition is increasing for the pursuit of such water sports as fishing, waterfowl hunting, skin diving, skiing, swimming and pleasure boating. The quality of the lake water at Bardwell Lake is acceptable for recreational purposes according to the United States Public Health Service standards based on semiannual chemical analysis performed twice annually and the monthly profiles of dissolved oxygen and temperature.

TABLE 3

DEGREE OF LIMITATIONS AND MAJOR SOIL FEATURES AFFECTING SELECTED USE, ELLIS COUNTY, TEXAS

| Soil Series | SOIL RATINGS AND ADVERSE FEATURES AFFECTING: Sewage Disposal: Filter Fields | Sewage Disposal: Lagoons | Construction | Traffic Ways | Camp Areas | Picnic Areas | Play-grounds | Paths & Trails | Wildlife Suitability | Range, Sites, Production, and Plants |
|---|---|---|---|---|---|---|---|---|---|---|
| WILSON Clay Loam 11 | Severe: perme-ability | Slight: 0-2% slopes Moderate: 2-5% slopes | Severe: shrink-swell potential corrosivity uncoated steel | Severe: shrink-swell potential traffic supporting capacity | Severe: perme-ability wetness | Moderate: wetness texture | Severe: perme-ability | Moderate: wetness texture | Openland: well suited Woodland: suited | Grayland Range Site: 3,500#-6,500# * Excellent conditions: little bluestem, Indiangrass, big bluestem, Virginia wildrye, vine-mesquite, Florida paspalum, sideoats, grama, Texas wintergrass, silver bluestem, tall dropseed, hairy dropseed, plains lovegrass, forbs and sedges. |
| SUMPTER Clay 12 | Severe: perme-ability | Slight: 1-2% slope Moderate: 2-7% Severe: 7-20% | Severe: shrink-swell potential | Severe: shrink-swell potential, traffic supporting capacity | Severe: clay texture very slow perme-ability | Severe: clay texture | Severe: clay texture | Severe: clay texture | Openland: suited | Gullied Blackland: 3,000#-9,000# * Excellent condition: little bluestem, Indiangrass, big bluestem, tall dropseed, meadow dropseed, side-oats, grama, and silver bluestem. |
| CONSTRUCTION Materials 13 | | | | | | | | | | |

TABLE 3

DEGREE OF LIMITATIONS AND MAJOR SOIL FEATURES AFFECTING SELECTED USE, ELLIS COUNTY, TEXAS

| Soil Series | SOIL RATINGS AND ADVERSE FEATURES AFFECTING: Sewage Disposal Filter Fields | Sewage Disposal Lagoons | Construction | Traffic Ways | Camp Areas | Picnic Areas | Play-grounds | Paths & Trails | Wildlife Suitability | Range Sites, Production and Plants |
|---|---|---|---|---|---|---|---|---|---|---|
| LEWISVILLE Soils 8 | Moderate: perme-ability | Moderate: 0-7% slopes perme-ability Severe: 7-10% slopes | Moderate: corrosivity uncoated steel Severe: slopes 8 to 10% | Severe: low strength; shrink-swell potential | Severe: soil texture | Severe: soil texture | Severe: soil texture | Severe: soil texture | Openland: suited Woodland: suited | Not suited to cultivated crops. It is suited to grasses. |
| TRINITY Clay Occasion-ally Flooded 9 | Severe: perme-ability, flood hazard | Slight: organic matter less than 2% Moderate: organic matter more than 2% | Severe: wetness flooding hazard shrink-swell potential corrosivity | Severe: shrink-swell potential flood hazard, traffic supporting capacity | Severe: flood hazard perme-ability texture | Severe: texture | Severe: flood hazard perme-ability texture | Severe: texture | Openland: suited Woodland: suited | Clayey Bottomland Site: 5,000# - 10,000# * Excellent Condition: Eastern gamagrass, Virginia wildrye, little bluestem, purpletop, switch-cane, vine-mesquite, plumegrass, beaked panicum, meadow dropseed, and stipa. Pasture group: heavy, clayey bottom-land - production is high for such species as improved bermuda grass. |
| TRINITY Clay, Frequently flooded 10 | | | | | | | | | | |

TABLE 3

DEGREE OF LIMITATIONS AND MAJOR SOIL FEATURES AFFECTING SELECTED USE, ELLIS COUNTY, TEXAS

| Soil Series | SOIL RATINGS AND ADVERSE FEATURES AFFECTING: Sewage Disposal Filter Fields | Sewage Disposal Lagoons | Construction | Traffic Ways | Camp Areas | Picnic Areas | Play-grounds | Paths & Trails | Wildlife Suitability | Range Sites, Production and Plants |
|---|---|---|---|---|---|---|---|---|---|---|
| HOUSTON Sumpter Complex 5 | Moderate: perme-ability | Moderate: 0-7% slopes perme-ability Severe: 7-10% slopes | Moderate: corrosivity uncoated steel Severe: slopes 8-10% | Severe: low strength; shrink-swell potential | Severe: soil texture | Severe: soil texture | Severe: soil texture | Severe: soil texture | Openland: suited | Occurs on the lower part of the slopes - abandoned pasture in which wild plants are stabilizing the gullies. Not suited to cultivated crops. Best suited to pasture of native bluestem. |
| LEWISVILLE Silty Clay 6 | Moderate: perme-ability | Moderate: 3-8% slopes perme-ability Severe: 7-10% slopes | Moderate: corrosivity uncoated steel Severe: 8-10% slopes | Severe: low strength shrink-swell potential | Severe: soil texture | Severe: soil texture | Severe: soil texture | Severe: soil texture | Openland: suited Woodland: suited | Rolling Blackland: 3,000#-5,000# * Excellent Condition: Indiangrass, big bluestem, switchgrass, little bluestem, Florida paspalum, and Virginia wildrye. Pasture Group: Friable clayey upland, adapted species include improved bermuda grass, johnsongrass, Kings Ranch bluestem, and lovegrass. |
| LEWISVILLE Association 7 | Moderate: perme-ability | Moderate: 0-7% slopes, perme-ability Severe: 7-10% slopes | Moderate: corrosivity uncoated steel Severe: slopes 8 to 10% | Severe: low strength; shrink-swell potential | Severe: soil texture | Severe: soil texture | Severe: soil texture | Severe: soil texture | Openland: suited Woodland: suited | Fairly well suited to cultivated crops, but good management of crop residue and cover crops is needed to control erosin. Best suited to small grains; sweet clover, and other cool-season crops. |

TABLE 3

DEGREE OF LIMITATIONS AND MAJOR SOIL FEATURES AFFECTING SELECTED USE, ELLIS COUNTY, TEXAS

| Soil Series | SOIL RATINGS AND ADVERSE FEATURES AFFECTING: Sewage Disposal: Filter Fields | Sewage Disposal: Lagoons | Construction | Traffic Ways | Camp Areas | Picnic Areas | Play-grounds | Paths & Trails | Wildlife Suitability | Range Sites, Production and Plants |
|---|---|---|---|---|---|---|---|---|---|---|
| GRAVEL PIT<br>2 | | | | | | | | | | |
| HOUSTON BLACK Clay<br>3 | Severe: very slow perme-ability | Slight: 0-2% slopes Moderate: slopes exceed 2% | Severe: very high shrink-swell potential; corrosivity | Severe: very poor supporting capacity | Severe: clay texture very slow perme-ability | Severe: clay texture | Severe: clay texture; very slow perme-ability | Severe: clay texture | Openland: slight Woodland: severe - no woodland | Rolling Blackland Site: 6,000#-10,000 Excellent conditions: big bluestem, little bluestem, Indiangrass, and switchgrass. Pasture group is heavy, clayey upland, adapted to such species as improved bermudagrass and kleingrass. |
| HOUSTON Clay<br>4 | Moderate: perme-ability | Moderate: 0-7% slopes perme-ability Severe: 7-10% slopes | Moderate: corrosivity uncoated steel Severe: slopes 8-10% | Severe: low strength; shrink-swell potential | Severe: soil texture | Severe: soil texture | Severe: soil texture | Severe: soil texture | Openland: suited | Less dark, are thinner, and are more sloping than Houston Black soils. They are darker, thicker, and less sloping than sumter soils. |

TABLE 3

DEGREE OF LIMITATIONS AND MAJOR SOIL FEATURES AFFECTING SELECTED USE, ELLIS COUNTY, TEXAS

| Soil Series | SOIL RATINGS AND ADVERSE FEATURES AFFECTING: Sewage Disposal: Filter Fields | Sewage Disposal: Lagoons | Construction | Traffic Ways | Camp Areas | Picnic Areas | Play-grounds | Paths & Trails | Wildlife Suitability | Range Sites, Production, and Plants |
|---|---|---|---|---|---|---|---|---|---|---|
| BURLESON Clay 1 | Severe: perme-ability. | Slight: 0-2% slopes. Moderate: 2.5% slopes. | Severe: shrink-swell potential, corrosivity to uncoated steel. | Severe: shrink-swell potential, traffic supporting capacity. | Severe: clay texture, very slow perme-ability. | Severe: clay texture, | Severe: clay texture, very slow perme-ability. | Severe: clay texture, | Openland: suited. Woodland: poorly suited, heavy clay. | Grayland Sites: 4,000# - 6,500# * Excellent condition: little bluestem, Indiangrass, big bluestem, Virginia wildrye, vine-mesquite, Florida paspalum, sideoats grama, Texas wintergrass, silver bluestem, tall dropseed, hairy dropseed, plains lovegrass, forbs, and sedges. Pasture Group: heavy, clayey, upland. High production for bermudagrass and kleingrass. Medium production for Kings Ranch bluestem and kleberg bluestem. |

VALUES FOR RATING DEGREE OF LIMITATION OF SOILS FOR SPECIFIED USES:

None to slight: The soil has no limitation or no more than some limitation. The limitation is not serious and is easy to overcome.

Moderate: The soil has moderate limitation to use. The limitation needs to be recognized, but it can be overcome or corrected by means that, in general, are practical.

Severe: The soil has severe limitation. Use of the soil is questionable because the limitation is difficult to overcome.

* Pounds of estimated production of air dry herbage per acre per year.

## II. RESOURCE PLANNING AND MANAGEMENT

### 2.01 General

#### A. Trends:

Bardwell Lake is located in a principally rural area and is surrounded by land used primarily for ranching and farming. The town of Bardwell has remained stable in growth development. Whereas, Ennis is spreading rapidly in urban development. Presently, day use activities predominates over night use at the lake. This trend is likely to continue because of the lakes proximity to the large metropolitian areas of Ft Worth and Dallas, with peoples increased leisure time and willingness to travel in pursuit of recreational activities.

#### B. Objectives:

The basic objective of land planning is to provide proper stewardship of the land and its resources through protection, development, and management. To help meet present and future needs in consonance with the land capability and aesthetics of the area, lands will be allocated as changing needs and priorities dictate. All Federally owned project lands are considered necessary to meet the current and future needs of the project. Established woodland areas and desirable grasses will not be disturbed unless a more desirable vegetation will be accomplished through lease agreements and comprehensive vegetative management plans and practices. Erosion control and revegetative practices will be in accordance with the Resource Management Plan required by Engineer Regulation 1130-2-400 and in cooperation with Federal, State, and local governments.

## 2.02 Land and Water Planning

### A. Land Planning

#### 1. General Planning:

A general land use planning map showing the various land allocations is presented as Plate 2.1 following page 2-06. A key indicating the types of usage and acreage involved is presented as Table 4 on page 2-06.

#### 2. Types of Usage

##### a. Recreation - Intensive Use

High intensity public use areas or Park areas support a variety of activities and physical developments. Selection of these areas was based upon the following site characteristics: Terrain and vegetative resources and their adaptability to physical development; ease of public access; shoreline and water characteristics; and overall distribution of park areas around the project. Individual descriptions and complete development details for each park area is contained in Section III, Plan of Development.

##### b. Recreation - Low Density Use

These are areas set aside for the management of resources for multiple recreation uses not requiring support facilities, such as cross country hiking, informal nature study, photography, etc. Resource management plans will restore, enhance and protect the area's resources. These areas provide scenic vistas and buffer zones between Federal and adjacent non-government land. Hunting will be allowed and only foot traffic will be permitted in these areas. No physical development of recreational facilities are planned for these areas since activities which require such facilities are not compatible with the area's designation.

##### c. Wildlife Areas:

Areas set aside for the management of wildlife re-

sources. These lands are intended to provide, through proper management, suitable habitat for propagation and preservation of native wildlife species and to promote a greater variety of species. Resource management plans will be directed toward soil, vegetative and habitat improvement. Hunting will be permitted in these areas, subject to applicable game laws. These areas are also available for low density recreation activities.

d. Operation and Maintenance Area:

This area is required for normal operating procedures and emergency flood control, such as the dam, pertinent works, administrative office area and compound, and spillway.

3. Zoning and Control:

Lands will be marked according to corresponding allocated land uses on the Land Use Planning Plate with signs appropriate to the purpose. For example, aesthetic/recreation areas, nature trails, wildlife areas, picnic areas, camping areas, and beaches can be designated by conventional or symbol signs identifying their intended use. Hazardous areas will be marked for safety of the visiting public. Where necessary, land areas will be fenced to control people, vehicles, and livestock.

4. Interim Uses

a. General:

The resource manager will maintain an up-to-date listing of all outgrants and their locations which will be readily available at the project office.

b. Outgrants:

The Land Use Planning Map, Plate 2.1 indicates the proposed land allocations. Grazing is a management tool which may be used as a vehicle to install measures for soil and vegetative restoration. Lessees will be encouraged to provide soil and vegetative restoration measures or plant specified crops for wildlife as part, or total payment for grazing

permits on selected areas. Other interim uses may consist of short-term grants to other public agencies and non-profit organizations. Any interim use that degrades aesthetic and/or natural values will be reviewed and corrected in light of land management policies.

(1) Agri-Grazing Leases:

Outgrants for grazing will be made only when needed for management of vegetation and are not to exceed five years. Summer grazing will be restricted to a four or six month period in any one year and subject to close observation for adherence to the lease agreement and good management practices. All agriculture and/or grazing control and obtaining maintenance protection, repair, or restoration practices through a leasing program. Stocking will be by animal-unit per month (AUM) based on the land's carrying capacity and the objectives in habitat management. Hunting is allowed as discussed in the Wildlife Management Plan, Appendix D, of this Revised Master Plan.

(2) Group and Private Club Areas:

Churches, Scouts, and other organizations with compatible recreation programs will be encouraged to share available sites to insure that the sites will be effectively utilized by the greatest number of people. This will result in greater utilization of project lands and, at the same time, reduce the cost of development, maintenance, and operation of the areas for these organizations. There are no plans for long term leases of group or private club areas at Bardwell Lake.

c. Easements:

All outgrants, including easements for roads and utility lines, will be processed on an individual case basis through the Project Resource Manager with final approval granted by higher authority. The policy of attempting to have roads and utility lines located on privately owned land where feasible, to minimize any adverse aesthetic effect on Government-owned lands, will be adhered to.

TABLE 4

LAND USE PLANNING

LAND RESOURCE ALLOCATION

| | Acres |
|---|---|
| Recreation - Intensive Use | |
| Park Areas | 1,407 |
| Primitive Group Camp | 46 |
| Recreation Low - Density Use | 1,072 |
| Wildlife Management | 1,119 |
| Operations and Maintenance | 274 |
| TOTAL LAND ACREAGE | 3,918 |
| TOTAL WATER USE ACREAGE | 3,570 |
| TOTAL FEE ACREAGE | 7,488 |
| TOTAL LAND EASEMENT ACREAGE | 675 |
| TOTAL ACREAGE | 8,163 |

B. Water Use Planning

1. General:

A water use planning map (Plate 2.2) indicates various restricted areas have been prepared so that a water safety program identifying the restricted areas can be implemented.

2. Zoning and Restrictions

a. Swimming Areas:

Beaches and swimming areas located in designated park areas will be so identified by buoys and proper signs. Only swimming and related activities are to be allowed in these areas. No boating or fishing will be permitted.

b. Outlet and Intake Structures:

Water areas within 300 feet of outlet and intake structures are restricted from public use and will be so marked.

c. Low Speed Boating Areas:

Congested areas, such as boat ramp and marina mooring areas where high speed boating and the associated wakes create an opportunity for accidents and property damage, are designated as low speed boating areas.

d. Shallow Areas:

Areas that are intermittent with shallow and deep water will be managed as shallow water areas in the interests of public safety. Floats advising the public of these areas will be maintained at the entrance or perimeter of the areas, whichever conditions warrant.

e. Low Pool Hazards:

Low pool hazards are sub-surface structures such as old bridges, embankments, etc., which become hazardous to boaters at elevations lower than normal pool. These areas will be identified by appropriate markers.

2.03 Management

A. General:

The protection and enhancement of natural and created resources will receive equal consideration to other project purposes. The key to successful use and upkeep of project resources is proper resource management. With this in mind, these guidelines are to be used within the context of Fort Worth District Regulation 1130-2-61 and Southwestern Division Regulation 1130-2-7, as well as applicable Engineer Regulations.

B. Human Resources

1. District Level:

The recruitment of additional resource specialists to serve as consultants for problems encountered on the project and development of proper resource management plans is essential to provide proper guidance for project operation.

2. Project Level:

Proper implementation of this Revised Master Plan, including the resource management plans, is necessary to insure adequate stewardship of the project's resources. Protective measures include protection not only from natural elements such as fire, flood, etc., but also from overuse by the visiting public. This plan shall be a guide for such protection in addition to the resource management plan and applicable regulations. Individual protective measures shall include, but not be limited to, such items as prevention of the deterioration or destruction of resources through overuse (such as closing public use areas to allow for revegetation), reduction of mowing to allow for propagation of a younger growth of trees, clearing only those individual sites for camping facilities in order to leave a vegetative barrier between sites. Each year an annual questionnaire will be forwarded by the District to the project for completion by the Resource Manager. The purpose of this questionnaire is to provide a means for the Resource Manager to express himself on visitor management, new trends in

public use at the project, management problems encountered during the year, current project needs, and other resource management problems. Information from this questionnaire will be used in conjunction with user surveys to make adjustments in management programs and shall be reflected in the update of the project's Master Plan. Personnel for proper operation of facilities and for the management of the resources will be needed to accomplish the objectives for this report. These requirements are estimated to be as shown in Table 5, page 2-11.

3. Required Inspections:

To insure management objectives and goals are being attained at project level, routine and random inspections of licensed areas, leased areas, and outgrants should be made by project personnel. The frequency and responsibility of the interim inspections shall be determined in the field by the Resource Manager. Required inspections, the frequency involved, and the personnel responsible are given in Table 6, page 2-12.

TABLE 5

PERSONNEL REQUIREMENTS

Administration

| Title | Present Grade | Optimum Grade |
|---|---|---|
| Resident Engineer (1/6 time) | GS-13 | GS-13 |
| Reservoir Manager | GS-11 | GS-11 |
| Civil Engineering Technician (Res Ofc 1/6 time) | | GS-09 |
| Reservoir Clerk | GS-05 | GS-06 |
| Resident Office Clerk (1/6 time) | GS-05 | GS-06 |

Public Use

| Title | Present Grade | Optimum Grade |
|---|---|---|
| Reservoir Ranger | GS-07 | GS-09 |
| 2 Reservoir Rangers | GS-05 | GS-07 |
| 1 Reservoir Ranger | | GS-07 |

Operation and Maintenance

| Title | Present Grade | Optimum Grade |
|---|---|---|
| Reservoir Maintenance Worker Foreman | WS-07 | WS-07 |
| 3 Reservoir Maintenance Workers | WG-08 | WG-08 |
| 2 Reservoir Maintenance Workers | | WG-05 |
| 2 Laborers | WG-03 | WG-03 |
| Seasonal employees as necessary for workload | | |

TABLE 6

REQUIRED INSPECTIONS

| Type | Frequency | Purpose | Responsibility |
|---|---|---|---|
| Project Inspections | Annual | To evaluate the maintenance of the project and determine the condition of the project structures. | Operations Division |
| Periodic and Continuing | 1 to 5 Years | To make an engineering determination of the function and safety of project structures. | Engineering Division |
| Maintenance Inspections | Bi-monthly | To inspect dam and facilities | Reservoir Manager |
| Distress Inspections | Daily | To detect abnormal conditions | Reservoir Manager |
| Stilling Basin Inspections | 5 years | To insure conditions of the stilling basin. | Operations Division and Engineering Division |
| Compliance Inspections | Annual and Random | To insure compliance with lease, licenses, easements, permits, and regulations. | Real Estate Division and Operations Division |
| Utilization Inspections | Annual | Inspection of all project lands and facilities. | Real Estate Division and Operations Division |

C. Natural Resource Management

1. Fish and Wildlife Management

a. Fish Management:

The Texas Parks and Wildlife Department is the responsible state agency designated to maintain, manage, and improve the fisheries resources of the Bardwell Lake. The fisheries crew operating under the department and who manage the lake fisheries is located in Pottsboro, Texas. Adjunct to these duties, the state department also has game management officers who periodically patrol the lake and enforce all state regulations pertaining to both the fish and wildlife resources. The Corps of Engineers, as represented by the project manager and rangers, maintain liaison with the state department regional fisheries crew, and are receptive to any suggestions as to how the Corps can help regulate or improve the fisheries. One of the primary jobs of the Texas Parks and Wildlife Department fisheries crew is to set gill nets and conduct shoreline seining of the lake. Information tabulated from the catches are represented in a complete fish composition report of the fishes in the lake, and also indicate the relative abundance of the rough fish to the game fish. Management considerations may be forthcoming on data received during the lake sampling surveys. Fishes found in Bardwell Lake according to the latest netting survey made by the state fisheries crew in April 1973 are listed in Section 1-02 of this Master Plan. The Corps of Engineers will augment the state departments efforts by being receptive to any fisheries management proposals on their request. It is part of this management plan to implement a creel census by lake rangers on Bardwell Lake. The Texas Parks and Wildlife Department will be contacted and requested to furnish those creel census data measurements that will prove most useful. Time, labor, funds and equipment for this plan will be furnished by the Corps of Engineers. Information relating to the present fisheries status of Bardwell Lake will also be researched by lake rangers. Information will be gathered from past records of the Texas Parks and Wildlife Department, limnological and biological studies as done by nearby universities, graduate theses etc. Monthly oxygen and

temperature measurements will continue to be part of the lake rangers duties. Hopefully in the future years some important chemical parameters will be recorded on the water quality of Bardwell Lake. This may well form a second part of the present program if necessary funding can be appropriated. Specifics for the above management plan will be incorporated as Appendix D (Fish and Wildlife Management Plan) for Bardwell Lake and made supplementary to this Master Plan.

### b. Wildlife Management

#### (1) Game Species:

The major game species at Bardwell Lake are cottontails, swamp rabbits, bobwhite, mourning dove and waterfowl. Species less important to hunters are red and gray fox, coyote, bobcat, skunk, opossum, and armadillo in the upper reaches of the lake. There are no recorded hunter harvest figures although cottontails, swamp rabbits, bobwhite and mourning dove support heavy to moderately heavy hunting pressure. Waterfowl hunting success fluctuates from year to year and is largely confined to the upper portion of the lake. Red fox, raccoon, gray fox, and coyote provide some sport for hunters using predator calls or running dogs.

#### (2) Requirements For Game Species:

Bardwell Lake has small areas of quality habitat for fox squirrel, cottontail, swamp rabbit, raccoon, and bobwhite quail. A good variety of oaks and pecan, elms, hackberry, willows, and cottonwood grow in the bottomlands and lower upland areas. Associated with these food producers are mesquite, gum elastic, sumac, and plums on the uplands. Grasses, sedges, forbs, and woody shrubs along the creek floodways form excellent range for swamp rabbits. Mesquite and grass, forbs, and miscellaneous sedges and shrubs make attractive coverts for cottontails. Pecan, cottonwood, and other trees along streams and in river bottoms provide good fox squirrel habitat. Waste grains, seeds, or fruits of sunflower, croton, hackberry, elm, ash, sumac, oak, pecan, chinaberry, fruit of gum elastic, and grapes, provide foods for game and non-game species of birds and

mammals. Waterfowl will forage for waste grains available on crop lands up to 50 miles from the lake. Duck millets, sedges, or other foods in creek bottoms, and inlets, in the shallow portion of the lake supplement waste grains available from farming activities. Habitat suited to bobwhite is also sufficient for dove, cottontail, raccoon, skunk, fox, and coyote. Special food plots, or fields of maize, corn, and wheat would make the project into an attractive overwintering area for waterfowl.

(3) Hunting Restrictions:

Hunting should be permitted for all available game species, according to state laws and regulations, on all land and water areas except those in developed intensive use areas and those adjoining project structures. Waterfowl hunting should be permitted from permitted water blinds, temporary land-based blinds, shore blinds, or by jump-shooting. Duck hunting can be safely permitted on most areas between the November and January dates usually set for the Texas season. Due to the lack of public access on private lands, efforts should be made to develop hunting for quail and other small game in season where it can be safely conducted. Game management can be applied in the undeveloped park to provide attractive habitat for all kinds of wildlife as well as in low density recreation areas noted on the Land Use Planning Map. All hunting must conform to Title 36 and the Amendment to Fort Worth District Regulation 1130-2-100 dated 3 November 1971.

(4) Coordination and Cooperation:

Federal and State agencies have shown no interest in lands at Bardwell Lake project so they will be managed by project personnel. State game laws are in effect at Bardwell and are enforced by Game Management Officers of the Texas Parks and Wildlife Department. Coordination of vegetative development with wildlife management is provided in Appendix D to this revised plan.

(5) Rare and Endangered Species:

The Texas red wolf, American Bald Eagle, and

Osprey, are the main species of the rare or endangered animals that may occur at Bardwell Lake. Pure blooded red wolves are extremely rare in this area. Bardwell Lake lies within the range of the American Peregrine and the Prairie falcon. These medium sized hawks are classified as rare and have disappeared from many localities within their overall range. Preservation and enhancement of the present environment is vital to these species. Project personnel should familiarize themselves with the characteristics of these rare or endangered species in the event one is sighted. All sightings should be immediately reported to the Bureau of Sports Fisheries and Wildlife.

(6) Fish and Wildlife Management Plan:

A detailed Fish and Wildlife Management Plan has been developed in accordance with Engineer Regulation 1130-2-400 and is presented as Appendix D to this Revised Master Plan. (For specific details, see Appendix D).

2. Soil Management Concepts:

The soils in this area vary from heavy clays to sandy loam, with some sandy soil. These soils have developed from four basic sources; shale (Eagle Ford formation) chalk (Austin formation) mar (Taylor formation) and alluvial deposits. Soil is a basic factor used in determining the carrying capacity of the resource, therefore, soil protection and stabilization is a most important consideration of resource management. The best protection for these soils is a good vegetative cover.

3. Vegetative Management

a. General:

In the recreational areas to be revitalized, vegetation that can withstand or resist overuse will be favored in order to preserve the beauty of the recreation areas.

b. Grasses:

The climax vegetation at Bardwell is made up of both decreasers (those plants whose numbers decrease with heavy use) and increasers (those plants whose number increase under some heavy use). Invaders (those plants which invade and increase under continued heavy use) are widespread, indicating overuse and disturbance. Some climax species are big and little bluestem, sideoats grama, Texas wintergrass, buffalograss, the tridens, and broomsedge. Invaders include the three-awns, sandbur, and the windmill grasses.

c. Woody Vegetation:

Woody plants (trees and shrubs) inhabit considerable acreage. Some dry land species (uplands) are the oaks, mesquite, honey locust, and the elms. Bottomland trees incluce pecan, hickory, ash, and sycamore. Flood plain trees are willow, cottonwood, and buttonwillow.

d. Revegetation Plan:

Where soils are shallow and without ground cover, or have intense use, erosion becomes a critical problem. A revegetation plan has been developed for those areas with sparse vegetative cover. In developing this plan, the following was considered:

(1) These areas should be seeded with native grasses, forb, or shrubs that are adaptable to the area and can best withstand heavy use. Grasses such as bermuda or buffalograss are recommended for those areas that may be inundated for long periods of time.

(2) Some system of irrigation should be developed at Bardwell Lake because of recurrent droughts. Heavily used park areas are especially in need of irrigation to maintain vegetation and prevent soil erosion.

(3) A shrub and tree planting program will be developed. Trees and shrubs native or adaptable to the area should be planted

where determined necessary by the Resource Manager in coordination with District personnel. Plantings should be accomplished within a two year minimum period prior to any proposed recreational development and be coordinated with wildlife management plantings.

(4) Brush control should be considered in the revegetation plan. Mesquite is the major problem. Mesquite have invaded because of long periods of over-grazing of the native vegetation. Brush control should take place only in areas where the brush is not desirable. Eradication should be done selectively on an individual area basis. Proper control measures must be taken so that no desirable vegetation is destroyed. The practice of spraying by planes and dragging by dozers will be avoided since there is little control of what is destroyed. Brush cleared should not be burned or hauled off, but piled or placed where wildlife can utilize it for protection. Brush that is not piled should be left lying where it falls, providing a place for grass to grow with some protection from grazing. This practice aids in preventing erosion.

(5) Grasses and trees in this area are well adapted to dry seasons, however, during drought periods, the carrying capacity of the land must be reduced to the point of virtually no use. Good land management must be practiced on grazing leases also. Proper management will include livestock distribution by fencing, water, saltblock placement, and feeding. Rotation systems for livestock should be established where practical. This allows for some areas to rest when it has been grazed adequately.

e. Vegetative Management Plan - Appendix B:

A vegetative management plan has been prepared in accordance with Engineer Regulation 1130-2-400 and is presented as Appendix B to this Revised Master Plan. For vegetative management details, see Appendix B.

4. Water Management:

The lake water area will be zoned and buoys placed to identify hazard areas and to control speed of watercraft at the spillway, boat ramps, courtesy docks, swimming areas, and other sites. During peak periods of visitation, measures must be taken to provide necessary control and to help maintain water safety.

a. Control of Floating Debris:

A continual check on floating debris will be made for water safety purposes. Cleanup measures will be taken where necessary.

b. Mooring Policy:

In order to (1) prevent the despoilment of the natural scenic beauty of the shoreline and preserve the shoreline area in as near the project natural state as possible, (2) protect the public interest in the project from the standpoint of fire control and navigational safety, (3) safeguard public health by an effective program of water pollution control, and (4) provide for the general public use, in lieu of private use, of project lands and waters, no permits will be issued for private boathouses. Individuals who desire to store and moor boats, barges, and other vessels on the reservoir for periods in excess of three days at any one time shall arrange for such storage in selected storage areas leased to concessionaires. Such concessionaires shall be responsible for the care and protection of vessels stored with them when not in use, and for the movement of such vessels in case of fluctuation of the lake level, and in other emergencies. Permits will not be issued by the Corps of Engineers for the construction of permanent piers and docks, or for the permanent mooring of any individual boats, boat docks, boathouses, barges, houseboats, or vessels on Bardwell Lake waters and project lands, at locations other than those included in concession lease areas. When justified need for boat storage and vessel mooring facilities develops at various locations throughout the reservoir area, the Corps of Engineers will attempt to provide for these facilities. Written requests from county authorities or other govern-

mental agencies for authority to construct access roads to reservoir waters, and build boat launching facilities and parking areas at the ends of such roads in order to serve adjoining real estate developments will be considered for approval. Bona fide yacht clubs will, upon written request, be given consideration to lease certain land and water areas for the purpose of providing collective multiple storage facilities for vessels belonging to members of the club in accordance with ER 1120-2-400.

D. Created Resources

1. Dam and Pertinent Works:

The Operations and Maintenance Manual (Fort Worth District Regulation 1130-2-62) contains technical data on the operation and maintenance procedures for structures and equipment.

2. Park Areas

a. General:

These areas will be generally administered and managed in accordance with Engineer Regulations 405-1-800, 405-1-830, 405-2-835, 1120-2-400, 1130-2-400, Southwestern Division Regulation 1130-2-7, the Operations and Maintenance Manual, the Revised Master Plan, and attached Appendices.

b. Inspection of Areas:

Park areas shall be continually monitored to detect problem areas, changes in use trends, soil or vegetation erosion, proper maintenance of facilities, and for the management of visitors.

c. Recreational Attitude:

The maintenance and operation of public management areas will reflect an attitude conducive to proper public service. Accomplishment will be through the presence of Rangers in park areas (24 hours when necessary), good sanitation measures, continual cleanup of recreation areas, and constant evaluation of maintenance procedures. Project personnel

will continually offer aid to the visitors. Rangers will also inform the visiting public of their misuse as well as commend them on their good practices. Boating and camping habits, trash disposal practices and water safety habits are good examples of items Rangers should observe. Training will be provided for project personnel who have contact with the public in such areas as listed in Appendix E, paragraph 3, or the new Safety Regulations, Fort Worth District Regulation 385-1-90 dated 3 November 1971.

d. Park Evaluation:

Each park will be evaluated on a continuing basis to determine usage needs, public trends, public demands, and the condition of soil, vegetation, and facilities. Based on these evaluations, overused areas will be clearly marked and fenced to eliminate encroachments, stray cattle, and for visitor control. Clearing of any over-growth which obstructs the monuments should be done regularly.

e. Vandalism Control:

Vandalism will be curbed by providing Ranger presence on a 24-hour basis, if necessary. Contact with local law enforcement officials by Rangers should be maintained by radio where possible. Ranger vehicles should be equipped with dual radios for this purpose with at least one manned vehicle having this equipment in the lake area during each patrol period.

3. User Fee Management:

Section 210 of the Flood Control Act of 1968 (Public Law 90-383) prohibits the use of entrance fees at Corps of Engineers administered projects. Under existing laws and directives, it is the policy of the Corps of Engineers to charge user fees for highly developed camp areas and where special services are provided.

## 2.04 Special Activities

### A. Fire Prevention:

A fire protection plan for Bardwell Lake has been developed and is contained in Appendix C to this Revised Master Plan. The fire protection plan establishes policies, procedures, equipment, and training for personnel to protect project property at Bardwell Lake from damage or destruction by fire. For additional information, see Appendix C, Fire Protection Plan, to this Revised Master Plan.

### B. Safety:

A project safety plan for Bardwell Lake has been developed and is presented in Appendix E to this Revised Master Plan. Under this plan, the Resource Manager has identified common, recurring hazards of unsafe conditions in each major phase or area of his operation. The plan indicates the precautionary actions to be taken to prevent, reduce, or control such hazards. This plan has been coordinated with the District Safety Office for review and recommendations prior to submission to Southwestern Division for approval and attachment to this Revised Master Plan. It will be a guide for safety surveys, and inspections.

### C. Public Health

#### 1. General:

Public health protection is one of the primary responsibilities of the O&M program. All visitors must obey all Federal and State laws and regulations. State Health Department approval of all water and sewage systems to be installed on Government property is required. Bacteriological analysis of public water supplies are conducted monthly and chemical analysis either annually or semi-annually, dependent upon the source. Liquid and solid wastes are collected on schedule and disposed of in an approved manner. Camping, picnicking, and sanitary facilities are cleaned and serviced on regular schedules. The insect and animal control

programs are designed to protect the health and well-being of the visitors. Project personnel will attend the American Red Cross Standard First Aid Course and will participate actively in water safety programs under Fort Worth District Regulation 385-1-90, Project and Recreational Safety Program.

2. Sanitation:

Sanitation, or good housekeeping, is the most effective and economical method of protecting the public health. Therefore, good sanitation programs are stressed and Federal and State rules and regulations are adhered to in design, construction and servicing of facilities.

3. Insect and Animal Control

a. Insect Control

(1) Control Problem:

Undesirable insects, ticks, chiggers, and spiders, attack man or his supplies, materials, structures, and both ornamental and natural vegetation. Many arthropoda are detrimental to man's health or adversely affect his morale. It is therefore imperative that the projects maintain satisfactory control of undesirable species of insects and other arthropoda.

(2) Management:

Project personnel will make routine inspections for insect damage and initiate control programs on an "as needed, where needed" basis. Control programs on private property adjacent to Government land or where extension areas must be treated, will be accomplished in cooperation with the appropriate local, state, or Federal agencies having the authority or interest in the problem.

b. Animal Control

(1) Control Problem:

Rodents may serve as disease carriers, destroy supplies and materials, damage structures, cause fire losses, and damage grasses and shrubs. Their burrows may also cause erosion problems. For these reasons, the projects must maintain a satisfactory degree of control over rodent populations. Predators and similar types of animals will not normally need to be controlled as they are a natural part of the ecosystem. However, in emergency or extreme instances, control will be accomplished by the Bureau of Sports Fisheries and Wildlife's Division of Wildlife Services in accordance with Executive Order 11643, dated 8 February 1972, subject, "Environmental Safeguards On Activities For Animal Damage Control On Federal Lands". *

(2) Management:

The most effective and economical management plan is a preventative program to avert possible outbreaks which could cause serious losses. Project personnel will make routine inspections for signs of rodent damage and initiate control programs when necessary. Control of predators should be accomplished by the Bureau of Sports Fisheries and Wildlife by means of shooting or trapping individual target animals. Measures such as placing poison baits or the use of "coyote getters" are prohibited.

D. Law Enforcement:

Enforcement of civil and criminal laws at the lake on Government land and water remains the responsibility of duly constituted officers of Federal, State, and local governmental agencies. The Corps of Engineers

* Control of wild dogs and other animals creating a nuisance will be handled by live-trapping or other measures by cooperating local authorities.

through field personnel, will cooperate fully with all officers responsible for the enforcement of laws relative to civil actions, game and fish conservation, public health and sanitation, boating, and the prevention of pollution. The Corps of Engineers' citation authority governs refuse dumping and the provisions of Title 36 only. Where practicable, Resource Managers will provide Rangers to man selected park areas on a 24-hour basis during peak recreation periods to provide visitor protection and reduce vandalism. The Resource Manager will attempt to gain passage of local ordinances or laws which will encompass all Corps of Engineers rules and regulations.

2.05 Coordination With Other Agencies:

Coordination with local, state, and Federal agencies is imperative for the operation, management, and development of the natural and man-made resources at Bardwell Lake. The Corps of Engineers has sustained a very strong working relationship with other agencies. This effort enables both interested agencies and the Corps of Engineers to exchange thoughts aimed at developing and managing the project's resources in the best interest of the public. The organizations contacted, with a summary of their contribution to the operation, management, and development of the resources at Bardwell Lake are listed below:

A. Public Hearing:

6-07. Public hearing. A public hearing was held at Ennis, Texas, on 5 March 1963, with a total attendance of 117 persons, which included representatives of various Federal, State, and local governmental agencies and interested individuals. The purpose of the hearing was to inform the public of the proposed plan of land acquisition for Bardwell Reservoir. An exhibit showing the location of the recreation areas was displayed at this hearing.

B. Federal and State Health Services:

The United States Public Health Service, in cooperation with the Texas State Department of Health, submitted in April 1961 a report entitled "Preliminary Evaluation Report on Vector Problems Related to the Proposed Corps of Engineers Bardwell Reservoir, Waxahachie Creek, Texas." A copy of this report was incorporated in Design Memorandum No. 5, General, as Appendix III. The Texas State Health Department furnishes monthly bacteriological analyses for all water supply sources. They also furnish annual or semi-annual chemical analyses depending upon the water source (surface waters are analyzed semi-annually while well waters are analyzed annually). They also approve plans for all sanitary facilities.

C. Texas A&M Extension Service:

The Corps of Engineers coordinates with Texas A&M Extension Service regarding insect and rodent control.

D. Department of Agriculture:

The Corps of Engineers coordinates with the Department of Agriculture regarding weed control. The Soil Conservation Service provides the Corps of Engineers with soils maps and pertinent information used as an aid in development of Corps of Engineers' parks and lands.

E. Federal Aviation Administration:

The Corps of Engineers coordinates with the Federal Aviation Administration for approval of all aerial applications for weed control.

F. Bureau of Sports Fisheries and Wildlife:

On 22 August 1960, the Bureau of Sport Fisheries and Wildlife, * of the U. S. Fish and Wildlife Service, submitted a report on the fish and wildlife resources of the Bardwell project. On 3 December 1962, the Bureau submitted a supplement to the original report. A copy of this report and the supplement are incorporated in Design Memorandum No. 5, General, as Appendix I. The report shows that hunting benefits will amount to about $8,000 annually. Fishing benefits will be insignificant because of the proximity of many existing and potential reservoirs. A potentially valuable commercial fishery however, will be created.

G. Texas Parks and Wildlife Department:

The Texas Parks and Wildlife Department has primary responsibility for management of the fish and wildlife resources at Bardwell Lake. The Department conducts an annual test-netting program to determine species composition, growth rates, and general conditions of the fish population. The Corps of Engineers provides assistance to the Department when requested.

H. Texas Department of Public Safety:

The Corps of Engineers coordinates with the Texas Department of Public Safety concerning law enforcement problems and practices.

* Previously called the Fish and Wildlife Service.

## III. PLAN OF DEVELOPMENT

### 3.01 General:

This plan is designed to be flexible enough to meet variable conditions and changing needs. It is to serve as a guide for the comprehensive management and development of the project through sound planning principles and basic site design criteria. Appropriate provisions are included in the plan for providing recreational facilities for current and projected design loads. It is also intended to provide sufficient services to meet the visitor's needs and demands within the desired carrying capacity of the resource.

### 3.02 Ecological Considerations:

Areas designated for public use as well as those designated for other land uses should be continually observed by project personnel to detect ecological imbalances. An example of this is soil erosion or vegetative wear due to heavy foot and/or vehicular traffic. Areas in question should be referred to qualified personnel at project level or District level as appropriate for further study.

### 3.03 Environmental Statement:

Reference is made to the requirement set forth in the National Environmental Policy Act of 1969 (Public Law 91-190). An environmental impact statement is being prepared for this project in accordance with current guidance.

### 3.04 Methodology:

Factors considered in selecting the areas for recreational development as presented in this Revised Master Plan are:

A. Access to existing roads

B. Topography of the area

C. Scenery

D. Location of the area with respect to the usable exposure of water for recreational activities

E. Degree of shelter for protection

F. Water depths

G. Existing land use

H. Drainage

I. Soils surveys

J. Wind-velocity and direction

3.05 Recreational Facilities:

The following concepts were used in development of this plan:

A. Provide adequate facilities to handle the present and future annual visitation.

B. Limit the development of recreational facilities to the desired carrying capacity of the area for protection of the resources.

3.06 Analyses:

Analyses were conducted to determine visitation projections, ultimate carrying capacity, and facilities required. The desired carrying capacity has not yet been determined. It will be determined in the future according to the criteria outlined in Paragraph A, page 3-03.

A. Visitation Projection Analysis:

In formulating the estimated recreation visits, the population within the day use market area was projected through the year 2020. The population projections for Bardwell Lake are based on a Series C population projection. The day use market area (the geographical area from which 80 percent of the daytime users originate) was determined to be 75 miles. The population projection for the market area is:

POPULATIONS PROJECTIONS FOR THE MARKET AREA

( SERIES C POPULATIONS )

| 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|
| 2,439,000 | 3,038,000 | 3,749,900 | 4,505,000 | 5,357,000 | 6,288,000 |

The per capita use rates for Bardwell Lake's 75 mile zone were computed for 1970 and was adjusted through 2020. The existing per capita use rate is 0.27.

*The per capita rate factors used to adjust the existing per capita use rate through 2020 are:

| 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|
| 1.00 | 1.22 | 1.44 | 1.62 | 1.80 | 1.96 |

The adjusted per capita use rate was applied to the population projections to arrive at the estimated visitation expected to originate from the day-use market area. Then, by adding the additional projected visitation which originates beyond the day use market area (amounting to 20 percent of the total visitation), the total projected participation demand was computed. The projected annual visitation at Bardwell Lake, based on the above population and per capita use participation rates are:

* Based on Project Area Evaluation 1/ by Recreation Section, Sacramento District, dated November 1968.

| Year | Projected Annual Visitation |
|---|---|
| 1975 | 896,500 |
| 1978 | 971,300 |
| 1980 | 1,006,500 |
| 1990 | 1,445,800 |
| 2000 | 1,985,700 |
| 2010 | 2,599,500 |
| 2020 | 3,367,400 |

1,500,000 - Ultimate Capacity

B. Ultimate Carrying Capacity:

A combination of related aspects which concern the ability of the project resources to sustain intense use were studied to determine an ultimate carrying capacity. This ultimate capacity is estimated to be 1,500,000 visitors per year. This figure is a reflection of the aspects of the size, location, sustained ecological balance, and other characteristics of the project. At Bardwell Lake, the projected visitation demand in the decade 2000 is greater than the carrying capacity of the projected resources. Through observation and future visitor use trends, this capacity may change. Future updates will reflect any changes in this capacity due to changing conditions.

C. Desired Carrying Capacity:

The lands adjacent to the lake have a definite desired carrying capacity for recreation use. This capacity will be less than the ultimate carrying capacity eliminating overuse, deterioration, and misuse by the visiting public. As of this date, the desired carrying capacity has not been determined. Field office and District personnel shall monitor site deterioration in conjunction with user density and the influencing factors listed below to develop a desired carrying capacity for the natural resources at this project.

1. Access
2. Slope
3. Existing vegetation
4. Ecological consideration
5. Existing land use
6. Aesthetics
7. Scenic vistas
8. Drainage and soil types
9. Orientation - sun and wind
10. Social interaction zones

These factors will precede the detailed site planning phase at the time funds are appropriated for construction of the planned facilities listed in this Revised Master Plan.

D. Facilities Analysis:

Current and projected recreation visitation was broken into the following activities:

1. Design day load
2. Picnicking
3. Camping
4. Boat ramps for boating, fishing, and skiing
5. Beaches for swimming

For facility requirement computations, see Tables 7 thru 9, pages 3-07 thru 3-09.

E. Future Development:

The ultimate carrying capacity for public use at Bardwell Lake is estimated to be 1,500,000 visitors annually. Facility requirements, determined by the recreation analysis, to support the ultimate visitation is 277 picnic units and 411 camp units. Based on site analysis during field reconnaissance, this Revised Master Plan supports a total of 364 picnic units

and 770 camp units. The number of facilities required by the recreation analysis reflects demand, while the number of facilities supported in the Revised Master Plan reflects a measure of what can be supplied in areas that are feasible for development without permanent damage to the resource. Only through additional land acquisition or through intensive resource management, including visitor and physical resource management (tree planting, etc.), can existing land areas currently not feasible for development be made desirable for recreational development.

TABLE 7

FACILITY REQUIREMENTS - FY 79

Project: Bardwell Lake

Total Annual Attendance: 971,300

Design Load Computations: 11,140

Design Day Load

971,300 total annual attendance X 0.42 visits during summer months X 0.70 which occurs on weekends = 239,641 total number of weekend users.

Total number of weekend users ÷ 26 weekend days = 11,140 design day load.

Picnicking

Design day load X 0.27 of total are picnickers = number of picnickers.

Number of picnickers X 0.40 of picnickers requiring facilities = number of picnickers requiring facilities.

Number of picnickers requiring facilities ÷ turnover rate of 2 ÷ 3.3 persons per vehicle = 182 picnic units required.

Camping

Design day load X 0.08 of total are campers = number of campers.

Number of campers ÷ 3.3 persons per vehicle = 270 camping units required.

Boat Ramps

Design day load ÷ load factor of 3.3 = number of vehicles.

Number of vehicles X 0.37 of vehicles with boats = number of boats.

Number of boats ÷ 60 launchings per day = 21 boat launching lanes required.

Beaches

Design day load X 0.47 swimmers = number of swimmers.

Number of swimmers X 0.60 swimmers on beach = number of beach users.

Number of beach users ÷ turnover rate of 3 = number of users on beach at any one time.

Number of users on beach at same time X 50 square feet of beach per person = 1.20 acres of land area required for sand beaches.

Number of swimmers X 0.30 are swimmers in water = number of swimmers in water.

Number of swimmers in water ÷ turnover rate of 3 = number of swimmers in water at any one time.

Number of swimmers in the water at any one time X 100 square feet of water surface per user = 1.20 acres water surface required.

10% of swimmers need no additional land.

TABLE 8

FACILITY REQUIREMENTS - FY 81

Project: Bardwell Lake

Total Annual Attendance: 1,006,500

Design Load Computations: 11,543

Design Day Load

1,006,500 total annual attendance X 0.42 visits during summer months X 0.70 which occurs on weekends = 300,138 total number of weekend users.

Total number of weekend users ÷ 26 weekend days = 11,543 design day load.

Picnicking

Design day load X 0.27 of total are picnickers = number of picnickers.

Number of picnickers X 0.40 of picnickers requiring facilities = number of picnickers requiring facilities.

Number of picnickers requiring facilities ÷ turnover rate of 2 ÷ 3 persons per vehicle = 188 picnic units required.

Camping

Design day load X 0.08 of total are campers = number of campers.

Number of campers ÷ 3.3 persons per vehicle = 280 camping units required.

Boat Ramps

Design day load ÷ load factor of 3.3 = number of vehicles.

Number of vehicles X 0.37 of vehicles with boats = number of boats.

Number of boats ÷ 60 launchings per day = 22 boat launching lanes required.

Beaches

Design day load X 0.47 swimmers = number of swimmers.

Number of swimmers X 0.60 swimmers on beach = number of beach users.

Number of beach users ÷ turnover rate of 3 = number of users on beach at any one time.

Number of users on beach at same time X 50 square feet of beach per person = 1.24 acres of land area required for sand beaches.

Number of swimmers X 0.30 are swimmers in water = number of swimmers in water.

Number of swimmers in water ÷ turnover rate of 3 = number of swimmers in water at any one time.

Number of swimmers in the water at any one time X 100 square feet of water surface per user = 1.24 acres water surface required.

10% of swimmers need no additional land.

TABLE 9

FACILITY REQUIREMENTS - ULTIMATE

Project: Bardwell Lake

Total Annual Attendance: 1,500,000

Design Load Computations: 16,961

Design Day Load

1,500,000 total annual attendance X 0.42 visits during summer months X 0.70 which occurs on weekends = 441,000 total number of weekend users.

Total number of weekend users ÷ 26 weekend days = 16,961 design day load.

Picnicking

Design day load X 0.27 of total are picnickers = number of picnickers.

Number of picnickers X 0.40 of picnickers requiring facilities = number of picnickers requiring facilities.

Number of picnickers requiring facilities ÷ turnover rate of 2 ÷ 3.3 persons per vehicle = 277 picnic units required.

Camping

Design day load X 0.08 of total are campers = number of campers.

Number of campers ÷ 3.3 persons per vehicle = 411 camping units required.

Boat Ramps

Design day load ÷ load factor of 3.3 = number of vehicles.

Number of vehicles X 0.37 of vehicles with boats = number of boats.

Number of boats ÷ 60 launchings per day = 31 boat launching lanes required.

Beaches

Design day load X 0.47 swimmers = number of swimmers.

Number of swimmers X 0.60 swimmers on beach = number of beach users.

Number of beach users ÷ turnover rate of 3 = number of users on beach at any one time.

Number of users on beach at same time X 50 square feet of beach per person = 1.83 acres of land area required for sand beaches.

Number of swimmers X 0.30 are swimmers in water = number of swimmers in water.

Number of swimmers in water ÷ turnover rate of 3 = number of swimmers in water at any one time.

Number of swimmers in the water at any one time X 100 square feet of water surface per user = 1.83 acres water surface required.

10% of swimmers need no additional land.

## 3.07 Development

### A. General Planning Considerations

#### 1. Selection of Areas:

New areas were selected and some old areas were designated or redesignated for camping, picnicking, and other uses based upon site characteristics, recreation demands, and resource management objectives, including the new administration policy regarding cost sharing and recovery of O&M&R cost as outlined in ER's 1130-2-121 & 123.

a. Control visitor use.

b. Separate non-compatable uses
(day use - overnight use).

c. Define activity areas.

d. Manage and control each area as a separate unit.

e. Utilize screened or buffered areas.

f. User Fee Management

#### 2. Road Developments:

New area circulation roads have been proposed while some existing roads are scheduled to be deleted. The objectives in constructing new area circulation roads and deleting some of the old roads are:

a. To provide uniform and defined traffic flow.

b. To provide vehicular access to existing and proposed camp or picnic units via means of individual pullouts.

c. To prevent excessive through-traffic.

d. To provide traffic control in fee areas.

The circulation roads will be sited in the field. The centerlines of these roads are secondary in importance to the preservation of existing tree cover.

#### 3. Sanitary Facilities:

In areas where intense public use dictates, existing concrete vault type toilets are scheduled to be converted to waterborne facilities. Additional sanitary facilities are proposed to meet visitor needs

and demands. Waste treatment plants and other pollution abatement facilities are planned where the load is extremely heavy and the soils will not accommodate septic tanks. The following criteria was used in determining the number and location of sanitary facilities:

a. Anticipated visitor use of each area.

b. Accessibility by visitors within an area.

c. EM 1110-2-400.

4. Additional Picnic and Camp Units:

The number of additional picnic and camp units was based upon the recreation analysis, and criteria presented in EM 1110-2-400. Each area's site characteristics and existing development were considered before any additional units were scheduled. The number of units proposed for five year development is more than the required visitation computations.

5. Traffic Control Gates:

Traffic control gates are proposed at strategic locations. These gates are to be used as a management tool and have the following functions.

a. Define and Separate areas.

b. Provide visitor direction and control.

c. Provide control for fee areas.

d. Provide a means of closing areas during quiet hours in overnight areas, and during construction, revegetation, and revitalization periods.

6. Traffic Control Barriers:

Barriers are to be used to complement the use of traffic control gates in areas where it is necessary or desirable to exclude vehicles. This will also aid in the prevention of vandalism and illegal dumping on government property. Barriers should be constructed of natural materials local to the area whenever possible.

7. Courtesy Docks:

Courtesy docks have been incorporated in the development of public use areas. These facilities are to be located adjacent to boat launching sites and at selected sites within management areas. Courtesy docks are to be used only for loading or unloading passengers and gear. No boats will be allowed to anchor to the docks except when loading. Appropriate signs will be placed at the docks informing visitors of this restriction.

8. Boat Launch Sites:

One ultimate boat launch site is proposed for development at Bardwell Lake.

B. Project Works Area:

No new development is planned in this Revised Master Plan for the operations and maintenance area.

C. Public Use Areas

1. General Description:

There are 6 public use areas encompassing 1,453 acres of land area adjacent to the lake's 25 mile shoreline. The parks are characterized by moderately sloping terrain with sparse tree cover consisting primarily of mesquite, except for Waxahachie Park which contains primarily large oaks. Ground cover consists of several varieties of grasses such as Texas wintergrass, buffalograss, tall dropseed, vine mesquite, tall grama, hairy grama, switchgrass, Indiangrass, little bluestem, and big bluestem. Prior to construction of the project, the land was used primarily for agriculture and grazing. Shoreline erosin has been severe on the eastern shoreline, which does require intensive vegetation management to stabilize the shoreline. Paved interior circulation roads leading to camp and picnic sites with pullouts have been incorporated in this plan to meet the visitors demand to drive as near to their ultimate destination as possible. This plan of development, coupled with proper traffic control, will alleviate vegetative and erosion problems created by off-road use of vehicles.

2. Specific Parks:

The following pages illustrate the planned development, present status and future requirements of each park. The location of a planned management area is specified by a numbered "bubble". The site layouts were prepared to reflect major facility locations and the design to be used in developing the management area of each park. However, to insure harmonious development with the environment, facility locations must remain flexible to allow for minor adjustments at the time of construction.

3. Primitive Group Camp Area:

This area is shown on the land use plate 2.1 and will be managed as a primitive group camp area for group activities involving short-term camping of a week or less, extended term camping of more than a week and special educational uses on a first-come, first-serve, or short-term reservation basis. A development plan was not proposed at this time, but when development is considered the following facilities should be provided: gravel access road and parking area, vault type restrooms, camp fire circles, hiking trails and/or nature trails.

4. Local Interests Involvement:

As described by EC 1130-2-121, the District Engineer contacted all affected non-federal public bodies by letter to advise them of the current administration policy regarding future recreation development at completed Corps projects. Specifically, Honorable Milton Hartsfield, Ellis County, was contacted by letter dated 10 April 73, explaining the policy and advising that a representative would contact him in the near future to discuss his interests in participating in further recreational development at Corps lakes in his area of concern or jurisdiction. Judge Hartsfield was telephoned 26 April 73, to discuss the cost sharing program and the letter mentioned above. Judge Hartsfield stated that his county was not interested in a cost sharing plan with the Corps but he would not furnish a letter making this statement of non acceptance of the proposal. The Texas Parks and Wildlife Department was contacted also, but did not express an interest in Bardwell Lake. Unless other interests develop, a cost sharing proposal is not anticipated at Bardwell Lake.

# TABLE 10

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: BARDWELL LAKE

PUBLIC AREA: MOTT

(PLANNED DEV.-AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | 56,000 | 0.3 | 17.4 | | | 0.3 | 17.4 |
| B PAVE EXIST. GRAVEL PK. RD. | | | | | | | | |
| C AREA CIRCULATION 1-WAY | | 18,000 | | | 1.6 | 28.8 | 1.6 | 28.8 |
| D AREA CIRCULATION 2-WAY | | 28,000 | 0.1 | 2.8 | 0.3 | 8.4 | 0.4 | 11.2 |
| E GRAVEL | | 10,000 | 0.1 | 1.0 | | | 0.1 | 1.0 |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | 999.0 | 5.0 | 3378.0 | 16.9 | 4377.0 | 21.9 |
| B PAVE EXIST.GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | | | 12931.0 | 64.7 | 12931.0 | 64.7 |
| D GRAVEL PULLOUTS | | 0.003 | 264.0 | 0.8 | | | 264.0 | 0.8 |
| 3 BOAT LAUNCHING RAMPS:(CONC) | S.Y. | | | | | | | |
| A 1-LANE 16 FT.WIDE | | | | | | | | |
| B 2-LANES 32 FT.WIDE | | | | | | | | |
| C 3-LANES 50 FT.WIDE | | | | | | | | |
| D 4-LANES 68 FT.WIDE | | | | | | | | |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | 5.000 | | | 1.0 | 5.0 | 1.0 | 5.0 |
| C DRINKING FOUNTAINS | | 0.220 | 1.0 | 0.2 | 18.0 | 4.0 | 19.0 | 4.2 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40.000 | | | 4.0 | 160.0 | 4.0 | 160.0 |
| B CONVERT TO WATERBORNE TOILETS | | 15.000 | 2.0 | 30.0 | | | 2.0 | 30.0 |
| C MASONRY CONC.VAULT TOILETS | | | | | | | | |
| D SERVICE BLG.(WITH TOILETS, SHOWERS,LAUNDRY FACILITIES) | | | | | | | | |
| E BATHHOUSE WITH TOILETS | | | | | | | | |
| F BATHHOUSE NO TOILETS | | 8.000 | 1.0 | 8.0 | | | 1.0 | 8.0 |
| G SANITARY DUMP STA.(TRAILER) | | | | | | | | |
| H SANITARY DUMP STA.(MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | 100.000 | | | 1.0 | 100.0 | 1.0 | 100.0 |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC,VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | 13.000 | 0.1 | 1.4 | 0.9 | 11.6 | 1.0 | 13.0 |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | 0.050 | | | 70.0 | 3.5 | 70.0 | 3.5 |
| E WATER HOOKUPS | | 0.020 | | | 70.0 | 1.4 | 70.0 | 1.4 |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | 0.425 | | | 40.0 | 17.0 | 40.0 | 17.0 |
| B CAMP UNITS (1 UNIT=1-TABLE,1-COOKER,AND 1-TRASH CAN) | | 0.435 | | | 113.0 | 49.2 | 113.0 | 49.2 |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0.500 | 153.0 | 76.5 | | | 153.0 | 76.5 |
| B GROUP (3-TABLES) | | 5.000 | 2.0 | 10.0 | | | 2.0 | 10.0 |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | 2.100 | 1.0 | 2.1 | 1.0 | 2.1 | 2.0 | 4.2 |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | 8.000 | 1.0 | 8.0 | | | 1.0 | 8.0 |
| B UNIMPROVED | | | | | | | | |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | 1.000 | 0.3 | 0.3 | 0.7 | 0.7 | 1.0 | 1.0 |
| C BULLETIN BOARDS,REG,BOOTHS | | | | | | | | |
| D BUOYS & ANCHOR | | 2.200 | 1.0 | 2.2 | | | 1.0 | 2.2 |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 4.000 | 0.0 | 0.2 | 1.0 | 3.8 | 1.0 | 4.0 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0.550 | 2.0 | 1.1 | 3.0 | 1.6 | 5.0 | 2.7 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | 1.000 | 1.5 | 1.5 | | | 1.5 | 1.5 |
| B BICYCLE TRAILS | | | | | | | | |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES(STEEL)4FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B NET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | 168. | | 478. | | 647. |

## MOTT PARK

This area consists of approximately 270 acres with development on approximately 54 acres. Access to the area is a paved road which connects to FM Highway 985. Existing development consists of picnic facilities, boat ramps, sanitary facilities, beach improvements, and potable water supply. Investments by the Federal Government in development of these facilities is $134,000. Planned development for the next 5 years consists of sanitary improvements, beach improvements, and a group shelter, and an additional picnic area. Planned future development calls for two camping areas and a picnic area.

Visitation Statistics for Mott Park:

| Year | Number of visitors | |
|---|---|---|
| 1967 | 70,600 | (First year of record) |
| 1968 | 72,200 | |
| 1969 | 95,755 | |
| 1970 | 101,472 | |
| 1971 | 137,674 | |
| 1972 | 142,641 | |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 1<br>Natural Area | | Traffic control gate | Traffic control gate |
| 2<br>Picnic Area | 10 picnic units w/shelters<br>Masonry vault toilet<br><br>Courtesy ramp 4-lanes<br><br>2 drinking fountains | Convert existing toilet to water-borne<br>Courtesy dock<br>Group shelter<br>Drinking fountain | |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 3<br>Picnic Area | 30 picnic units w/shelters<br>Masonry vault toilet<br>4 drinking fountains<br>Water treatment plant | Convert existing toilet to water-borne<br>Change shelter w/showers<br>Group shelter | |
| 4<br>Multiple Use Area | | | |
| 5<br>Beach Area | | Beach improvement<br>Buoys | |
| 6<br>Camp Area | | | Waste treatment plant<br>70 camp units w/shelters w/electric and water hookups<br>2 service buildings<br>10 drinking fountains<br>Traffic control gate |
| 7<br>Picnic Area | | | 40 picnic units w/shelters<br>Waterborne toilet<br>Water treatment plant<br>4 drinking fountains<br>Traffic control gate<br>Courtesy dock |
| 8<br>Camp Area | | | 43 camp units w/shelters w/21 tent pads<br>Service building<br>4 drinking fountains<br>Traffic control gate<br>Boating beach<br>1.5 miles hiking trail |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| Additional Supporting Facilities: | | | |
| | 1.9 miles paved park road | .3 mile primary park road<br>.1 mile two-way area circulation road | .3 mile two-way area circulation road |
| | .1 mile gravel road | | 1.6 mile one-way area circulation road |
| | 3750 sq. yds. group paved parking | 994 sq. yds. group paved parking | 3378 sq. yds. group paved parking |
| | | .1 mile gravel road | |
| | | 264 sq. yds. gravel pullouts | 10,251 sq. yds. paved pullouts |

# TABLE 11

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: HARDWELL LAKE

PUBLIC AREA: NOTT EXPANSION

(PLANNED DEV.=AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | | | | | | | |
| B PAVE EXIST. GRAVEL PK. RD. | | 30.000 | | | 0.5 | 15.0 | 0.5 | 15.0 |
| C AREA CIRCULATION 1-WAY | | 18.000 | | | 0.9 | 16.2 | 0.9 | 16.2 |
| D AREA CIRCULATION 2-WAY | | 28.000 | | | 0.4 | 11.2 | 0.4 | 11.2 |
| E GRAVEL | | | | | | | | |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | | | 1177.0 | 5.9 | 1177.0 | 5.9 |
| B PAVE EXIST.GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | | | 4221.0 | 21.1 | 4221.0 | 21.1 |
| D GRAVEL PULLOUTS | | | | | | | | |
| 3 BOAT LAUNCHING RAMPS:(CONC) | S.Y. | | | | | | | |
| A 1-LANE 14 FT.WIDE | | | | | | | | |
| B 2-LANES 32 FT.WIDE | | | | | | | | |
| C 3-LANES 50 FT.WIDE | | | | | | | | |
| D 4-LANES 68 FT.WIDE | | | | | | | | |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | 5.000 | | | 1.0 | 5.0 | 1.0 | 5.0 |
| C DRINKING FOUNTAINS | | 0.220 | | | 8.0 | 1.8 | 8.0 | 1.8 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40.000 | | | 1.0 | 40.0 | 1.0 | 40.0 |
| B CONVERT TO WATERBORNE TOILETS | | | | | | | | |
| C MASONRY CONC.VAULT TOILETS | | | | | | | | |
| D SERVICE BLG.(WITH TOILETS, SHOWERS,LAUNDRY FACILITIES) | | | | | | | | |
| E BATHHOUSE WITH TOILETS | | 50.000 | | | 1.0 | 50.0 | 1.0 | 50.0 |
| F BATHHOUSE NO TOILETS | | | | | | | | |
| G SANITARY DUMP STA.(TRAILER) | | | | | | | | |
| H SANITARY DUMP STA.(MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | | | | — | | | |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC.VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | | | | | | | |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | | | | | | | |
| E WATER HOOKUPS | | | | | | | | |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | 0.425 | | | 56.0 | 23.8 | 56.0 | 23.8 |
| B CAMP UNITS | | | | | | | | |
| (1 UNIT=1-TABLE,1-COOKER,AND 1-TRASH CAN) | | | | | | | | |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0.500 | | | 56.0 | 28.0 | 56.0 | 28.0 |
| B GROUP (3-TABLES) | | 5.000 | | | 1.0 | 5.0 | 1.0 | 5.0 |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | | | | | | | |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | | | | | | | |
| B UNIMPROVED | | 10.500 | | | 1.0 | 10.5 | 1.0 | 10.5 |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | 7.600 | | | 1.0 | 7.6 | 1.0 | 7.6 |
| C BULLETIN BOARDS,REG.BOOTHS | | | | | | | | |
| D BUOYS & ANCHOR | | 2.585 | | | 1.0 | 2.6 | 1.0 | 2.6 |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 2.000 | | | 1.0 | 2.0 | 1.0 | 2.0 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0.550 | | | 3.0 | 1.6 | 3.0 | 1.6 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | | | | | | | |
| B BICYCLE TRAILS | | | | | | | | |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES(STEEL)4FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B NET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | | 247. | | 247. | |

## MOTT PARK EXPANSION

This 105 acre expansion to Mott Park is located adjacent to the southern edge of Mott Park. It is proposed to be incorporated as a part of Mott Park because of the high intensity use of the area by fishermen. Access will be by the embankment service road to the planned picnic and beach area. Management control policies will need to be implemented to eliminate promiscuous roads to the area.

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 1<br>Picnic Area | | | 56 picnic units w/shelters<br>Waterborne toilet<br>6 drinking fountains<br>2 traffic control gates<br>Water treatment plant |
| 2<br>Beach Area | | | Change shelter w/toilets and showers<br>Group shelter<br>Beach improvement<br>Bouys<br>Traffic control gate<br>2 drinking fountains |
| Additional Supporting Facilities: | | | |
| | .5 mile service road | | .5 mile reseal service road<br>.4 mile two-way area circulation road<br>.9 mile one-way area circulation road<br>1177 sq. yds. group paved parking<br>4221 sq. yds. paved pullouts |

# TABLE 12

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: BARDWELL LAKE

PUBLIC AREA: HIGHVIEW

(PLANNED DEV.-AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | | | | | | | |
| B PAVE EXIST. GRAVEL PK. RD. | | | | | | | | |
| C AREA CIRCULATION 1-WAY | | 18,000 | | | 0.9 | 16.2 | 0.9 | 16.2 |
| D AREA CIRCULATION 2-WAY | | 28,000 | | | 0.5 | 14.0 | 0.5 | 14.0 |
| E GRAVEL | | 10,000 | 0.2 | 2.0 | | | 0.2 | 2.0 |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | 111.0 | 0.6 | 6367.0 | 31.8 | 6478.0 | 32.4 |
| B PAVE EXIST. GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | | | 4824.0 | 24.1 | 4824.0 | 24.1 |
| D GRAVEL PULLOUTS | | | | | | | | |
| 3 BOAT LAUNCHING RAMPS: (CONC) | S.Y. | | | | | | | |
| A 1-LANE 14 FT. WIDE | | | | | | | | |
| B 2-LANES 32 FT. WIDE | | | | | | | | |
| C 3-LANES 50 FT. WIDE | | | | | | | | |
| D 4-LANES 68 FT. WIDE | | | | | | | | |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | 5,000 | | | 1.0 | 5.0 | 1.0 | 5.0 |
| C DRINKING FOUNTAINS | | 0.220 | | | 10.0 | 2.2 | 10.0 | 2.2 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40,000 | | | 2.0 | 80.0 | 2.0 | 80.0 |
| B CONVERT TO WATERBORNE TOILETS | | 0.150 | 3.0 | 0.4 | | | 3.0 | 0.4 |
| C MASONRY CONC. VAULT TOILETS | | | | | | | | |
| D SERVICE BLG. (WITH TOILETS, SHOWERS, LAUNDRY FACILITIES) | | | | | | | | |
| E BATHHOUSE WITH TOILETS | | | | | | | | |
| F BATHHOUSE NO TOILETS | | | | | | | | |
| G SANITARY DUMP STA. (TRAILER) | | 2,500 | | | 1.0 | 2.5 | 1.0 | 2.5 |
| H SANITARY DUMP STA. (MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | 100,000 | 1.0 | 100.0 | | | 1.0 | 100.0 |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC. VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | 24,600 | 0.1 | 1.5 | 0.9 | 23.1 | 1.0 | 24.6 |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | 0.050 | 13.0 | 0.6 | 65.0 | 3.2 | 78.0 | 3.9 |
| E WATER HOOKUPS | | 0.020 | 26.0 | 0.5 | 65.0 | 1.3 | 91.0 | 1.8 |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | | | | | | | |
| B CAMP UNITS | | | | | | | | |
| (1 UNIT=1-TABLE, 1-COOKER, AND 1-TRASH CAN) | | 0.435 | | | 65.0 | 28.3 | 65.0 | 28.3 |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0.500 | | | 65.0 | 32.5 | 65.0 | 32.5 |
| B GROUP (3-TABLES) | | 5.000 | 1.0 | 5.0 | 1.0 | 5.0 | 2.0 | 10.0 |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | 2,100 | 1.0 | 2.1 | | | 1.0 | 2.1 |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | | | | | | | |
| B UNIMPROVED | | 3,000 | 1.0 | 3.0 | | | 1.0 | 3.0 |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | | | | | | | |
| C BULLETIN BOARDS, REG. BOOTHS | | | | | | | | |
| D BUOYS & ANCHOR | | 1,200 | 1.0 | 1.2 | | | 1.0 | 1.2 |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 1,775 | 0.0 | 0.1 | 1.0 | 1.7 | 1.0 | 1.8 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0.550 | 2.0 | 1.1 | 2.0 | 1.1 | 4.0 | 2.2 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | | | | | | | |
| B BICYCLE TRAILS | | | | | | | | |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES (STEEL) #FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B NET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | 118. | | 272. | | 390. |

## HIGH VIEW PARK

This area consists of approximately 155 acres with development on 79 acres. Access is over a paved county road leading from State Highway 34. Development by the Corps of Engineers consists of picnic facilities, camping area, boat ramps, sanitary facilities, and potable water supply. Investment by the Federal Government in these facilities is $146,244. Planned future recreational development consists of two complete camping areas and a group area.

Visitation Statistics for High View Park:

| Year | Number of visitors | |
|---|---|---|
| 1967 | 102,000 | (First year of record) |
| 1968 | 110,400 | |
| 1969 | 136,127 | |
| 1970 | 120,273 | (Decreased due to construction work on Highway 34). |
| 1971 | 174,109 | |
| 1972 | 142,902 | |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 1<br>Camp Area | | | 30 camp units<br>w/shelters<br>w/electric and water hookups<br>Waterborne toilet<br>4 drinking fountains<br>Traffic control gate |
| 2<br>Group Area | | | Group shelter<br>Water treatment plant<br>Drinking fountain |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 3<br>Camp Area | | | 35 camp units w/shelters w/electric and water hookups<br>Service building<br>4 drinking fountains<br>Traffic control gate<br>Boating beach<br>Sanitary dump station |
| 4<br>Multiple Use Area | | Traffic control gate | Drinking fountain<br>Traffic control gate |
| 5<br>Camp Area | 26 camp units w/shelters<br>Masonry vault toilet<br>Water treatment plant<br>3 drinking fountains<br>Trailer dump station<br>Well | 13 electric hookups<br>Convert existing toilet to waterborne<br>Waste treatment plant<br>26 water hookups<br>Traffic control gate | |
| 6<br>Beach Areas | Drinking fountain | Beach improvement<br>Play apparatus<br>Buoys | |
| 7<br>Picnic Area | 10 picnic units w/shelters<br>Masonry vault toilet<br>2 drinking fountains | Group shelter<br>Convert existing toilet to waterborne<br>Traffic control gate | |
| 8<br>Picnic Area | 10 picnic units w/shelters<br>Masonry vault toilet<br>Launch ramp w/4 lanes<br>2 drinking fountains | Convert existing toilet to waterborne<br>Courtesy dock | |
| Additional Supporting Facilities: | | | |
| | 1.9 mile paved park road | .2 mile gravel road | .9 mile one-way area circulation road<br>.5 mile two-way area circulation road |
| | 4820 sq. yds. group paved parking<br>880 sq. yds. gravel pullouts | 111 sq. yds. group paved parking | 6367 sq. yds. group paved parking<br>4824 sq. yds. paved pullouts |

# TABLE 13

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: BARDWELL LAKE

PUBLIC AREA: WAXAHACHIE

(PLANNED DEV.-AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | | | | | | | |
| B PAVE EXIST. GRAVEL PK. RD. | | 18,000 | 0.9 | 16.2 | | | 0.9 | 16.2 |
| C AREA CIRCULATION 1-WAY | | 28,000 | 0.3 | 8.4 | | | 0.3 | 8.4 |
| D AREA CIRCULATION 2-WAY | | | | | | | | |
| E GRAVEL | | | | | | | | |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | 378.0 | 1.9 | | | 378.0 | 1.9 |
| B PAVE EXIST. GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | 5628.0 | 28.1 | | | 5628.0 | 28.1 |
| D GRAVEL PULLOUTS | | 0.003 | 528.0 | 1.6 | | | 528.0 | 1.6 |
| 3 BOAT LAUNCHING RAMPS: (CONC) | S.Y. | | | | | | | |
| A 1-LANE 14 FT. WIDE | | | | | | | | |
| B 2-LANES 32 FT. WIDE | | | | | | | | |
| C 3-LANES 50 FT. WIDE | | | | | | | | |
| D 4-LANES 68 FT. WIDE | | | | | | | | |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | | | | | | | |
| C DRINKING FOUNTAINS | | 0.220 | 10.0 | 2.2 | | | 10.0 | 2.2 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40.000 | 2.0 | 80.0 | | | 2.0 | 80.0 |
| B CONVERT TO WATERBORNE TOILETS | | 15.000 | 2.0 | 30.0 | | | 2.0 | 30.0 |
| C MASONRY CONC. VAULT TOILETS | | | | | | | | |
| D SERVICE BLG. (WITH TOILETS, SHOWERS, LAUNDRY FACILITIES) | | | | | | | | |
| E BATHHOUSE WITH TOILETS | | | | | | | | |
| F BATHHOUSE NO TOILETS | | | | | | | | |
| G SANITARY DUMP STA. (TRAILER) | | 2.500 | 1.0 | 2.5 | | | 1.0 | 2.5 |
| H SANITARY DUMP STA. (MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | 100.000 | 1.0 | 100.0 | | | 1.0 | 100.0 |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC. VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | 11.200 | 1.0 | 11.2 | | | 1.0 | 11.2 |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | 0.050 | 124.0 | 6.2 | | | 124.0 | 6.2 |
| E WATER HOOKUPS | | 0.020 | 124.0 | 2.5 | | | 124.0 | 2.5 |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | | | | | | | |
| B CAMP UNITS | | | | | | | | |
| (1 UNIT=1-TABLE, 1-COOKER, AND 1-TRASH CAN) | | 0.435 | 84.0 | 36.5 | | | 84.0 | 36.5 |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0.500 | 84.0 | 42.0 | | | 84.0 | 42.0 |
| B GROUP (3-TABLES) | | | | | | | | |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | 2.100 | 4.0 | 8.4 | | | 4.0 | 8.4 |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | | | | | | | |
| B UNIMPROVED | | | | | | | | |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | 0.400 | 1.0 | 0.4 | | | 1.0 | 0.4 |
| C BULLETIN BOARDS, REG. BOOTHS | | | | | | | | |
| D BUOYS & ANCHOR | | | | | | | | |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 2.100 | 1.0 | 2.1 | | | 1.0 | 2.1 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0.550 | 5.0 | 2.7 | | | 5.0 | 2.7 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | | | | | | | |
| B BICYCLE TRAILS | | | | | | | | |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES (STEEL) 4FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B NET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | 383. | | | | 383. |

## WAXAHACHIE CREEK PARK

This area is located in the upper reaches of the lake along the Waxahachie Creek arm of impoundment. It consists of approximately 205 acres with development on 63 acres. The area is accessible over two gravel county roads which leads from FM Highway 34, and one paved county road which leads from FM Highway 984. Existing development consists of camping facilities, boat launching ramps, sanitary facilities, showers and potable water supply. Planned future recreational development consists of additional camping areas and sanitary facilities. To date, the government has invested $206,851 on existing facilities. Large oak trees gives this park an aesthetic advantage over the other parks.

Visitation Statistics for Waxahachie Creek Park:

| Year | Number of visitors | |
|---|---|---|
| 1967 | 112,000 | (First year of record) |
| 1968 | 126,400 | |
| 1969 | 169,452 | |
| 1970 | 162,316 | (Decrease due to construction work on Highway 34) |
| 1971 | 209,093 | |
| 1972 | 197,155 | |

| Management Area | Existing Facilities | Proposed Facilities: 5-Year Development | Proposed Facilities: Future Development |
|---|---|---|---|
| 1 Camp Area | | 84 camp units w/shelters w/electric and water hookups | |
| | Masonry vault toilet | Convert existing toilet to water-borne | |
| | Water treatment plant | Service building | |
| | Launch ramp 4-lanes | 3 courtesy docks | |
| | Drinking fountain | 10 drinking fountains | |
| | | 3 traffic control gates | |
| | Sanitary dump station | Waste treatment plant | |

| Management Area | Existing Facilities | Proposed Facilities: 5-Year Development | Proposed Facilities: Future Development |
|---|---|---|---|
| 2 Camp Area | 55 camp units (15 w/shelters) | | |
| | 20 gravel pullouts | 2 traffic control gates | |
| | Waterborne toilet | | |
| | Masonry vault toilet | Convert existing toilet to water-borne | |
| | 2 frame toilets | Replace frame toilets w/water-borne toilet | |
| | Sanitary dump station | Sanitary dump station | |
| | Water treatment plant | 40 electric water hookups | |
| | 3 drinking fountains | | |
| | Launch ramp 4-lanes | Courtesy dock | |
| Additional Supporting Facilities: | | | |
| | 2.6 miles paved park road | .3 mile two-way area circulation road | |
| | .1 mile gravel road | .9 mile one-way area circulation road | |
| | 6540 sq. yds. group paved parking | 378 sq. yds. group paved parking | |
| | | 5628 sq. yds. paved pullouts | |
| | | 528 sq. yds. gravel pullouts | |

# TABLE 14

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: BARDWELL LAKE

PUBLIC AREA: BIG MUSTANG

(PLANNED DEV.-AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | | | | | | | |
| B PAVE EXIST. GRAVEL PK. RD. | | 18.000 | | | 2.0 | 36.0 | 2.0 | 36.0 |
| C AREA CIRCULATION 1-WAY | | 28.000 | | | 0.4 | 11.2 | 0.4 | 11.2 |
| D AREA CIRCULATION 2-WAY | | | | | | | | |
| E GRAVEL | | | | | | | | |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | | | 6241.0 | 31.2 | 6241.0 | 31.2 |
| B PAVE EXIST.GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | | | 8658.0 | 43.3 | 8658.0 | 43.3 |
| D GRAVEL PULLOUTS | | | | | | | | |
| 3 BOAT LAUNCHING RAMPS:(CONC) | S.Y. | | | | | | | |
| A 1-LANE 14 FT.WIDE | | | | | | | | |
| B 2-LANES 32 FT.WIDE | | | | | | | | |
| C 3-LANES 50 FT.WIDE | | | | | | | | |
| D 4-LANES 68 FT.WIDE | | 0.030 | | | 982.0 | 29.5 | 982.0 | 29.5 |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | 5.000 | | | 1.0 | 5.0 | 1.0 | 5.0 |
| C DRINKING FOUNTAINS | | 0.220 | | | 17.0 | 3.7 | 17.0 | 3.7 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40.000 | | | 5.0 | 200.0 | 5.0 | 200.0 |
| B CONVERT TO WATERBORNE TOILETS | | | | | | | | |
| C MASONRY CONC.VAULT TOILETS | | | | | | | | |
| D SERVICE BLG.(WITH TOILETS, SHOWERS,LAUNDRY FACILITIES) | | 50.000 | | | 1.0 | 50.0 | 1.0 | 50.0 |
| E BATHHOUSE WITH TOILETS | | | | | | | | |
| F BATHHOUSE NO TOILETS | | | | | | | | |
| G SANITARY DUMP STA.(TRAILER) | | | | | | | | |
| H SANITARY DUMP STA.(MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | 100.000 | | | 1.0 | 100.0 | 1.0 | 100.0 |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC.VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | 17.400 | | | 1.0 | 17.4 | 1.0 | 17.4 |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | 0.050 | | | 123.0 | 6.1 | 123.0 | 6.1 |
| E WATER HOOKUPS | | 0.020 | | | 123.0 | 2.5 | 123.0 | 2.5 |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | | | | | | | |
| B CAMP UNITS | | | | | | | | |
| (1 UNIT=1-TABLE,1-COOKER,AND 1-TRASH CAN) | | 0.435 | | | 129.0 | 56.1 | 129.0 | 56.1 |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0.500 | | | 129.0 | 64.5 | 129.0 | 64.5 |
| B GROUP (3-TABLES) | | | | | | | | |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | 2.100 | | | 3.0 | 6.3 | 3.0 | 6.3 |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | 7.000 | | | 1.0 | 7.0 | 1.0 | 7.0 |
| B UNIMPROVED | | | | | | | | |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | 1.850 | | | 1.0 | 1.8 | 1.0 | 1.8 |
| C BULLETIN BOARDS,REG.BOOTHS | | 1.880 | | | 1.0 | 1.9 | 1.0 | 1.9 |
| D BUOYS & ANCHOR | | | | | | | | |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 0.875 | | | 1.0 | 0.9 | 1.0 | 0.9 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0.550 | | | 5.0 | 2.7 | 5.0 | 2.7 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | | | | | | | |
| B BICYCLE TRAILS | | | | | | | | |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES(STEEL)4FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B NET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | | 677. | | 677. | |

## BIG MUSTANG CREEK PARK

This area is located in the upper reaches of the lake and is on a promontory formed by the junction of the Waxahachie Creek and Mustang Creek arms of the lake. Access is over a partially paved and gravel county road that connects with U.S. Highway 287. The area consists of 75 acres and is devoid of trees. There has been no development to date. The area is used by hunters and fishermen. Since 1969 the estimated visitation has been 21,131. This estimate is made from on-site counts of vehicle and load factors made by the rangers. Future development will consist of group camping, camping, sanitary, and beach facilities.

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 1<br>Beach Area | | | Change shelter w/showers<br>Buoys<br>Beach improvement<br>Traffic control gate |
| 2<br>Camp Areas | | | 117 camp units w/shelters w/electric and water hookups<br>12 drinking fountains<br>3 traffic control gates<br>Waste treatment plant<br>Launch ramp 4-lanes<br>3 courtesy docks<br>4 service buildings |
| 3<br>Play Area | | | Play apparatus<br>1 drinking fountain |
| 4<br>Group Camp Area | | | 6 double camp units w/shelters w/electric and water hookups<br>Water treatment plant<br>3 drinking fountains |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| Additional Supporting Facilities: | | | |
| | | | .3 mile two-way area circulation road<br>2.1 mile one-way area circulation road<br>71 sq. yds. group paved parking<br>9360 sq. yds. paved pullouts |

# TABLE 15

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: BARDWELL LAKE

PUBLIC AREA: LITTLE MUSTANG

(PLANNED DEV.-AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | | | | | | | |
| B PAVE EXIST. GRAVEL PK. RD. | | 18,000 | 1.4 | 25.2 | 1.5 | 27.0 | 2.9 | 52.2 |
| C AREA CIRCULATION 1-WAY | | 24,000 | 0.5 | 14.0 | 0.1 | 2.8 | 0.6 | 16.8 |
| D AREA CIRCULATION 2-WAY | | | | | | | | |
| E GRAVEL | | | | | | | | |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | 4776.0 | 23.9 | 378.0 | 1.9 | 5154.0 | 25.8 |
| B PAVE EXIST.GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | 6834.0 | 34.2 | 7504.0 | 37.5 | 14338.0 | 71.7 |
| D GRAVEL PULLOUTS | | | | | | | | |
| 3 BOAT LAUNCHING RAMPS:(CONC) | S.Y. | | | | | | | |
| A 1-LANE 14 FT.WIDE | | | | | | | | |
| B 2-LANES 32 FT.WIDE | | | | | | | | |
| C 3-LANES 50 FT.WIDE | | | | | | | | |
| D 4-LANES 68 FT.WIDE | | | | | | | | |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | 5,000 | 1.0 | 5.0 | | | 1.0 | 5.0 |
| C DRINKING FOUNTAINS | | 0,220 | 12.0 | 2.6 | 9.0 | 2.0 | 21.0 | 4.6 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40,000 | 2.0 | 80.0 | 3.0 | 120.0 | 5.0 | 200.0 |
| B CONVERT TO WATERBORNE TOILETS | | | | | | | | |
| C MASONRY CONC.VAULT TOILETS | | | | | | | | |
| D SERVICE BLG.(WITH TOILETS, SHOWERS,LAUNDRY FACILITIES) | | | | | | | | |
| E BATHHOUSE WITH TOILETS | | | | | | | | |
| F BATHHOUSE NO TOILETS | | 8,000 | 1.0 | 8.0 | | | 1.0 | 8.0 |
| G SANITARY DUMP STA.(TRAILER) | | 2,500 | 1.0 | 2.5 | | | 1.0 | 2.5 |
| H SANITARY DUMP STA.(MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | 100,000 | 1.0 | 100.0 | | | 1.0 | 100.0 |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC.VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | 26,300 | 0.7 | 18.1 | 0.3 | 8.2 | 1.0 | 26.3 |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | 0,050 | 70.0 | 3.5 | 64.0 | 3.2 | 134.0 | 6.7 |
| E WATER HOOKUPS | | 0,020 | 70.0 | 1.4 | 64.0 | 1.3 | 134.0 | 2.7 |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | 0,425 | 32.0 | 13.6 | 48.0 | 20.4 | 80.0 | 34.0 |
| B CAMP UNITS | | | | | | | | |
| (1 UNIT=1-TABLE,1-COOKER,AND 1-TRASH CAN) | | 0,435 | 70.0 | 30.4 | 64.0 | 27.8 | 134.0 | 58.3 |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0,500 | 102.0 | 51.0 | 112.0 | 56.0 | 214.0 | 107.0 |
| B GROUP (3-TABLES) | | 5,000 | 1.0 | 5.0 | | | 1.0 | 5.0 |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | 2,100 | 1.0 | 2.1 | | | 1.0 | 2.1 |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | | | | | | | |
| B UNIMPROVED | | 5,000 | 1.0 | 5.0 | | | 1.0 | 5.0 |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | 1,400 | 0.7 | 1.0 | 0.3 | 0.4 | 1.0 | 1.4 |
| C BULLETIN BOARDS,REG.BOOTHS | | | | | | | | |
| D BUOYS & ANCHOR | | | | | | | | |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 5,850 | 0.5 | 3.0 | 0.5 | 2.8 | 1.0 | 5.8 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0,550 | 2.0 | 1.1 | 4.0 | 2.2 | 6.0 | 3.3 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | 1,000 | 1.0 | 1.0 | | | 1.0 | 1.0 |
| B BICYCLE TRAILS | | 0,500 | 1.0 | 0.5 | | | 1.0 | 0.5 |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES(STEEL)4FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B PET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | 432. | | 313. | | 745. |

## LITTLE MUSTANG CREEK PARK

This area is located in the upper reaches of the lake on a promontory formed by the junction of the Mustang Creek and Little Creek arms of the lake. The area consists of 163 acres with development of 12 acres to date. Access is over an existing paved county road and a road that was constructed as part of the relocations phase of the project. Existing recreational development consists of boat launching ramps and a sanitary facility. The Federal Government has invested $51,802 in the existing facilities. Planned 5-year recreational development consists of two picnic areas, camping area, beach improvements, group area, and sanitary facilities. Planned future development consists of one additional camping area. This park is recommended for cost sharing if ever desired by either the City of Ennis or Ellis County, because of the accessibility.

Visitation Statistics for Little Mustang Creek Park:

| Year | Number of visitors | |
|---|---|---|
| 1967 | 47,400 | (First year of record) |
| 1968 | 64,500 | |
| 1969 | 83,237 | |
| 1970 | 63,025 | |
| 1971 | 67,811 | |

| Management Area | Existing Facilities | Proposed Facilities: 5-Year Development | Proposed Facilities: Future Development |
|---|---|---|---|
| 1 Natural Area | | Mile Trail | |
| 2 Camp Area | | Sanitary dump station<br>Play equipment | 64 camp units w/shelters w/electric and water hookups<br>Service building<br>5 drinking fountains |
| | | Traffic control gate | Traffic control gate |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 3<br>Camp Area | | 70 camp units w/shelters w/electric and water hookups<br>Service building<br>6 drinking fountains<br>Boating beach | Traffic control gate |
| 4<br>Beach Area | | Change shelters w/showers<br>2 drinking fountains<br>Beach imporvement<br>Buoys | |
| 5<br>Group Area | | Group shelter<br>Drinking fountain<br>Traffic control gate | |
| 6<br>Picnic Area | Launch ramp 4-lanes<br>Frame toilet | 32 picnic units w/shelters<br>Waterborne toilet<br>3 drinking fountains<br>Play equipment<br>Waste treatment plant<br>Courtesy dock<br>Traffic control gate | Waterborne toilet |
| 7<br>Picnic Area | | Mini-bike trail | 48 picnic units w/shelters<br>Water treatment plant<br>Waterborne toilet<br>4 drinking fountains |
| Additional Supporting Facilities: | | | |
| | 1.0 mile paved park road | .5 mile two-way area circulation road<br>1.4 mile one-way area circulation road | .1 mile two-way area circulation road<br>.5 mile one-way area circulation road |
| | 2500 sq. yds. paved parking | 4776 sq. yds. group paved parking<br>6834 sq. yds. paved pullouts | 378 sq. yds. group paved parking<br>7504 sq. yds. paved pullouts |

# TABLE 16

DETAILED ESTIMATE OF COST FOR ADDITIONAL RECREATIONAL FACILITIES

PROJECT: BARDWELL LAKE

PUBLIC AREA: LOVE

(PLANNED DEV.=AMOUNTS IN THOUSANDS OF DOLLARS)

| ITEM | UNIT | UNIT COST $ | 5 YR DEV PLAN QUAN. | 5 YR DEV PLAN COST $ | (FUTURE) QUAN. | (FUTURE) COST $ | TOTAL PLANNED DEV. QUAN. | TOTAL PLANNED DEV. COST $ |
|---|---|---|---|---|---|---|---|---|
| 1 ROADS: | MILE | | | | | | | |
| A PARK ROADS (BIT) | | | | | | | | |
| B PAVE EXIST. GRAVEL PK. RD. | | | | | | | | |
| C AREA CIRCULATION 1-WAY | | 16,000 | 2.1 | 37.8 | 0.9 | 16.2 | 3.0 | 54.0 |
| D AREA CIRCULATION 2-WAY | | 28,000 | 0.8 | 22.4 | 0.3 | 8.4 | 1.1 | 30.8 |
| E GRAVEL | | 10,000 | | | 0.2 | 2.0 | 0.2 | 2.0 |
| 2 PARKING AREAS: | S.Y. | | | | | | | |
| A PAVED (BIT) | | 0.005 | 3271.0 | 16.4 | 2122.0 | 10.6 | 5393.0 | 27.0 |
| B PAVE EXIST.GRAVEL | | | | | | | | |
| C PAVED PULLOUTS | | 0.005 | 9782.0 | 48.9 | 6298.0 | 31.5 | 16080.0 | 80.4 |
| D GRAVEL PULLOUTS | | | | | | | | |
| 3 BOAT LAUNCHING RAMPS:(CONC) | S.Y. | | | | | | | |
| A 1-LANE 14 FT.WIDE | | | | | | | | |
| B 2-LANES 32 FT.WIDE | | | | | | | | |
| C 3-LANES 50 FT.WIDE | | | | | | | | |
| D 4-LANES 68 FT.WIDE | | | | | | | | |
| E EXTENSIONS | | | | | | | | |
| 4 WATER SUPPLY SYSTEMS: | EACH | | | | | | | |
| A WELLS (PRESSURE TYPE) | | | | | | | | |
| B LAKE PUMP AND FILTER | | | | | | | | |
| C DRINKING FOUNTAINS | | 0,220 | 21.0 | 4.6 | 12.0 | 2.6 | 33.0 | 7.3 |
| 5 SANITARY FACILITIES: | EACH | | | | | | | |
| A MASONRY WATERBORNE TOILETS | | 40,000 | 4.0 | 160.0 | 2.0 | 80.0 | 6.0 | 240.0 |
| B CONVERT TO WATERBORNE TOILETS | | 0,015 | 3.0 | 0.0 | | | 3.0 | 0.0 |
| C MASONRY CONC.VAULT TOILETS | | | | | | | | |
| D SERVICE BLG.(WITH TOILETS, SHOWERS,LAUNDRY FACILITIES) | | | | | | | | |
| E BATHHOUSE WITH TOILETS | | | | | | | | |
| F BATHHOUSE NO TOILETS | | | | | | | | |
| G SANITARY DUMP STA.(TRAILER) | | 2,500 | 1.0 | 2.5 | 1.0 | 2.5 | 2.0 | 5.0 |
| H SANITARY DUMP STA.(MARINE) | | | | | | | | |
| I WASTE TREATMENT PLANTS | | 100,000 | 2.0 | 200.0 | | | 2.0 | 200.0 |
| J WASTE DISPOSAL PLANTS | | | | | | | | |
| K FRAME TOILETS (CONC,VAULT) | | | | | | | | |
| 6 UTILITIES: | JOB | | | | | | | |
| A WATER DISTRIBUTION LINES | | 33,900 | 0.7 | 22.7 | 0.3 | 11.2 | 1.0 | 33.9 |
| B ELECTRIC SERVICE LINES | | | | | | | | |
| C LIGHT STANDARDS ETC. | | | | | | | | |
| D ELECTRIC HOOKUPS | | 0,050 | 70.0 | 3.5 | | | 70.0 | 3.5 |
| E WATER HOOKUPS | | 0,020 | 70.0 | 1.4 | | | 70.0 | 1.4 |
| 7 PICNIC AND CAMPING UNITS: | EACH | | | | | | | |
| A PICNIC UNITS | | 0,425 | 88.0 | 37.4 | | | 88.0 | 37.4 |
| B CAMP UNITS | | | | | | | | |
| (1 UNIT=1-TABLE,1-COOKER,AND 1-TRASH CAN) | | 0,435 | 70.0 | 30.4 | 94.0 | 40.9 | 164.0 | 71.3 |
| 8 TABLE SHELTERS: | EACH | | | | | | | |
| A SINGLE (1-TABLE) | | 0,500 | 158.0 | 79.0 | 94.0 | 47.0 | 252.0 | 126.0 |
| B GROUP (4-TABLES) | | 5,000 | 2.0 | 10.0 | | | 2.0 | 10.0 |
| C GROUP (10-TABLES) | | | | | | | | |
| 9 OBSERVATION SHELTERS: | EACH | | | | | | | |
| A WITH WATERBORNE TOILETS | | | | | | | | |
| B NO TOILETS | | | | | | | | |
| 10 FLOATING DOCKS: | EACH | | | | | | | |
| A COURTESY (BOATING) | | 2,100 | 2.0 | 4.2 | 2.0 | 4.2 | 4.0 | 8.4 |
| B FISHING | | | | | | | | |
| C FISH CLEANING HOUSE | | | | | | | | |
| 11 SWIMMING BEACHES | EACH | | | | | | | |
| A IMPROVED | | 9,000 | 1.0 | 9.0 | | | 1.0 | 9.0 |
| B UNIMPROVED | | | | | | | | |
| 12 SIGNS & BUOYS: | JOB | | | | | | | |
| A PARK ENTRANCE SIGNS | | | | | | | | |
| B DIRECTIONAL SIGNS | | 2,500 | 0.9 | 2.2 | 0.1 | 0.3 | 1.0 | 2.5 |
| C BULLETIN BOARDS,REG.BOOTHS | | | | | | | | |
| D BUOYS & ANCHOR | | 2,200 | 1.0 | 2.2 | | | 1.0 | 2.2 |
| 13 SITE IMPROVEMENT: | JOB | | | | | | | |
| A UNDERBRUSHING | | 6,700 | 0.6 | 4.3 | 0.4 | 2.4 | 1.0 | 6.7 |
| B GRADING-DRAINAGE | | | | | | | | |
| C REFORESTATION | | | | | | | | |
| D SEEDING | | | | | | | | |
| E CHANNEL EXCAV. | | | | | | | | |
| 14 LANDSCAPING | JOB | | | | | | | |
| A TURFING AND LANDSCAPING | | | | | | | | |
| 15 GATES | EACH | | | | | | | |
| A TRAFFIC CONTROL GATES | | 0,550 | 8.0 | 4.4 | 2.0 | 1.1 | 10.0 | 5.5 |
| 16 TRAILS | MILE | | | | | | | |
| A HIKING TRAILS | | | | | | | | |
| B BICYCLE TRAILS | | | | | | | | |
| 17 BRIDGES: | L.F. | | | | | | | |
| A FOOT BRIDGES(STEEL)4FT. | | | | | | | | |
| 18 INTERPRETIVE FACILITIES: | EACH | | | | | | | |
| A VISITOR INTERP. CENTER | | | | | | | | |
| 19 FENCING | MILE | | | | | | | |
| A CHAIN LINK | | | | | | | | |
| B NET-WIRE | | | | | | | | |
| C BARBED WIRE | | | | | | | | |
| SUBTOTALS | | | | 703. | | 260. | | 964. |

## LOVE PARK

This area is located on the eastern shore of the lake and consists of 439 acres of which 49 acres have been developed. Access to the northern portion is over a paved county road. Access to the southern portion is over a paved county road and a paved road constructed by the city of Ennis for access to a water treatment plant, which is adjacent to the area. Existing development in the north portion consists of picnic facilities, sanitary facilities, and potable water supply. This area is abundant in bluebonnets and for the past three years has been included in the bluebonnet drive which is held in May each year. 61 acres has been deleted from this park area and rezoned for low density use because the terrain was not conducive to any major park development. The existing development of the south portion consists of picnic facilities, boat ramps, sanitary facilities, beach area, and potable water. Planned development for the next 5 years for the southern part consists of a camping area and sanitary facilities

Visitation Statistics for Love Park:

| Year | Number of visitors | |
|---|---|---|
| 1967 | 111,110 | (First year of record) |
| 1968 | 104,000 | |
| 1969 | 179,599 | |
| 1970 | 169,789 | (Decline due to swimmers going to Mott Park) |
| 1971 | 172,614 | |
| 1972 | 167,631 | |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 1<br>Picnic Area | 20 picnic units (10 w/shelters)<br>Masonry vault toilet<br>Water treatment plant<br>3 drinking fountains | Group shelter<br>Convert existing toilet to water-borne<br>Traffic control gate | |

| Management Area | Existing Facilities | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 2<br>Picnic Area | | 76 picnic units w/shelters<br>2 waterborne toilets<br>8 drinking fountains<br>Waste treatment plant<br>3 traffic control gates | |
| 3<br>State Ramps | Launching ramp 3-lanes | | |
| 4<br>Roadside Picnic Area | | | 6 double picnic units w/shelters<br>Waterborne toilet<br>4 drinking fountains |
| 5<br>Natural Area | | | |
| 6<br>Camp Area | | | 46 camp units w/shelters<br>Service building<br>Traffic control gate<br>6 drinking fountains<br>Courtesy dock |
| 7<br>Camp Area | | | 48 camp units w/shelters<br>Service building<br>Traffic control gate<br>6 drinking fountains<br>Courtesy dock<br>Sanitary dump station |
| 8<br>Picnic Area | 20 picnic units w/shelters<br>Masonry vault toilet<br>3 drinking fountains<br>Change shelter<br>Beach | Convert existing toilet to waterborne<br>Beach improvement<br>Buoys<br>Traffic control gate | |

| Management Area | Existing Development | Proposed Facilities | |
|---|---|---|---|
| | | 5-Year Development | Future Development |
| 9<br>Camp Area | | 70 camp units<br>w/shelters<br>w/electric and water hookups<br>Service building | |
| | Launching ramp<br>4-lanes | 2 courtesy docks<br>Waste treatment plant<br>Sanitary dump station | |
| | Drinking fountain | 8 drinking fountains | |
| | Masonry vault toilet | Convert existing toilet to waterborne<br>2 traffic control gates<br>Play equipment | |
| 10<br>Group Picnic Area | | Group shelter<br>Drinking fountain<br>Traffic control gate | |
| 11<br>Multiple Use Area | | | Concession building<br>2 ball fields |
| 12<br>Natural Area | | 1.5 mile hiking trail<br>2 foot bridges | |
| Additional Supporting Facilities: | | | |
| | | .8 mile two-way area circulation road<br>2.1 miles one-way area circulation road | .3 mile two-way area circulation road<br>.9 mile one-way area circulation road<br>.2 mile one-way gravel road |
| | | 3271 sq. yds. group paved parking<br>9782 sq. yds. paved pullouts | 2122 sq. yds. group paved parking<br>6298 sq. yds. paved pullouts |

## 3.08 Facility Design Concepts

### A. Planning For An Indigenous Character:

The recreational development will endeavor to maintain an indigenous character which will complement the existing environment. Before a structure is designed for any location, a physiographical analysis of the land shall be performed to include the guidelines in the Plan of Development. Each of these processes interact with the other and has implications which can affect facility design solutions. The design of any structure shall blend into the natural environment using indigenous materials which best relate to the character of the region.

### B. Standard Construction Methods

#### 1. General Guidelines

##### a. Flexibility:

All facilities shall be designed to adapt to various sizes as local needs dictate. Building components which are mobile and adaptable to a variety of construction types should be considered.

##### b. Simplicity:

Any proposed design shall be harmonious with its surroundings and simple to build. Good recreation planning and design principals shall be employed to assure that appropriate designs are developed. For example, austerity does not necessarily degrade designs, nor does standardization result in stereotyped facilities.

#### 2. Facilities Descriptions:

Engineer Regulations 1110-2-400, 1120-2-400, 1130-2-400, and 1165-2-400 as well as the following comments will be used as guides in planning new facilities. Every effort shall be made to meet program requirements and preserve natural resource qualities.

a. Roads and Rights-of-Way:

Clearing for road rights-of-way in public access areas will be confined within the top of the back slope and/or the toe of the fill where this type of construction is used. Where no cuts or fills are made, clearing will only extend as far as it is needed on either side of the road. Where possible clearing will be the width of the base course only. In order to prevent the needless destruction of desirable trees and shrubs, the back slope shall be warped around such growth. Excessive ditching will be eliminated in order that vegetation may grow as close to the road as possible. Selective plantings will be performed to encourage desirable growth on the back slopes. Selective clearing will be performed or supervised by trained district personnel by an on-the-site analysis. In all cases natural vegetation and understory should continue to grow as close to the road as possible to maintain a park-like appearance as well as to discourage off-road use. Area circulation roads, except in extreme instances, will conform to the following general practices in order to lessen their impact on the park environment:

(1) Use minimum cuts or fills

(2) Follow lay of land

(3) Natural drainage pattern to continue across the road

(4) Maximum width for one way roads will be 12 feet (10 feet minimum) with no shoulders

(5) Maximum width for two way roads will be 20 feet (18 feet minimum) with 2 feet shoulders

These roads will complement units and facilities and will be designed to make these facilities accessible to vehicular traffic via paved pullouts. It is not the intent to design these roads solely for the purpose of moving traffic. Consequently, site designs with specific unit locations will determine where access is needed. Designation of road centerlines will take place during relocation of the existing units to conform to new or proposed road patterns that will prevent possible management problems such as off-road use, multiple access, clustering, overcrowding, etc.

b. Controlled Access Ways:

Means will be developed to control the access routes into the project areas. For example, vegetation programs and physical barriers using indigenous materials such as berms, wooden posts, rustic fence, rock out-croppings, and existing natural vegetation can be used to control access into and within park areas.

3. Summary of Cost Estimates

a. General:

The cost estimates for the planned development used in the Cost Estimates Tables are based on:

(1) Adjusted July 1971 price levels

(2) Experienced cost of similar facilities

(3) Estimated cost of facilities not previously constructed

The total cost for all recreational facilities presented in this plan is an increase of $1,767,321 over the total cost estimate for development in the Updated Master Plan approved by the Chief of Engineers, dated May 1969. The increase in cost is due to the following conditions:

(1) Additional recreational facilities needed to accommodate the general public use of the project as indicated in the Facilities Analysis under Section III of this plan.

(2) Upgrading of basic facilities to current standards.

(3) Inclusion of waterborne sanitary facilities.

(4) Increase in unit prices to reflect the estimated 1 July 1972 construction price level increase.

b. The planned development cost for the five-year and future development plan is presented as Table 17, page 3-44. The total existing and planned facilities supported by this Master Plan is presented as Table 18, page 3-45. A summary of cost, by park, is presented as Table 19, page 3-46.

c. Funds required for operation and maintenance at Bardwell Lake are shown in Table 20, page 3-47.

# TABLE 17

## SUMMARY OF PLANNED FACILITIES

| Item Number | Item | Unit | 5-Year Development Plan Quantity | 5-Year Development Plan Cost | Future Development Plan Quantity | Future Development Plan Cost |
|---|---|---|---|---|---|---|
| 1. | ROADS: | Mile | | | | |
| | a. Park Roads (Bituminous) | | 0.3 | 17,400 | | |
| | b. Pave Existing Gravel Park Road | | | | 0.5 | 15,000 |
| | c. Area Circulation Road - 1 way | | 4.4 | 79,200 | 7.8 | 14,040 |
| | d. Area Circulation Road - 2 way | | 1.7 | 47,600 | 2. | 56,000 |
| | e. Gravel | | 0.3 | 3,000 | 0.2 | 2,000 |
| 2. | PARKING AREAS: | Sq. yds. | | | | |
| | a. Paved Parking (Bituminous) | | 9,535. | 47,675 | 19,663. | 98,315 |
| | b. Pave Existing Gravel Parking | | | | | |
| | c. Paved Pullouts | | 22,244. | 111,220 | 44,436. | 222,180 |
| | d. Gravel Pullouts | | 792. | 2,376 | | |
| 3. | BOAT LAUNCHING RAMPS (CONCRETE) | Sq. yds. | | | | |
| | a. 1-Lane, 14 feet wide | | | | | |
| | b. 2-Lanes, 32 feet wide | | | | | |
| | c. 3-Lanes, 50 feet wide | | | | | |
| | d. 4-Lanes, 68 feet wide | | | | | |
| | e. Extensions | | | | 982. (*1) | 29,460 |
| 4. | WATER SUPPLY SYSTEMS: | Each | | | | |
| | a. Wells (Pressure Type) | | | | | |
| | b. Lake Pump and Filter | | 1. | 5,000 | 4. | 20,000 |
| | c. Drinking Fountains | | 44. | 9,680 | 74. | 16,280 |
| 5. | SANITARY FACILITIES: | Each | | | | |
| | a. Masonry Waterborne Toilets | | 8. | 320,000 | 17. | 680,000 |
| | b. Convert to Waterborne Toilets | | 10. | 60,495 | | |
| | c. Masonry Concrete Vault Toilets | | | | | |
| | d. Service Building With Toilets, Showers, Laundry Facilities | | | | | |
| | e. Bathhouse With Toilets | | | | 2. | 100,000 |
| | f. Bathhouse Without Toilets | | 2. | 16,000 | | |
| | g. Sanitary Dump Station (Trailer) | | 3. | 7,500 | 2. | 5,000 |
| | h. Sanitary Dump Station (Marine) | | | | | |
| | i. Waste Treatment Plants | | 5. | 500,000 | 2. | 200,000 |
| | j. Waste Disposal Plants | | | | | |
| | k. Frame Toilets (Concrete Vault) | | | | | |
| 6. | UTILITIES: | Job | | | | |
| | a. Water Distribution Lines | | 0.4 | 54,966 | .6 | 71,434 |
| | b. Electric Service Lines | | | | | |
| | c. Light Standards, Etc. | | | | | |
| | d. Electric Hookups | | 0.5 | 13,850 | .5 | 16,100 |
| | e. Water Hookups | | 0.5 | 5,800 | .5 | 6,440 |
| 7. | PICNIC AND CAMP UNITS: | Each | | | | |
| | a. Picnic Units | | 120. | 51,000 | 144. | 61,200 |
| | b. Camp Units (1 Unit = 1 Cooker and 1 Trash Can) | | 224. | 97,440 | 465. | 202,275 |
| 8. | TABLE SHELTERS: | Each | | | | |
| | a. Single (1 Table) | | 497. | 248,500 | 456. | 228,000 |
| | b. Group (3 Tables) | | 6. | 30,000 | 2. | 10,000 |
| | c. Group (10 Tables) | | | | | |
| 9. | OBSERVATION SHELTERS: | Each | | | | |
| | a. Shelter With Waterborne Toilets | | | | | |
| | b. Shelter Without Toilets | | | | | |
| 10. | FLOATING DOCKS: | Each | | | | |
| | a. Courtesy (Boating) | | 9. | 18,900 | 6. | 5,100 |
| | b. Fishing | | | | | |
| | c. Fish Cleaning House | | | | | |
| 11. | SWIMMING BEACHES: | Each | | | | |
| | a. Improved | | 2. | 17,000 | 1. | 7,000 |
| | b. Unimproved | | 2. | 8,000 | 1. | 10,500 |
| 12. | SIGNS AND BUOYS: | Job | | | | |
| | a. Park Entrance Signs | | | | | |
| | b. Directional Signs | | 0.3 | 3,866 | .7 | 10,884 |
| | c. Bulletin Boards, Registration Booth | | | | | |
| | d. Buoys and Anchors | | 0.6 | 5,600 | .4 | 4,465 |
| 13. | SITE IMPROVEMENTS: | Job | | | | |
| | a. Underbrushing | | 0.4 | 9,661 | .6 | 13,639 |
| | b. Grading - Drainage | | | | | |
| | c. Reforestation | | | | | |
| | d. Seeding | | | | | |
| | e. Channel Excavation | | | | | |
| 14. | LANDSCAPING: | Job | | | | |
| | a. Turfing and Landscaping | | | | | |
| 15. | GATES: | Each | | | | |
| | a. Traffic Control Gates | | 19. | 10,450 | 19. | 10,450 |
| 16. | TRAILS: | Mile | | | | |
| | a. Hiking Trails | | 2.5 | 2,500 | | |
| | b. Bicycle Trails | | 1. | 500 | | |
| 17. | BRIDGES: | Linear Feet | | | | |
| | a. Foot Bridges (Steel) 4 Feet | | | | | |
| 18. | INTERPRETIVE FACILITIES: | Each | | | | |
| | a. Visitor Interpretive Center | | | | | |
| 19. | FENCING: | Mile | | | | |
| | a. Chain Link | | | | | |
| | b. Net Wire | | | | | |
| | c. Barbed Wire | | | | | |
| | | TOTAL DIRECT COST | | $ 1,805,179 | | $ 2,249,622 |
| | | ENGINEERING AND DESIGN | | 162,466 | | 202,466 |
| | | SUPERVISION AND ADMINISTRATION | | 108,311 | | 134,977 |
| | | TOTAL | | $ 2,075,956 | | $ 2,587,065 |

* Sites

# TABLE 18

## TOTAL EXISTING AND PLANNED FACILITIES

| Item Number | Item | Unit | Existing Facilities Through FY 1973 Quantity | Planned Facilities Quantity | Planned Facilities Cost |
|---|---|---|---|---|---|
| 1. | ROADS: | Mile | | | |
| | a. Park Roads (Bituminous) | | 10.35 | 0.3 | 17,400. |
| | b. Pave Existing Gravel Park Road | | | 0.5 | 15,000. |
| | c. Area Circulation Road - 1 way | | | 12.2 | 219,600. |
| | d. Area Circulation Road - 2 way | | | 3.7 | 103,600. |
| | e. Gravel | | .2 | 0.5 | 5,000. |
| 2. | PARKING AREAS: | Square Yards | | | |
| | a. Paved (Bituminous) | | 22,740 (*2,370) | 29,198. | 145,990. |
| | b. Pave Existing Gravel | | | | |
| | c. Paved Pullouts | | | 66,680. | 333,400. |
| | d. Gravel | | | 792. | 2,376. |
| 3. | BOAT LAUNCHING RAMPS: (Concrete) | Lanes | | | |
| | a. 1-Lane, 14 feet wide | | | | |
| | b. 2-Lanes, 32 feet wide | | | | |
| | c. 3-Lanes, 50 feet wide | | | | |
| | d. 4-Lanes, 68 feet wide | | 6(*1) | 982. | 29,460. |
| | e. Extensions | | | | |
| 4. | WATER SUPPLY SYSTEMS: | Each | | | |
| | a. Wells (Pressure Type) | | | | |
| | b. Lake Pump and Filter | | 4 | 5. | 25,000. |
| | c. Drinking Fountains | | 26 | 118. | 25,960. |
| 5. | SANITARY FACILITIES: | Each | | | |
| | a. Masonry Waterborne Toilets | | 1 | 25. | 1,000,000. |
| | b. Convert Concrete Vault Toilets | | | 10. | 60,495. |
| | c. Masonry Concrete Vault Toilets | | 10 | | |
| | d. Service Building (With Toilets, Showers, Laundry Facilities) | | | | |
| | e. Bathhouse with Toilets | | | 2. | 100,000. |
| | f. Bathhouse Without Toilets | | 1 | 2. | 16,000. |
| | g. Sanitary Dump Station (Trailer) | | 2 | 5. | 12,500. |
| | h. Sanitary Dump Station (Marine) | | | | |
| | i. Waste Treatment Plants | | | 7. | 700,000. |
| | j. Waste Disposal Plants | | | | |
| | k. Frame Toilets (Concrete Vault) | | 4 | | |
| 6. | UTILITIES: | Job | | | |
| | a. Water Distribution Lines | | 17,624 | 1. | 126,400. |
| | b. Electric Service Lines | | | | |
| | c. Light Standards, Etc. | | | | |
| | d. Electric Hookups | | 10 | 1. | 29,950. |
| | e. Water Hookups | | | 1. | 12,240. |
| 7. | PICNIC AND CAMP UNITS: | Each | | | |
| | a. Picnic Units | | 100 | 264. | 112,200. |
| | b. Camp Units (1 Unit = 1 cooker and 1 trash can) | | 81 | 689. | 299,715. |
| 8. | TABLE SHELTERS: | Each | | | |
| | a. Single (1 table) | | 131 | 953. | 476,500. |
| | b. Group (3 tables) | | | 8. | 40,000. |
| | c. Group (10 tables) | | | | |
| 9. | OBSERVATION SHELTERS: | Each | | | |
| | a. With Waterborne Toilets | | | | |
| | b. Without Toilets | | 1 | | |
| 10. | FLOATING DOCKS: | Each | | | |
| | a. Courtesy (Boating) | | | 15. | 31,500. |
| | b. Fishing | | | | |
| | c. Fish Cleaning House | | | | |
| 11. | SWIMMING BEACHES: | Each | | | |
| | a. Improved | | 1 | 3. | 24,000. |
| | b. Unimproved | | 1 | 3. | 18,500. |
| 12. | SIGNS AND BUOYS: | Job | | | |
| | a. Park Entrance Signs | | As Required | | |
| | b. Directional Signs | | As Required | 1. | 14,750. |
| | c. Bulletin Boards, Registration Booth | | | | |
| | d. Buoys and Anchor | | As Required | 1. | 10,065. |
| 13. | SITE IMPROVEMENT: | Job | | | |
| | a. Underbrushing | | As Required | 1. | 23,300. |
| | b. Grading - Drainage | | | | |
| | c. Reforestation | | As Required | | |
| | d. Seeding | | As Required | | |
| | e. Channel Excavation | | | | |
| 14. | LANDSCAPING: | Job | | | |
| | a. Turfing and Landscaping | | | | |
| 15. | GATES: | Each | | | |
| | a. Traffic Control Gates | | | 38. | 20,900. |
| 16. | TRAILS: | Mile | | | |
| | a. Hiking Trails | | | 2.5 | 2,500. |
| | b. Bicycle Trails | | | 1. | 500. |
| 17. | BRIDGES: | Linear Feet | | | |
| | a. Foot Bridges (Steel) 4 feet | | | | |
| 18. | INTERPRETIVE FACILITIES: | Each | | | |
| | a. Visitor Interpretive Center | | | | |
| 19. | FENCING: | Mile | | | |
| | a. Chain Link | | | | |
| | b. Net-Wire | | | | |
| | c. Barbed Wire | | | | |

| | |
|---|---|
| TOTAL DIRECT COST | $ 4,054,801. |
| ENGINEERING AND DESIGN | 364,932. |
| SUPERVISION AND ADMINISTRATION | 243,288. |
| TOTAL | $ 4,663,021 |

* By others

TABLE 19

SUMMARY OF ESTIMATED COST FOR

ADDITIONAL RECREATIONAL FACILITIES BY AREA

| Account Number | Park Areas | Estimated Cost |
|---|---|---|
| 711 | Recreational Facilities: | |
| | Mott | $ 647,100. |
| | Mott Expansion | 247,300. |
| | Little Mustang | 745,700. |
| | Big Mustang | 677,200. |
| | Love | 964,300. |
| | Waxahachie | 383,000. |
| | Highview | 390,200. |
| | TOTAL DIRECT COST | $ 4,055,000. |
| 30 | Engineering and Design | 364,900. |
| 31 | Supervision and Administration | 243,300. |
| | TOTAL | $ 4,663,000 |

TABLE 20

FUNDS REQUIRED FOR OPERATION AND MAINTENANCE

1. The estimated annual cost of operation and maintenance and real estate management is:

| | | |
|---|---|---|
| **Recreation Facilities:** | | |
| Operation and maintenance facilities (includes contract cleanup, mowing, grading and maintenance of roads, repair of structures, nature area, etc.) | | $ 263,000 |
| Project Office | | 25,000 |
| District Office staff functions | | 20,000 |
| | SUB TOTAL | $ 308,000 |
| **Real Estate Management Services:** | | |
| Real Estate records, reports, audits | | $ 2,000 |
| Compliance inspections | | 4,000 |
| Outgrants | | 8,000 |
| Crops, timber, and gravel | | 1,000 |
| Utilization | | 1,000 |
| Other | | 1,000 |
| | SUB TOTAL | $ 17,000 |
| | TOTAL | 325,000 |

2. The above breakdown is developed from the past three years of actual cost. For planned recreational development, the average annual estimate is based on the capital outlay of the facilities for the five-year development plan.

## IV. SUMMARY

### 4.01 Analysis:

This Revised Master Plan incorporates recent criteria and concepts as a result of the OCE Task Force on resource management and eliminates some existing information included in past updated Master Plans. This was done in an effort to develop a more comprehensive and workable plan.

### 4.02 Estimate of the Situation:

Bardwell Lake is in need of additional recreational facilities to accommodate the expected visitation. A means for controlling the use of parks is necessary to prevent further deterioration of project resources. All control measures will need to be in effect before the year 1990. Partial control measures for individual management areas or isolated park resource problem areas should be implemented immediately.

### 4.03 Conclusions:

The development of Bardwell Lake is dependent upon the management of its resources and the visiting public. The plan for development and management herein will enable future visitors to continue to have a quality recreational experience without permanent damage to the project resources.

### 4.04 Submittal For Approval:

It is recommended that the planned development, as shown herein, be implemented. The Revised Master Plan for Bardwell Lake is submitted for approval.

DESIGN MEMORANDUM NUMBER 7C

**APPENDIX (A)**

**PROJECT RESOURCE MANAGEMENT PLAN**

**REVISED MASTER PLAN**

# BARDWELL LAKE

TRINITY RIVER BASIN

WAXAHACHIE CREEK, TEXAS

**U.S. ARMY ENGINEER DISTRICT** **FORT WORTH, TEXAS**

**MARCH, 1975**

DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102.

REPLY TO
ATTENTION OF:

SWFOD-M

20 March 1975

SUBJECT: Project Resource Management Plan, Appendix A, Design Memorandum No. 7C, Bardwell Lake, Trinity River Basin, Waxahachie Creek, Texas

Division Engineer, Southwestern
ATTN: SWDCO-OR

1. Reference Engineer Regulation 1130-2-400 dated 28 May 1971, SWDPL-R letter dated 8 March 1972, subject: Recreation Resource Planning and Management, and 2nd Indorsement thereto dated 17 May 1972.

2. In accordance with schedules previously furnished, seven copies of Appendix A, Project Resource Management Plan, Design Memorandum No. 7C, Revised Master Plan, Waxahachie Creek, Texas are submitted for approval.

FOR THE DISTRICT ENGINEER:

ALLIE J. MAJORS
Chief, Operations Division

1 Inclosure (7 cys)
As stated

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# APPENDIX A

## PROJECT RESOURCE MANAGEMENT PLAN

## BARDWELL LAKE

### REVISIONS AND UPDATES

Date

Page

# APPENDIX A

## PROJECT RESOURCE MANAGEMENT PLAN

### I. BACKGROUND INFORMATION

1.01 Purpose of the Project:

Bardwell Lake is a flood control and water conservation project which is also heavily utilized for recreational purposes. The Trinity River Authority has consumated contracts with the cities of Ennis and Waxahachie to obtain water from the lake for municipal and industrial purposes.

1.02 Operational Concepts:

The management of the project is attained through combined efforts of the District Office and field personnel. District personnel are principally concerned that the project is operated in accordance with the purpose for which it was authorized. Project personnel are concerned with direct operation, management, and maintenance of the project. The overall management objective of the Corps is maintenance of all facilities, conservation of natural environment, protection of visitors and personnel, and prevention of physical encroachments. Recreational facilities are developed in accordance with the approved Master Plan. The conservation pool elevation is 421.0 feet msl. This elevation is used to guide the development of recreational facilities. The Reservoir Rangers make visual surveys of the type of different activities and locations while performing their regular duties at Bardwell Lake. Information from these surveys is helpful in recommending future recreation facilities as well as areas for future development. Several small towns and the cities of Ennis and Waxahachie are near Bardwell Lake. These figures are also factors in planning for future recreational development. Visitation figures are represented on Table 1, page A-07, which states that the visitation figures have fluctuated significantly for the past eight years.

1.03 Land Acquisition Policy:

Land acquisition consists of approximately 7,488 acres in fee title (3,570 inundated) and lesser interest has been acquired over 675 acres. Fee title has been acquired to a blocked out line encompassing the upper guide contour of elevation 444.0 or 300 feet horizontally from the spillway elevation of 439.0, whichever is greater, and other additional lands which were required for public access. The 274 acres acquired for project operations is adequate. Only 257 acres of the 1,407 acres designated for parks has been developed.

## II. PUBLIC USE DEVELOPMENT

### 2.01 Public Use Areas:

The Master Plan established six parks at Bardwell Lake. Five now have recreational development. These are Mott, High View, Waxahachie Creek, Little Mustang, and Love parks. Big Mustang Park has no development.

### 2.02 Mott Park:

Reference, Revised Bardwell Lake Master Plan, Design Memorandum 7C for the current park description data. Existing development consists of picnic facilities, boat ramps, sanitary facilities, beach improvements, and potable water supply. Planned future development calls for tent camping areas, additional picnic facilities, sanitary facilities, potable water supply, and nature trails. A 105 acre park expansion to Mott Park has been incorporated to meet the requirements for additional recreation facilities. There is only about a 30 percent tree cover in this park. Approximately 3 years ago a number of trees and shrubs were planted in Mott Park but only about 40 percent survived. Another tree planting program needs to be implemented in the near future. Forty trees native to the area were transplanted during the winter months with a survival rate of 80 percent.

### 2.03 High View Park:

Reference, Revised Bardwell Lake Master Plan, Design Memorandum 7C for the current park description data. In June 1967 a 25 year contract for a marina was awarded. This consists of five acres of land and five acres of water. Services furnished by the marina consist of boat storage, sale of groceries, camping and fishing supplies, and all-weather fishing barge. Total assets to date are $18,400. Development by the Corps of Engineers consists of picnic facilities, camping areas, boat ramps, sanitary facilities, sanitary dump station, and potable water supply. Planned future recreational development will consist of beach improvements, group shelter, additional camping areas, sanitary facilities, and potable water supply.

Tree cover in the area is very scarce except for some small voluntary native pecan trees and approximately 50% survival on the trees and shrubs that were planted during the tree planting program 3 years ago. There is still a good grass cover in the area. There is no problem with recreational vehicles in this area.

2.04 Waxahachie Creek Park:

Reference, Revised Bardwell Lake Master Plan, Design Memorandum 7C for the current park description data. Existing development consists of camping facilities, tent camping areas, boat launching ramps, sanitary dump station, sanitary facilities, showers, and potable water supply. Planned future recreational development consists of camping areas, tent camping areas, sanitary facilities, and potable water supply. There is about an 80% tree cover in the developed area of this park consisting of native type trees. There is a need for tree planting in the undeveloped area in the future. There is a good grass cover over most of the park except for small areas where camping is heavy.

2.05 Big Mustang Creek Park:

Reference, Revised Bardwell Lake Master Plan, Design Memorandum 7C for the current park description data. This estimate was made from on-site counts of vehicles and load factors made by the Rangers. The area will be utilized mainly as a camping area and development will consist of the construction of camping facilities, play areas, beach improvements, sanitary facilities, potable water supply, and launching facilities.

2.06 Little Mustang Creek Park:

Reference, Bardwell Lake Master Plan, Design Memorandum 7C for the current park description data. Existing recreational development consists of boat launching ramps, and sanitary facilities. Planned future recreational development will include picnic facilities, camping facilities, beach improve-

ments, potable water supply, and additional sanitary facilities. There is a need for more grass cover to prevent erosion in some areas.

2.07 Love Park:

Reference, Bardwell Lake Master Plan, Design Memorandum 7C for the current park description data. Existing development in the north portion consists of picnic facilities, tent camping areas, sanitary facilities, and potable water supply. The existing development of the south portion consists of picnic facilities, tent camping areas, boat ramps, sanitary facilities, a swimming beach, a change shelter with showers, and potable water. There is good grass cover in this park except at the beach area in the southern portion of the park. This area is in poor condition due to wave action and sheet erosion. The wave action has washed all sand from the beach area leaving stumps and roots exposed above ground. There needs to be more sand hauled into the area. The native tree cover in the area is mesquite.

2.08 Pollution Control:

A. The present method for cleaning and trash pickup in park areas is by contract. An alternative to the present contracting of trash pick-up and cleaning is to take them over as a project function. This would provide better control, higher standards of cleaning, and more frequent trash pick-ups. Waste from sanitary facilities and solid wastes from recreation areas are collected and disposed of in municipal systems and in approved landfills.

B. During the peak season, table and shelter areas, trash cans and fountains are cleaned on Sunday, Monday and Friday. Toilets are cleaned four times weekly on Sunday, Monday, Wednesday and Friday. The contract also specifies weekly mowing around these facilities. During the off season, 1 September through 31 March, the table and shelter areas, trash cans and fountains are cleaned on Mondays. Toilets are cleaned on Mondays and Fridays. Mowing is accomplished weekly up through October. This frequency of cleanup seems to provide coverage for all areas and usage demands except for the isolated utilization of a park area by a large group before one of the non-

cleaning days. To date cleaning performed by contract has been satisfactory, generating few visitor complaints.

2.09 Visitation:

Principal population centers within a 50-mile radius of Bardwell Lake include Dallas, Ennis, Kaufman, Waxahachie, Corsicana, and Italy. Much of the eight county area within the 50-mile radius is rural with small farms and ranches. Population in this area increased 14.9 percent between 1960 and 1970. Total population in the 50-mile radius is approximately 1,532,000. Visitation at Bardwell Lake has risen from 487,500 in 1967 to 873,400 in 1971, and there was a decline in 1972 to 840,300 visitors. Based on the number of visitors attracted annually to other reservoirs in the area, it is estimated that Bardwell Lake will attract in excess of 1,500,000 visitors annually.

TABLE 1

ACTUAL AND PROJECTED VISITATION

AT

BARDWELL LAKE PARKS

| Park | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1978 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mott | 70,600 | 72,200 | 95,755 | 101,472 (1) | 137,674 | 142,641 | 132,618 | 124,403* | | | | | | | |
| Hinh View | 102,000 | 110,400 | 136,127 | 120,237 | 174,109 | 142,902 | 97,468 | 98,084* | | | | | | | |
| Waxahachie | 112,000 | 126,400 | 169,452 | 162,316 (2) | 209,093 | 197,155 | 172,234 | 112,639* | | | | | | | |
| Love | 111,110 | 104,000 | 179,599 | 169,789 (3) | 172,614 | 167,631 | 89,316 | 70,140* | | | | | | | |
| Little Mustang | 47,400 | 64,500 | 83,327 | 63,025 | 67,811 | - | 37,368 | 16,148* | | | | | | | |
| Other (4) | 44,390 | 40,700 | 46,830 | 81,461 | 112,099 | 189,987 | 122,347 | 72,667* | | | | | | | |
| TOTAL | 487,500 | 518,200 | 711,000 | 698,300 | 873,400 | 840,316 | 651,351 | 494,081* | 896,500 | 971,300 | 1,006,500 | 1,445,800 | 1,985,700 | 2,599,500 | 3,367,400 |

(1) decrease due to construction work on Highway 34

(2) decrease due to construction work on Highway 34

(3) decline due to swimmers going to Mott Park

(4) Big Mustang (not developed), overlook, Giddings area (fishing and hunting), public boat ramp

* Through September 1974

## 2.10 Landscaping of Parks:

During the calendar years of 1968 and 1969 the five parks with development were under a landscaping program. 1,700 trees were planted, which composed of ten varieties of trees, and also 350 shrubs consisting of six varieties were planted in these parks. The program was planned due to lack of trees in certain areas. The planting program was initiated for the purpose of beautification as well as providing shade for picnic facilities. The estimated mortality rate of these plants was 35 to 40%. Part of this loss is attributed to the fact that certain varieties of trees used were not well suited to this area. In the future native types will be used. Vandalism was another factor in this rate of loss.

## III. PROJECT ADMINISTRATION

### 3.01 Maintenance Facilities:

A. Bardwell has no specific areas designated as a paint shop, sign shop, carpenter shop, or mechanic shop. Equipment is available for these jobs as routing operation of the project. Special equipment includes a sandblasting machine, steam cleaner and metal cutting saw. Equipment such as a radial arm saw, gasoline generator, drill press, acetylene and arc welding equipment, and paint spray compressor with accessories and an assortment of small hand tools are utilized for maintenance work as needed.

B. This project has limited facilities and manpower for repairs to roads. All repairs are of an emergency or preventative nature. Holes and shoulders are patched using asphalt-concrete, cold-lay paving material. A major spot and shoulder repair effort is made annually to fully utilize the temporary seasonal help. During the remainder of the year, repairs are made as required using maintenance personnel. All major repairs are done by contract. A seal coat project was completed in April, 1974 on all park and access roads. A seal coat applied every three years will be sufficient to maintain the roads on this project. When an overlay is applied instead of a seal coat, a cycle of five years should be maintained. An overlay of the roads in Waxahachie and Mott Parks are anticipated for FY 76 if requested funds are made available. Repairs on facilities due to vandalism or normal wear are made as required. All facilities are inspected daily during the peak season and weekly during the off season. Needed repairs are noted by the Ranger on his daily rounds and reported to the lead foreman. Repairs or adjustments to preclude further deterioration are made in a like manner.

C. Vehicle maintenance is performed on site for minor repairs. Off site repair is performed by commercial shops when emergency conditions warrant. Preventative maintenance is accomplished by daily visual checks and by a quarterly check of each vehicle.

### 3.02 Signs:

This project makes all information and directional signs with

routed redwood, size 2" X 8" X 48". They are painted antique brown and non-chalking white paint for the letters. All signs are made to specifications from SWD sign handbook.

3.03 Equipment Cleaning Facilities:

This project is equipped with wash rack, steam cleaner, and sand blasting machine. This equipment is in good condition and no replacement is needed.

3.04 Storage Facilities:

Project office and related storage are surrounded by a six foot chain link fence with a three strand barb wire climb barrier on the top. Fenced area is 37,410 sq ft. Of this, approximately 5,800 sq ft are devoted to administrative and storage buildings. All of the fenced area is paved. Approximately 2,500 sq ft of paved parking area is available to employees and visitors immediately south of the fenced area. Inclosed storage at Bardwell Project consists of one metal building (2,050 sq ft), two metal buildings (83 sq ft each), and about 2,285 sq ft in the administration building, devoted to storage and maintenance facilities. The metal building at the east side of the inclosure is used for storage of hand tools, lumber, small mowers, pumps, air compressor, generator, welding equipment, and other equipment that would deteriorate if left exposed to the elements. The rubber tired tractor and 4X4 pickup are locked inside at night also. The 83 sq ft metal building near the northeast corner of the inclosure is used solely for paint and oil storage. The other 83 sq ft building along the west edge of the inclosure is used for storage of cement, fertilizer, and chemicals. The switch box to the fuel pumps is also located inside this building. The 2,285 sq ft of storage space in the administration building is used for storage of signs, miscellaneous tools, supplies for maintenance of recreational facilities, lockers for employees, and a safe for articles requiring additional security. Vehicles are also stored in this area at night and repair work on vehicles is performed here. Large mowers, concrete mixer, asphalt kettle, trailers and other large equipment are stored in the open inside the fence. Extra trash barrels, barrels of asphalt and guard posts are also stored in the open. The area north of the inclosure has con-

crete storage bins for storage of concrete aggregates, pre-mix asphalt, stockpiling of flexible base material, paving cover stone, and corrugated metal pipe for culverts. This area has been fenced off to prevent vehicular entry. The storage facilities are adequate for present needs.

3.05 Office and Administration Facilities:

Approximately 620 sq ft of the administration building is devoted to administrative activities and facilities. This includes office space for the Reservoir Manager, Reservoir Rangers, Clerk, Maintenance Foreman, and reception of visitors to the Project Office. Included also is space for project maps, cabinets, bookshelves and file cabinets necessary to accommodate project publications and office supplies.

3.06 Staffing and Organization:

The project is presently staffed with a Park Manager (GS-11), two Park Technicians (GS-07), one Clerk-Typist (GS-05), one Maintenance Worker Foreman (WS-07), two Reservoir Maintenance Workers (WG-08) and two Laborers (WG-03). The present staff and future staff requirements are shown below:

TABLE 2

ADMINISTRATION

| | Initial | Future |
|---|---|---|
| Park Manager | GS-11 | GS-11 |
| Clerk Typist | GS-05 | GS-06 |

PUBLIC USE

| | Initial | Future |
|---|---|---|
| Park Manager | GS-05 | GS-09 |
| 2 Park Technicians | GS-07 | GS-07 |

OPERATION AND MAINTENANCE

| | |
|---|---|
| Reservoir Maintenance Worker Foreman | WS-07 |
| 2 Reservoir Maintenance Workers | WG-08 |
| *2 Reservoir Maintenance Workers | WG-05 |
| 2 Laborers | WG-03 |

* Future Staff

Additional temporary Reservoir Rangers will be college students majoring in recreation resource management, natural resources, forestry, biology (fish and wildlife management) and/or agronomy. Permanent Reservoir Rangers will be college graduates or qualified personnel who have completed the Reservoir Ranger training program. The additional rangers will be used for increased surveillance on a 24 hour basis during the peak recreational season.

## IV. SPECIAL ACTIVITIES

### 4.01 User Fee Areas:

Waxahachie Creek Park is the only park that meets criteria at this time for a class A campground. Under the present criteria High View meets requirements for class B and Mott and Love meet requirements for class C. Fees are collected at present in Waxahachie Creek Park only.

### 4.02 Cooperative Activities with Other Agencies:

There are no other agencies directly associated with the project. Liaison is maintained with local and State law enforcement agencies, as outlined in "Law Enforcement", and with Texas Parks and Wildlife Department, Texas State Health Department, Texas Water Quality Board, Trinity River Authority of Texas, and others.

### 4.03 Ranger Activities:

The Reservoir Ranger holds a key position at the project he serves. His duties place him in direct contact with the public and he represents the District Engineer in upgrading the Corps image in the field. The ranger's actions, efficiency, attitude, and willingness to he helpful to the public does much in creating this image. The ranger is required to have a good working knowledge of rules and regulations relating to administration, conservation, environmental protection, and enhancement of Government property. Land activities include but are not limited to inspection of leases, licenses and permits or concession contracts, building construction by commercial leases and evaluation of mowing and cleaning contracts. The ranger patrols project lands for the purpose of detecting encroachments, timber cutting, vandalism, grass fires, pollution problems, theft, and public assistance. The ranger makes recommendations for the placement of future recreational facilities in connection with updating the recreation Master Plan. The ranger promotes good public relations by answering inquiries relative to recreation facilities, history of project, wildlife, weather and visitor programs. Data for many recreational reports such as Annual Reservoir Report required by OCE are

gathered by the rangers. Water activities include but are not limited to patrolling the lake area to enforce rules and regulations, promoting water safety by furnishing regulations, advising the public of hazards and giving information regarding state and federal regulations relating to water safety laws and fishing and hunting. In the event of a disaster, the ranger lends assistance in rescuing persons in distress and renders first aid to the injured.

4.04 Law Enforcement Arrangements and Procedures:

A. The Ellis County Sheriff's Office assigns deputies to patrol the recreational areas periodically. The water safety and fish and wildlife laws are enforced by the Texas Parks and Wildlife Department Game Management Officer. Two Corps vehicles are equipped for two-way radio contact with the Ellis County Sheriff's Department. The Ellis County Commissioners Court passed a resolution on 6 August 1971 requesting the State Parks and Wildlife Department to enforce the prohibition of swimming, boating, fishing and speeding of boats in certain designated areas. Rangers will use Citation Authority granted by Section 234 of the Flood Control Act of 1970 (Public Law 91-611, 31 December 1970, 84 Stat 1818) as a management tool to supplement enforcement by local and state agencies. The ranger will enforce all regulations pertaining to recreational vehicles, camping and picnicking, swimming, fishing, hunting, firearms, control of animals, boating and other minor offences. A Ranger is on duty seven days a week from 0800 to 1645. During heavy visitation there is a need for Rangers on duty 24 hours a day.

B. Rangers having Citation Authority are screened and given 40 hours of basic training before authority is issued. Each ranger with Citation Authority attends a 24 hour refresher training course each year, usually in May. Rangers do not have arrest authority, however, close relations are maintained with local law officials who are called when assistance is needed. Rangers on patrol check in with the local law agency by radio when on duty. Many emergency notifications are handled by rangers when called by local law agencies.

4.05 Safety - Visitors and Employees:

The safety of the visiting public is a prime responsibility of the Reservoir Manager. Recreational facilities provided by the Government are maintained in a safe condition at all times. The rangers inspect the concessionaire's facilities for unsafe conditions and they are brought to the concessionaire's attention and he is advised to correct the deficiency promptly. Questionable health conditions are reported to state health agencies. Project personnel are continuously alert for any potential hazards on the lake or project lands. Appropriate signs, buoys, and barricades are installed to warn visitors of any unsafe conditions. Appendix E, Project Safety Plan, has been prepared and forwarded for approval as a supplement to the master plan. This plan identifies hazards to safety and prescribes preventive measures, as well as the quality and type of safety equipment to be used. FWDR 385-1-90, dated 3 Nov 71, establishes guidelines for a project and recreational safety program for the safety of project personnel and the general public at the District's lake projects.
Prime objectives are:

A. Establishes a water safety council in the vicinity of the lake where sufficient local interest exists.

B. Establish and train a recreational safety ranger at the project.

C. Establish a lake safety patrol which should be coordinated with responsible state agencies.

D. A water safety program will be designed to meet specific project needs.

E. A project safety program will be designed to meet specific project needs.

Guidance for project safety is also contained in the following publications:

ER 385-1-1

EM 385-1-1

Title 36, Chapter III - Code of Federal Regulations

FWDR 1130-2-61

Boating rules and regulations, Title 36 and the project brochure, all containing water safety information, are distributed to the visiting public.

F. Reference is made to Water Use Planning, Section II of the

Resource Planning and Management, of Revised Master Plan. To implement the water safety program and identify potentially dangerous situations, five areas are marked or buoyed on Bardwell Lake. Two parks have designated beach and swimming areas, Mott and Love. Each has its boundaries marked by cannister type buoys. Inlet and outlet structures have warning signs and cannister type buoys indicating the need to stay 300 feet from the structures. Congested areas requiring low speed boat operation; swimming areas, boat ramps and marina, are also identified by the properly marked buoys. Shallow water and low pool hazards are marked with either buoys or warning signs as necessary.

4.06 Concessionaire Activities:

One concession operation through second party license agreement was granted 24 May 1967. The area is located in High View Park and consists of five acres of land and five acres of water. A fishing barge, covered and open boat storage, rental boats, bait, fuel, sporting goods, food and beverages are offered to the public. The concessionaire has been requested to upgrade this facility including cleanup and repairs of walkways. Since public demand has not reached the level that was anticipated, the concessionaire has requested that construction of additional facilities be waived until a need develops. Recommendation that his request be granted and construction be postponed has been made and approved. The marina concession is inspected annually or as deemed necessary for compliance with the terms of lease agreements.

4.07 Encroachments:

The project has been 100% monumented and much of the boundary has been fenced. Plans are presently underway to further mark the property line with signs. These actions help prevent encroachments. An effort is made to resolve all encroachments at the project level. If necessary, the encroachment is forwarded to the Chief of Operations. Solutions are offered: At present there are only minor encroachments, most of which are resolved at the project level. There are several access points including some

uncharted trails and roads used by the public but no problems have been encountered with private roads being created. A few cases of cattle being at large on government land have occurred, but these have been minor. This project is one of the newer projects in the Fort Worth District where individuals have not been permitted to place docks and boathouses on the lake. Due to this policy, no problems have been encountered with floating structures or with unauthorized mooring of water craft.

4.08 In-Service Training Programs:

The in-service training program for the Reservoir Rangers is a continuing program. The training instructor at the project is the Reservoir Manager. This training covers orientation, office administration, project administration, and maintenance operations. The Rangers alternate and work the week-end shifts and require knowledge of general operation and service of water and sewage treatment systems in the recreational areas. The Reservoir Maintenance Worker Foreman instructs them on procedure of servicing and adjusting systems.

4.09 Visitor Education and Interpretation:

A visitor's overlook and shelter with project area map is located near the headquarter's area. Brochures, maps, Title 36, and other District publications are furnished to the public at the project office and by the rangers in the public use areas. Upon request, scout troops, company and family groups, are assisted in finding locations for their visits and recommendations are made to best suit their needs. This assistance in the past has improved the image of the Corps and improved public understanding of the project. Plans are being made to locate a visitor information center in one of the public use areas. The center would be equipped with audio and visual aids which are self-operating and self-explanatory so that attendants would not be necessary. A center of this type could be used as a group meeting place for such groups as boy scouts, civic organizations and church groups. It would also be used by rangers to offer the public an interpretative education program. The incidence of vandalism damage to recreation facilities at this lake has been high and

would necessarily be a factor to be considered in the operation and maintenance of visitor information center; however, a continued effort is being made through public education and enforcement to bring this situation under control and it is hoped that, in the future, such a facility for the benefit of the public could be maintained. Signs, plaques and posters placed at strategic locations in the public use areas will also be used in the visitor interpretation program.

4.10 Pest Control Program:

This program is conducted in accordance with ER 1130-2-332, AR 420-76 and guidelines set forth by the District Office. Extreme caution is used in handling, storing and application of pesticides. The mosquito surveillance program for the period of April to October will be continued. Control of mosquitoes and house flies will be accomplished by spraying a 2% malathion solution inside buildings. Around doorways and trash receptacles a 2-1/2% solution will be used. The use of Pyrethrum "tossits" or a light film of oil will be used on stagnant ponds to control mosquito larva if draining is not feasible. Trees, shrubs and grass areas will be sprayed periodically with 50% malathion. The cleaning contractor is responsible for application of insecticides as specified in the contract in areas around picnic shelters, fireplaces, trash cans and sanitary facilities. Frequent inspections by the Reservoir Manager or his representative insure strict compliance with the contract specifications. The different types of pest effecting trees and shrubs in this area are: tree-borers, bag worms, web worms, army ants and grub worms. Control of these pest will be accomplished by use of 50% malathion applied as a .5 solution and by a 5% Sevin powder. Rodent population buildup is reduced in picnic table, shelter and trash can areas by a timely cleanup three times a week during peak months, 1 April through 31 August, and one time each week during the winter months. Rodent control around project buildings is accomplished by dispersing Diphacinone in a .005% cereal bait form, or .025% Fumarin in bait boxes. Bardwell project has one man trained in Pest

Management. Preparations are being made for implementation of PI 92-516 on 21 October 1974, and the new guidelines for application of pesticides, herbicides and rodenticides.

4.11 Control of Park Usage:

Public usage and popularity of parks and facilities vary through the season and from year to year. For example, Mott Park is now popular and is on the verge of overuse, while the other parks are comparatively underused. Plans for control of traffic, closing of areas for regeneration, and consideration of limiting access to overused areas, must vary accordingly. Even though signs are posted requesting that cars keep in designated parking areas and off the grass, traffic is very heavy along the shoreline in Mott Park. The same situation exists at times in the other parks. Physical barriers must be constructed and installed to reduce the compaction of shoreline areas and around camping and picnic facilities. Many areas are covered with new roads made by cars cutting across grass areas between the park roads. Here again, barriers of some sort must be constructed. Future plans are to install either posts and cable, concrete curbing or large rocks as an inducement to keep cars on the planned roads. Citations are issued to help control unauthorized use. These barriers will be installed as funds become available. As cars are restricted to hardtop roads and parking areas, more access roads to isolated picnic and camping facilities will have to be constructed. Pull-ins for camping units will need to be improved and identified better so the public will be aware of the off-limits areas. As the public becomes more aware of designated and non-designated traffic areas, it is felt they will willingly participate in keeping the misuse and undue compaction of the parks to a minimum. As the high usage season is short, it is not deemed necessary at this time to close any parks for regeneration of grass and shrubs. Mott Park is being monitored closely, and if the planned restriction of usage is not effective during the 1975 season, serious consideration will be given to closing it for a year. Personnel manning, including summer temporaries, is sufficient at this time under the limited user fee program to administer and manage all the parks. Mott Park is the only park that could now be

classified as nearing overuse. If the User Fee Program develops as anticipated, implementation of a policy of strict control of numbers of campers and picnickers allowed into the park at any one time will be initiated. Reduction of usage to tolerable limits will facilitate maintenance and management of land, trees and fixed equipment. The mere fact of a usage fee will shift some of the use to the remaining free parks, possibly causing a potential overuse problem there. The development and use of overflow areas designated in the master plan is not necessary at this time as the problem lies with having too high a concentration of people in one area, rather than not having enough area available to accommodate all the people. Control of park usage will require a continuing program of inspection, planning and management as visitations increase in the future years.

4.12 Vegetation Control:

The application of fertilizers to Corps areas of responsibility has obvious beneficial effects. Annual or even semi-annual applications are ideal in most cases. Park areas at Bardwell have never been fertilized except during the initial construction contract. Three applications have been made on the berm and dam embankment since it was constructed, with the last application during the fall of 1973. When available, a combination of fertilizer and weed killer was applied. Grass on the berm and dam embankment is mowed several times a year or as required to maintain it at a 6" minimum height. Cutting cycles will naturally vary with the quantity and frequency of rainfall. Grass types for park areas, dam embankments, and wildlife areas are recommended by the Soil Conservation Service. These recommendations include King Ranch bluestem, NK-14 bermuda sprigs or NK-37 seed for the embankment, buffalograss or bermudagrass for the parks and sideoats grama, Kline grass or hairy vetch for the wildlife management areas. Bermudagrass or buffalograss is recommended, as it can tolerate periods of inundation at lower elevations nearer the lake and can also tolerate heavy use by campers and picnickers. When control of vehicles in the park areas has been effected, the re-establishment of grass and shrub cover in the impacted areas will begin. These impacted areas include those parts of the lakeshore

used for unauthorized parking and camping, the impromptu pullouts and turn arounds in picnic and camp areas, as well as convenience roads. Convenience roads, pullouts and uncontrolled parking have denuded or damaged an estimated 50 acres, which need to be rehabilitated. Most of this could be seeded in with fast spreading grasses or forbs to reduce potential erosion. Mowing is necessary to keep the park areas vermin and snake free, besides presenting a pleasing aesthetic effect for the public. This mowing should be rigidly controlled to prevent scalping or mowing too close in areas of high usage. Once the soil surface is exposed, erosion takes over and the re-establishment of ground cover is difficult without closing off the area. Parks and access road areas are mowed approximately five times per year. Grass is not cut any lower than four inches, with mowing accomplished in a manner to preserve and encourage the growth of grasses. Chopping vegetation at or below ground level is not permitted. While mowing of the public areas is by contract, the berm and areas adjacent to the dam embankment and headquarters buildings are mowed by maintenance personnel. Other areas of the reservation are also mowed by maintenance personnel as deemed necessary by the Reservoir Manager to prevent fire hazard, to control weed species of brush and grasses, to stimulate cover for wildlife habitat and for other vegetation management projects. Any thinning of vegetation in the wildlife areas will be done so as to minimize damage to the habitat of both game and non-game species. Control operations for unwanted vegetation consist of mowing or brushhogging removal by hand chopping, or by use of herbicides. Herbicides are applied under guidance of the Herbicide Manual, TM 5-629 and correspondence from Fort Worth District Corps of Engineers. The two main herbicides used at this time are Tandex in solution form for grasses along and in roads, and Pramitol in granular form around monuments and boundaries. Underbrushing permits for lakeshore improvements for adjacent landowners is handled on a case by case basis. Working closely with the landowner, trees and areas of brush to be removed are identified and flagged. Spot checks are then made while brush is being cleared to see that requirements in the permit are being followed.

4.13 Erosion Control:

Prevention of erosion is an ongoing program. Controllable factors are: channelization of run-off water, prevention of overuse of areas in the parks, restriction of vehicular traffic to hardtop roads, and vegetation regeneration. Areas that are already eroded are filled, covered with a bermuda sod layer, and watered until well established. Fertilization and re-seeding are sometimes necessary for the berm and embankment to keep grass cover to a maximum. Eroded areas of the spillway and outlet channels have been filled and covered with riprap.

4.14 Debris Removal:

As Bardwell Lake was cleared of all trees and vegetation before impoundment, very little debris builds up along the shoreline. The small amount that accumulates is gathered and distributed to park areas for use as firewood by campers. Dead trees and branches removed in pruning and cleaning operations are also cut into usable lengths for campground fireplaces. The debris that is not suitable for firewood is removed and trucked to a sanitary fill. On occasion, debris piles occur in back areas, resulting from unauthorized dumping of household trash. This trash is either buried on site, when it will not contribute to lake pollution, or loaded and taken to the sanitary fill. Trash piles are cleaned up as soon as they are discovered so as not to attract more garbage. Access to the area of dumping is then restricted and posted as unlawful to dump.

4.15 Off-Road Vehicle Use:

Within the concept of Corps policy of optimizing public use of all project resources, initial planning for areas designated for off-road vehicle use has been completed. After a survey of park and outlying areas of Corps property around Bardwell Lake, keeping in mind the concept of the purpose and sport of operating the off-road vehicles over rugged and undeveloped terrain, it was determined that the area adjacent and to the north of Little Mustang Park would meet the criteria specified in ER 1130-2-405. As the key

to successful implementation of an off-road vehicle use program involves full public participation, Bardwell project is prepared for inquiries and suggestions of trail layout and requirements from local clubs and organizations interested in such an area. The City Council of Ennis has an off-road vehicle use program for city property under consideration. The demand for such a program is small in the Ennis area, and if the city program is implemented, the demand for use of project property will be even less. Title 36 regarding off-road vehicle use is enforced for park and adjacent areas. Some traffic does occur in isolated areas, but is blocked or obliterated as it occurs.

4.16 Testing Potable Water Systems:

Operation and testing of potable water systems is in accordance with ER 1130-2-407 and state regulations as interpreted by O&M Distribution #2, Number 74-57. Requirements for checking rural-city water systems vary from those for surface-ground water systems. As Bardwell has two parks on rural-city systems and three parks on surface water systems, water samples are gathered using the following specifications and frequencies: As the state standards are more rigid than the federal standards, the state standards will be followed. (ER 1130-2-407).

TABLE 3

STANDARDS FOR

TESTING POTABLE WATER SYSTEMS

| Rural-City Source | Surface-Ground Water Source |
|---|---|
| Federal Standards: (ER 1130-2-407) | |
| Bacteriological | |
| 1. After maintenance or repair | 1. After maintenance or repair |
| 2. Before seasonal operation | 2. Before seasonal operation |
| 3. After flooding of system | 3. After flooding of system |
| | 4. Check weekly |
| Chlorine Residual | |
| 1. Not less than 0.20 ppm at distant points of system | 1. Not less than 0.20 ppm at distant points of system |
| 2. Check periodically | 2. Check daily or no less than two times weekly |
| Chemical | |
| 1. Check yearly | 1. Check yearly |
| State Standards: | |
| Bacteriological | |
| 1. Same as federal plus | 1. 3 samples each week from plant tap |
| 2. A minimum of 4 samples each month from distribution system | |
| Chlorine Residual | |
| 1. Same as federal standards | 1. Same as federal standards |
| Chemical | |
| 1. Same as federal standards | 1. Same as federal standards |

| Parks | Water System Source |
|---|---|
| Mott Park | Rural |
| High View Park | Surface * |
| Waxahachie Creek Park | Surface * |
| Love Park (Upper) | Surface |
| Love Park (Lower) | City |

* Systems are now in process of being connected to the Rural Bardwell Water Supply facilities.

Bacteriological samples are gathered and mailed to the Dallas Health Department Laboratory. As the testing requires 24 hours to complete, samples must reach the lab no later than Thursday. Chlorination samples are tested on site using a Model A midget tester. The annual chemical analysis is also performed by the Dallas Health Department Laboratory. A record of all tests results are maintained at the project.

4.17 Contract Work:

Due to the number of project personnel available for anything other than routine maintenance, contracts are let for the more complex jobs. Extensive road repair and resurfacing is contracted on a per job basis. Mowing of park and road shoulder areas is contracted on a per year basis. Park cleanup is also let on a per year contract.

## V. SPECIAL FEATURES

### 5.01 Management of Historical and Archeological Sites:

A field reconnaissance of Bardwell Reservoir area was made by the Corps of Engineers and representatives of the National Park Service in 1961. A report was submitted in 1964 and is included as Appendix C, Section II, of the Design Memorandum No. 7C for the Trinity River Basin, dated May 1969. Marine, flora and fauna fossils were recovered by the Shuler Museum of Paleontology of Southern Methodist University. Students of archeology at times superficially explore the lake shore area for artifacts. In April of 1973, a skeleton was unearthed at Waxahachie Creek Park. It was identified as Indian and approximately 100-150 years old. Waxahachie Creek was probably a village or hunting site for the tribe of that name. No plans are under consideration at this time for a visitor or information center to display any area or artifacts of archeological interest. To do so would require personnel available on a 24 hour basis to monitor the display and prevent vandalism. A sign will be mounted in the near future at Waxahachie Park pointing out that the area was used at one time as a living and hunting site for the Waxahachie Indians. The only historical site near Bardwell Reservoir is the Sanderson Cemetery as chronicled by the D.A.R. It contains 32 graves dating from 1867. One grave is that of Jasper Venable, a corporal in the Confederate Army. (Thus the interest from the D.A.R.). The Corps of Engineers cleared the cemetery in June of 1966 and enclosed it with a chain link fence. The cemetery was designated as a historical site and will be permanently maintained by the Corps.