

Contract Study: Number 4, Part I

*Habitat Quality Assessment for
the Proposed Cibolo and Goliad
Reservoir Sites*



HABITAT QUALITY ASSESSMENT FOR

THE PROPOSED CIBOLO AND GOLIAD RESERVOIR SITES

Prepared By

Robin Cypher
Roy G. Frye

Resource Protection Division
Texas Parks and Wildlife Department

Texas Water Development Board
Interagency Contract No. 93-483-358

Introduction

The purpose of this study was to complete analyses to classify, delineate, and map major vegetational communities, and obtain wildlife habitat quality assessment data for the proposed Cibolo Reservoir in Wilson County and Goliad Reservoir in Karnes and Goliad Counties. The final study was conducted through an interagency contract (TWDB Contract No. 93-483-358) between the Texas Water Development Board (TWDB) and Texas Parks and Wildlife Department (TPWD). The vegetation mapping and inventory was previously accomplished through a TWDB contract (TVVDB Contract No. 92-483-307). Actual vegetation mapping was conducted by the Department of Geography and Planning, Southwest Texas State University at San Marcos. The work was conducted under the supervision of Dr. Ryan Rudnicki. Assessments of habitat quality were conducted by staff of the Environmental Assessment Branch, Resource Protection Division, TPWD. Vegetation inventory data and habitat quality assessment information submitted to the TWDB will be used by the Board to evaluate and compare environmental factors associated with proposed reservoir sites within the upper south Texas plains and middle gulf coastal prairie regions. The sites have been identified as potential reservoir locations for satisfying future water supply needs for this region of Texas. Additional natural resource data for these reservoir sites have been compiled under other provisions of previous interagency contracts and are contained in separate reports.

Study Area

The Cibolo Reservoir site lies principally within the floodplain of Cibolo Creek in Wilson County approximately 35 miles southeast of San Antonio (Figure 1). The northern portion of the site lies within the Post Oak Savannah ecological region, while the southern portion of the site lies within the South Texas Plains (Gould et.al. 1960). The Goliad site lies southeast of the Cibolo site within the floodplain of the San Antonio River approximately 5 miles west of the city of Goliad (Figure 2). This site is within portions of Karnes and Goliad Counties and is entirely contained within the South Texas Plains. Climate for both sites is subtropical, humid, with warm summers and mild winters. The average annual precipitation ranges between 28 and 32 inches; average annual high temperature ranges between 81 and 83 degrees F, while average annual low temperature ranges between 59 and 61 degrees F. The average annual gross lake surface evaporation rate for this region is 62 inches (Texas Department of Water Resources 1983).

Major vegetation cover types typical of this region have been previously mapped (McMahan et. al. 1984). These include a mosaic of post oak woods, forests and grasslands, mesquite-blackbrush brush, and pecan-elm riparian forests, all interspersed with croplands. Huisache, elm, and hackberry also commonly occur as variations of the former categories. Floodplains and creek drainages are characterized by pecan-elm forests and parklands that contain a wide diversity of woody vegetation that create sight specific variations from the primary type. Principal crops include agricultural row crops and hay pastures.

Cibolo

Normal Pool El.—400.1 ft. MSL
Surface Acres—9,493

Wilson County

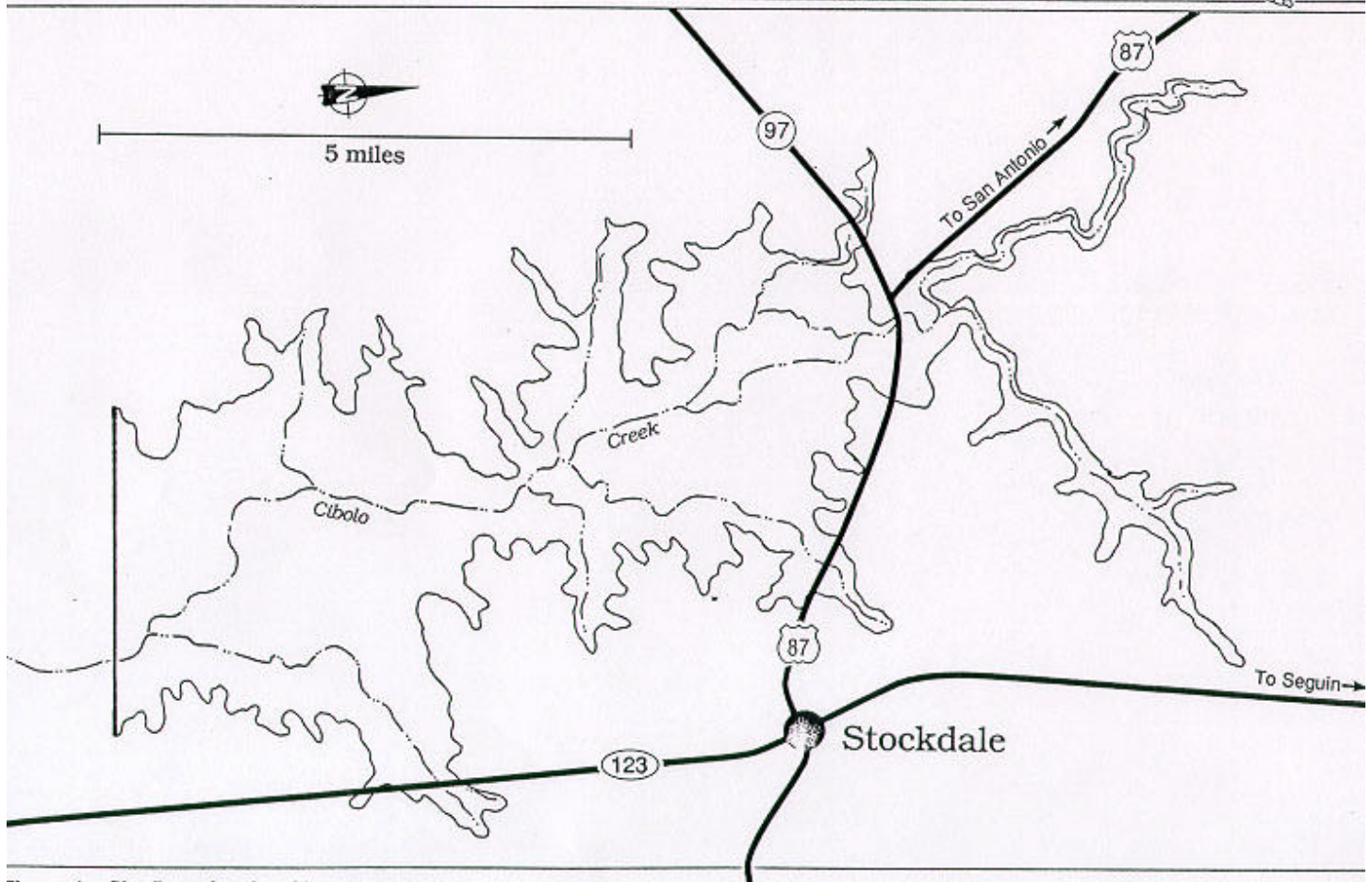


Figure 1. Site Location for Cibolo Reservoir

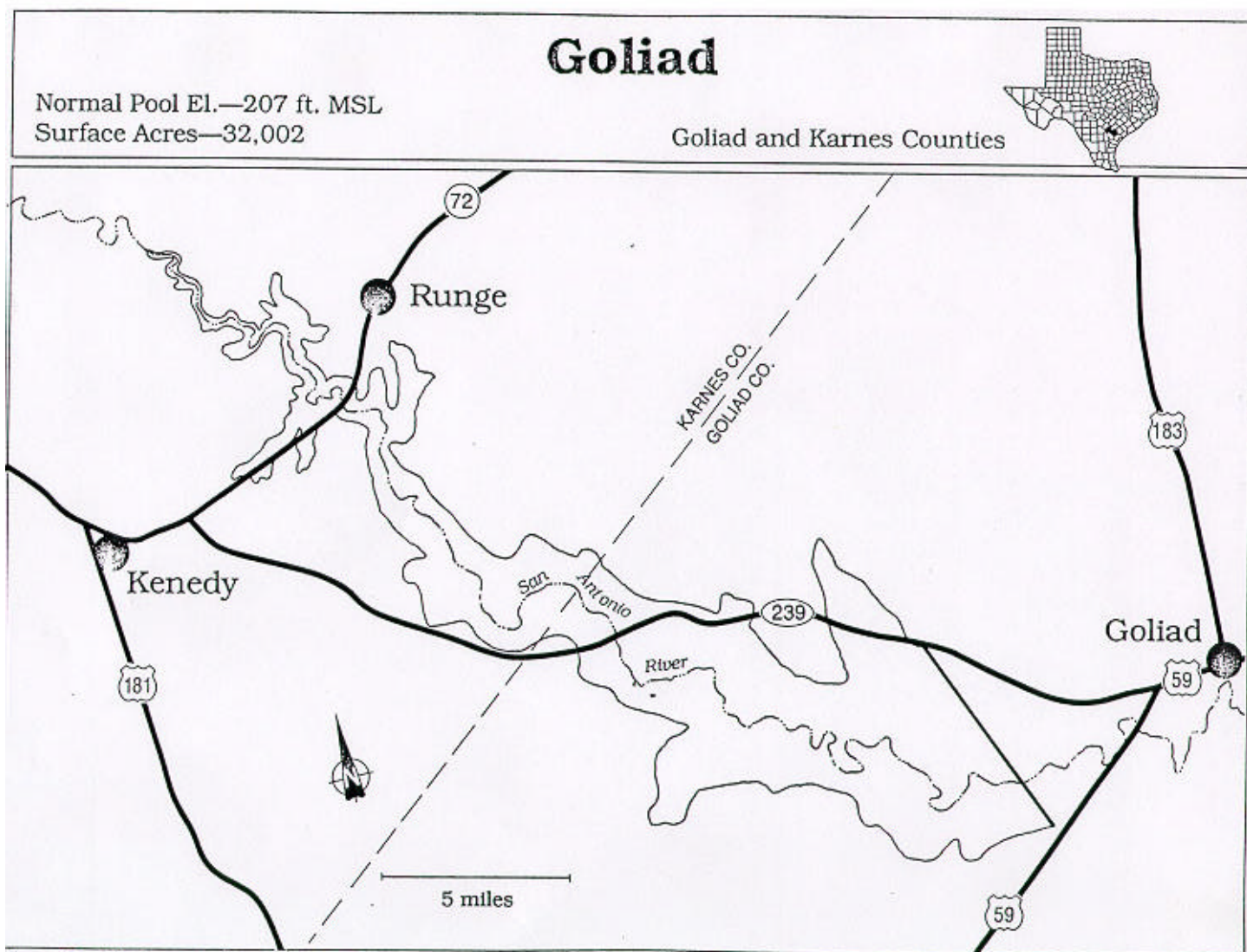


Figure 2. Site Location for Goliad Reservoir

Methods

Vegetation Mapping and Inventory

Classification and mapping of the occurring vegetation types were conducted through the use of aerial photography and conventional photo interpretation methods.

Color infrared NAPP photography at a scale of 1:24,000 was procured from the Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture, for use in preparation of vegetation maps. A total of 18 individual prints were required to ensure total coverage. Dates of acquisition were February 1989 and January 1990. The scale of the photography was selected to match U.S. Geological Survey (USGS) 7.5 minute maps which provided a registration base and also served to provide ancillary information to assist the vegetation classification process. Boundaries of the proposed normal pool elevations of both Cibolo and Goliad Reservoirs were provided by the TWDB.

A series of preliminary field vegetation maps were prepared by delineating boundaries of vegetation types specifically identified and located in the field. Vegetation boundaries were superimposed over individual aerial photos. Attempts were made to visit representative vegetation types by examining the available photos and traveling to specific sites. Field trips were conducted during the period March through May 1992. Patterns on the photos were correlated with existing ground cover through both on-site field checks, and extrapolation of photo colors, shapes, textures, and patterns. Ground cover was classified according to guidance provided by TPVVD staff. Criteria for physiognomic classification are presented in

Table 1. Cover types accounting for proportionately small acreage were lumped into other categories to facilitate the classification process. Ancillary ground truth from previous vegetation maps provided by Texas Parks and Wildlife Department was also utilized. The preliminary field maps were subsequently revised and modified as necessary to provide final manually drafted map products with well defined ground cover boundaries suitable for digitizing. A total of 11 individual vegetation maps, each corresponding to a USGS 7.5 minute quadrangle map, were produced during this stage. Generation of accurate inventory summary data and production of composite vegetation maps at varying scales required the digitization of each of the 11 handdrawn vegetation maps and subsequent transferal of this data to an appropriate Geographic Information System (GIS). Inventory data were then tabulated for each reservoir and map products were plotted.

Table 1. Physiognomic Classes of Cover Types Occurring Within the Reservoir Sites.

Grasses/Forbs	Herbs (grasses, forbs and grasslike plants) dominant; woody vegetation lacking or nearly so (generally 10% or less woody canopy coverage).
Brush	Woody plants mostly equal to or greater than 9 feet tall dominant and growing as random or evenly spaced individuals, small clusters or closed canopied stands (greater than 10% canopy cover).
Parks	Woody plants mostly equal to or greater than 9 feet tall generally dominant and growing as small clusters, or as randomly scattered individuals within continuous grass or forbs (11 to 70% woody canopy over overall).
Woods	Woody plants mostly 9 to 30 feet tall with closed crowns or nearly so (71 to 100% canopy cover); midstory usually lacking.
Forest	Deciduous or evergreen trees dominant; mostly greater than 30 feet tall with closed crowns or nearly so (71 to 100% canopy cover); midstory generally apparent except in managed monoculture.
Crops	Includes cultivated crops or row crops used for the purpose of producing food and fiber for man or domestic animals; also includes hay meadows where herbaceous cover is cropped and baled.
Water	Streams, lakes, ponds, flooded oxbows, and water treatment facilities.

Assessment of Wildlife Habitat Quality

The overall quality of the occurring habitat for wildlife resources was evaluated for the Cibolo and Goliad reservoir sites using a wildlife habitat appraisal procedure (WHAP) (Appendix 1). The technique measures key components which contribute to the ecological condition of the classified cover types within each reservoir site and resulting overall suitability for wildlife. Habitat quality values obtained from site evaluation criteria are combined with acreage figures for each cover type to provide available Habitat Units (HU).

The method is based on the following assumptions:

1. that vegetative structure including species composition and physiognomy is itself sufficient to define the habitat suitability for wildlife;
2. that a positive relationship exists between vegetation diversity and wildlife species diversity
3. that vegetative composition and primary productivity directly influence population densities of wildlife species.

Habitat quality scores for each cover type represent baseline conditions. The total HUs lost are numerical values that quantify initial direct impacts of reservoir construction, and to facilitate comparison with other projects, assume complete loss of existing vegetation cover below the proposed normal pool elevations. These numbers do not reflect annualized losses calculated over the life of the project nor account for any potential habitat gains that could be created as a result of the reservoirs. Consequently, the compensation estimates may not be the same as estimates calculated in future site specific evaluations. Other factors which can influence these differences include changes in project assumptions, variations in project design, land use changes, and priorities for certain habitat types. The compensation estimates calculated for this report are intended to provide preliminary data in a format to allow comparison of reservoir site alternatives. The estimates only address direct impacts. Long term indirect impacts such as increased landuse change around the proximity of the reservoirs or any changes to vegetation composition or quality below the dams as a result of altered instream flows are not included in this assessment.

Compensation requirements for each of the impacted cover types were calculated according to three hypothetical values representing proportional amounts (25%, 50%, and 100%) of the total potential gain in habitat quality of a compensation area which could be obtained with management. Raising the potential gain in habitat quality of a compensation area by 25% assumes relatively minimal management; an increase of 50% assumes moderate management; while achieving 100% of the potential gain assumes intensive management. Minimal management could include marking wildlife management area boundaries, providing protection by periodic surveillance, incorporating grazing control and allowing the habitat quality to increase through natural succession. Annual estimated costs per acre for this level of management according to expenditures by TPWD (1989 estimates) would be less than \$5.00 per acre. Moderate management might include the above measures with the addition of some selected herbaceous seedings and limited vegetation manipulation through controlled burning, disking, thinning, or other means. Cost estimates for this level would range between \$5.00 and \$10.00 per acre. Intensive management would include the above measures with the addition of significant efforts to reestablish communities of grasses, forbs, woody shrubs or trees through supplemental plantings and vegetation maintenance; establishing indices of relative abundance of wildlife species and conducting research associated with wildlife needs. Annual costs for this level are estimated to fall within the range of \$10.00 to \$20.00 per acre. All three levels of management would likely include wildlife-oriented public recreational use.

Resource Categories

All cover types evaluated for habitat quality were also classified into resource categories to denote mitigation planning goals. Such goals will be pursued by the U.S. Fish and Wildlife Service within the Federal permitting process and TPWD during the review of state water use permit applications and formulation of recommendations to the Texas Water Commission (TWC). A description of each resource category, designation criteria, and mitigation planning goals are provided in Table 2.

Table 2. Resource Categories and Mitigation Planning Goals.

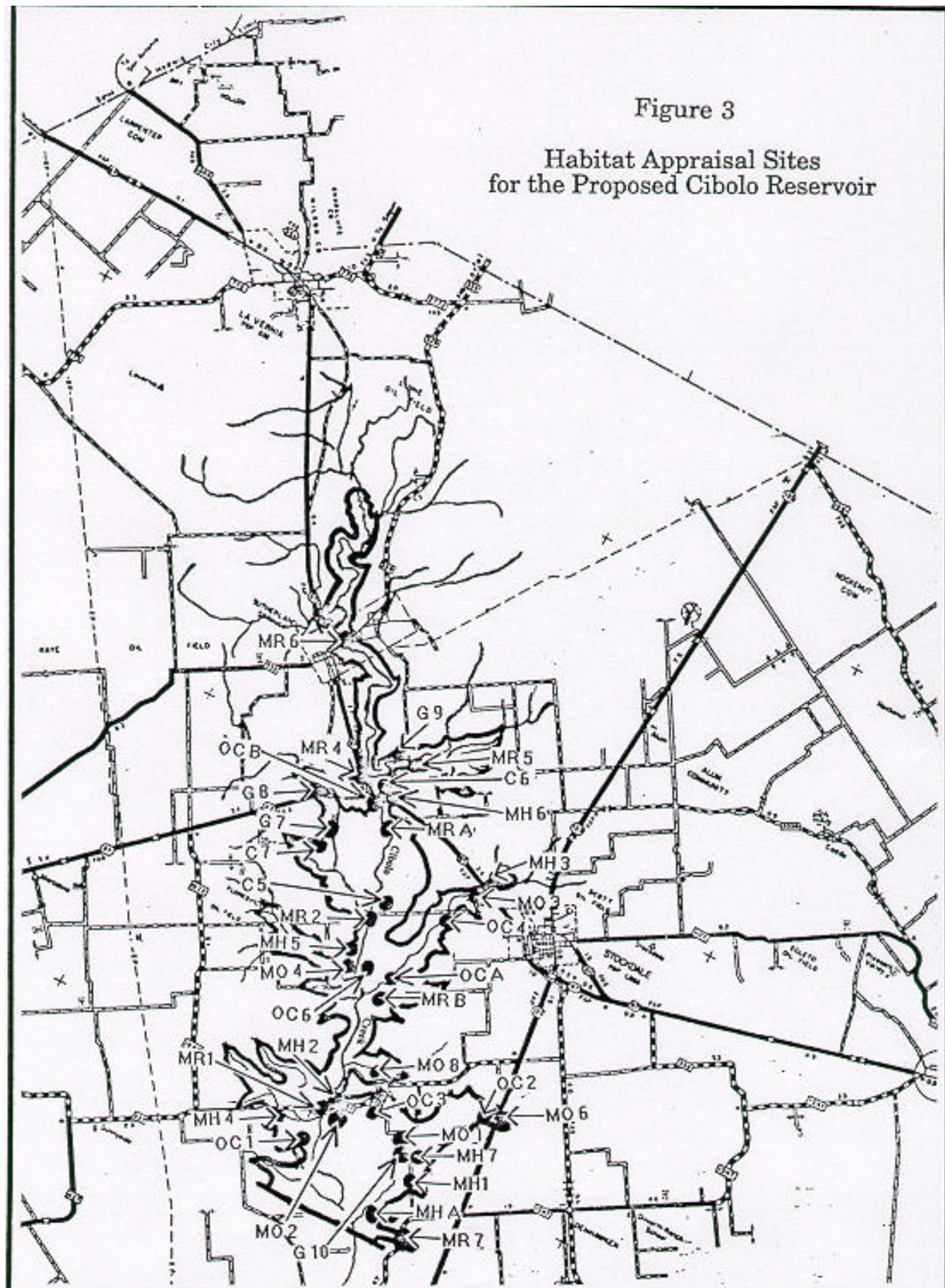
Resource Category	Designation Criteria	Resource Planning Goal
1	High value for evaluation species or habitats, unique or irreplaceable.	No loss of habitat value.
2	High value for evaluation species or habitats and scarce or becoming scarce.	No net loss of in-kind habitat value.
3	High to medium value for evaluation species or habitats and commonly occurs.	No net loss of habitat value while minimizing loss of in-kind habitat value.
4	Medium to low value for evaluation species or habitats.	Minimize loss of habitat value.

Field evaluation forms used to rate the existing cover types within the two reservoir sites are provided in Appendix 2 (Contact TPWD for Appendices at (512)912-7051.)

A total of 36 individual sites were evaluated during the period July 6-7, 1993 for the Cibolo Reservoir site. During that same period, a total of 33 sites were evaluated for the Goliad Reservoir site. The location of each site in relation to the approximate normal pool level of each reservoir is provided in Figures 3 and 4. Site assessments were performed by Kathy Kirwin-Boyclston, Robin Cypher, Jack Bauer, and Roy Frye of the Texas Parks and Wildlife Department's Resource Protection Division.

Figure 3

Habitat Appraisal Sites
for the Proposed Cibola Reservoir



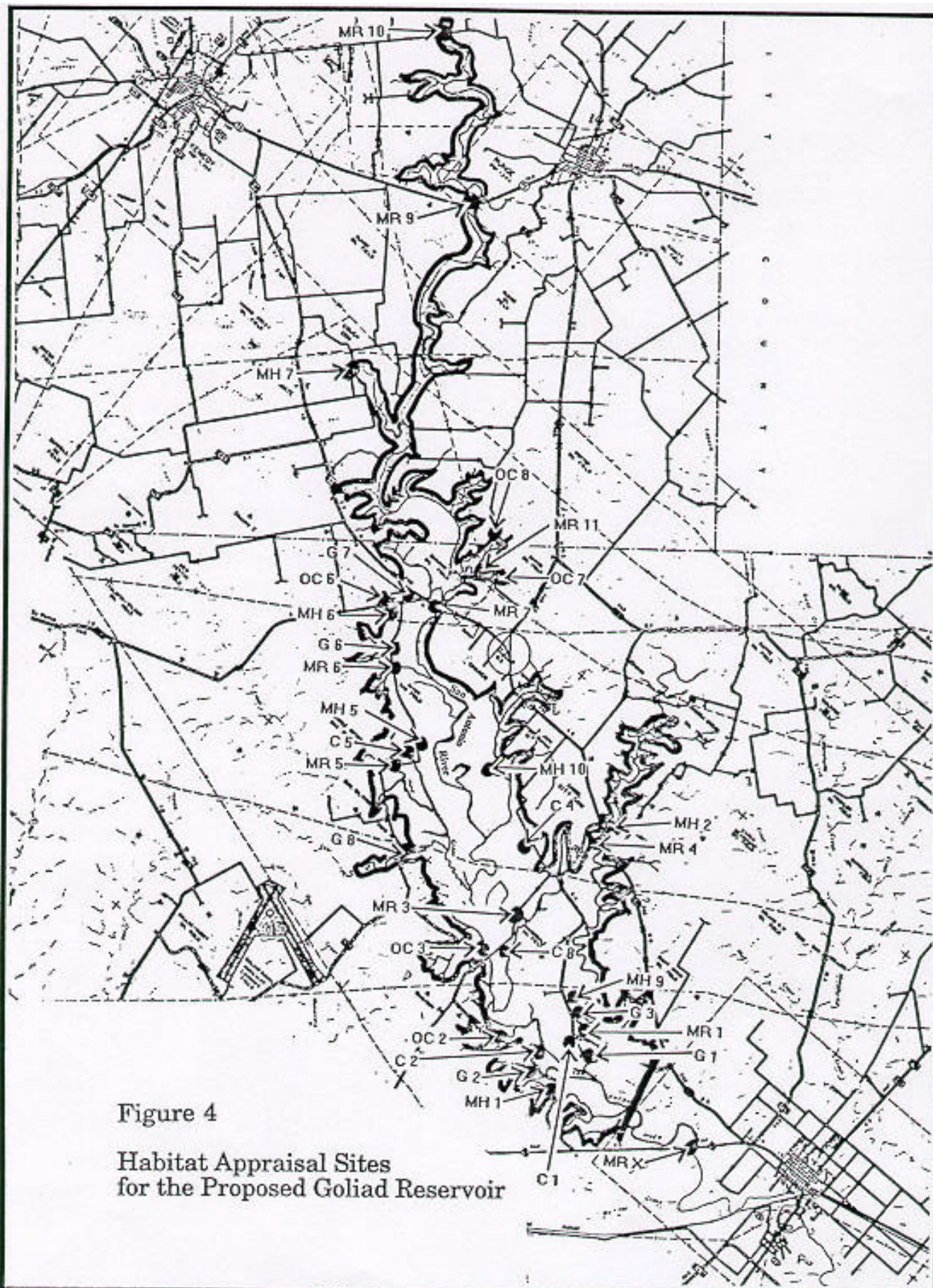


Figure 4

Habitat Appraisal Sites
for the Proposed Goliad Reservoir

Results

Wildlife habitat appraisals were conducted for six cover types within the Cibolo site. These included: 1) Grasses; 2) Mixed Riparian Forest; 3) Mixed Oak Forest/Woods; 4) Mesquite-Hackberry Woods/Brush; 5) Oak-Cedar Elm Park and 6) Crops.

Five cover types were evaluated for the Gohad site. These included: 1) Grasses; 2) Mixed Riparian Forest; 3) Mesquite-Hackberry Woods/Brush; 4) Oak-Cedar Elm Park and 5) Crops.

Where multiple plant species occur as indicated by the classification names, such species would generally be considered dominant. However, minor variations to this classification could occur depending on the specific site location. Occurrence of all observed woody species for each evaluated site has been documented on the field evaluation forms (Appendix 2).

Composite vegetation cover maps for the Cibolo and Gohad sites are provided respectively in Figures 5 and 6.

Tabulated Data Summaries

Tabulated data for the Cibolo and Gohad sites are contained respectively within Tables 3 and 4. Information includes the name of the cover type evaluated, resource category of the cover type (in parenthesis following the cover type name), acres impacted within normal pool elevation, habitat quality rating obtained by field evaluation, habitat units lost, hypothetical management options, potential gain in habitat quality, and compensation requirements for each management option. Mitigation goals in regard to habitat losses can be obtained by noting the resource category designation after the cover type name and referencing Table 2.

VEGETATION COVER TYPES PROPOSED CIBOLO RESERVOIR

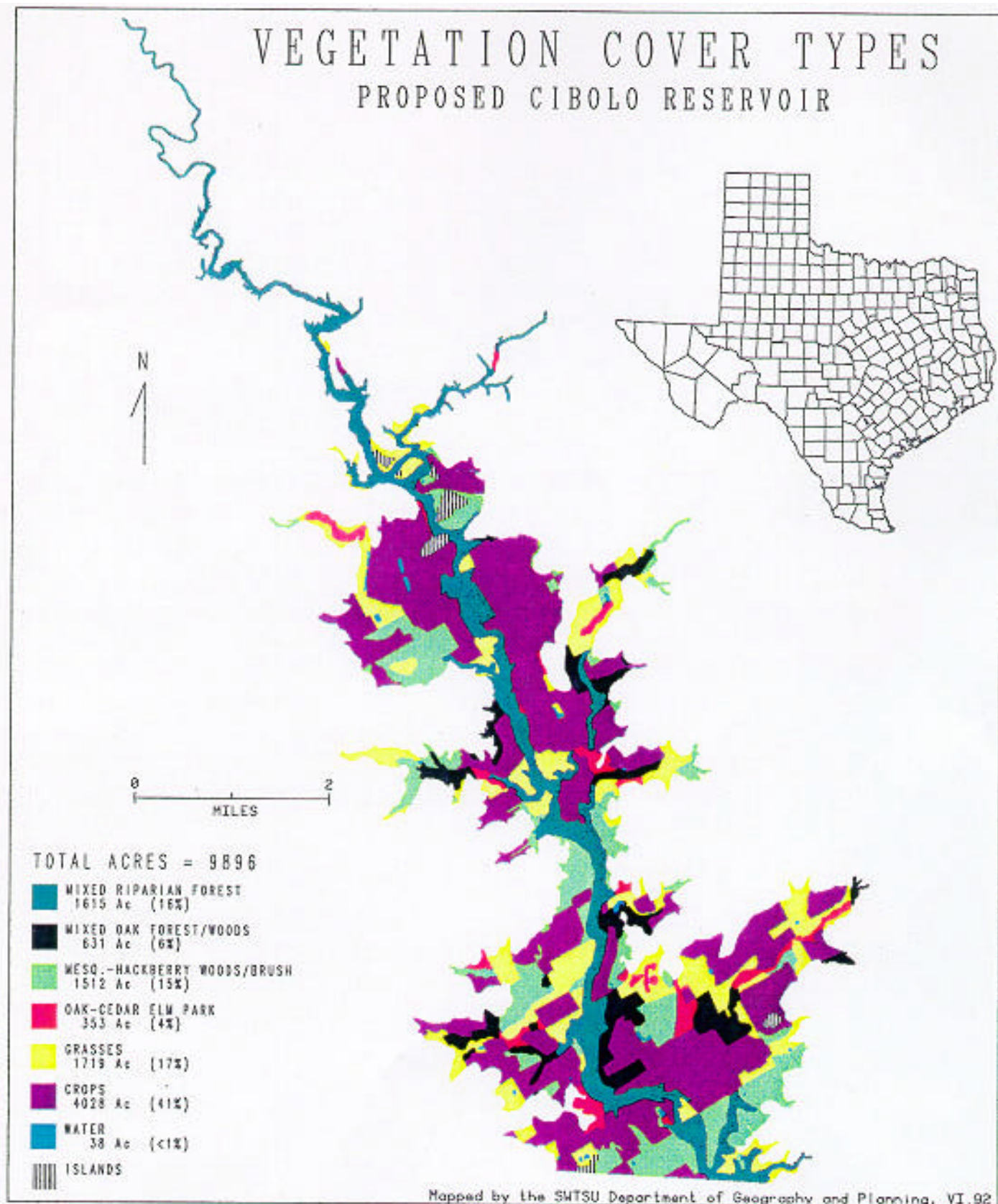


Figure 5. Vegetation Cover Types for Cibolo Reservoir

VEGETATION COVER TYPES

PROPOSED GOLIAD RESERVOIR

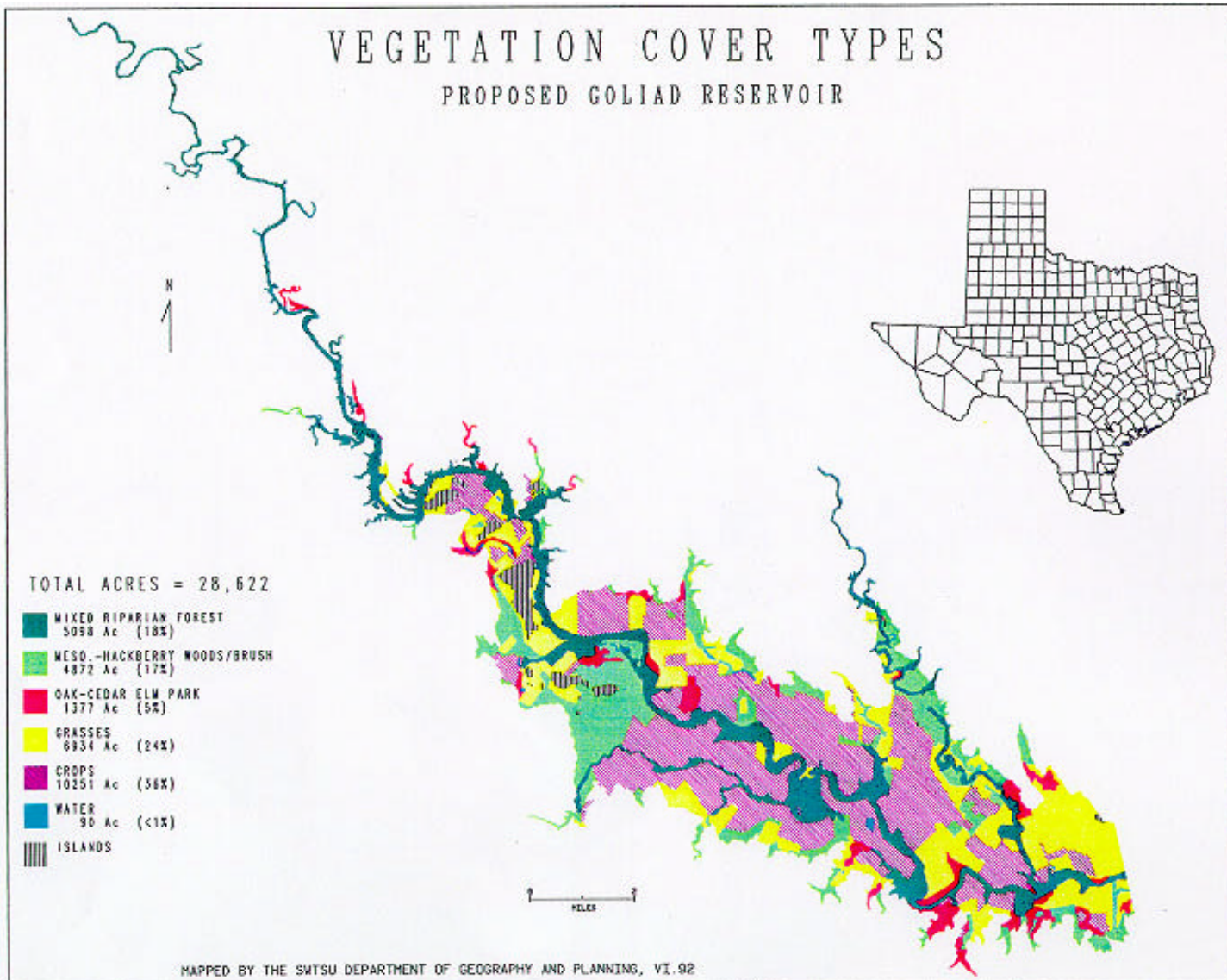


Figure 6. Vegetation Cover Types for Goliad Reservoir

Table 3. Inventory of Cover Types and Habitat Quality Assessment for the Proposed Cibolo, Reservoir She, Normal Pool Elevation = 400.1 ' msl.

Cover Type/ Resource Category	Acres Inventoried	Habitat Quality Value	Habitat Units Lost	Management Option	Potential Habitat Quality Gain	Compensation Requirements (Acres)
Crops (4)	4,028	.22	886	Minimum 25% Moderate 50% Maximum 100%	.108 .215 .430	8,204 4,121 2,060
Grasses (4)	1,719	.36	619	Minimum 25% Moderate 50% Maximum 100%	.128 .255 .510	4,836 2,427 1,214
Mixed Riparian Forest (2)	1,615	.74	1,195	Minimum 25% Moderate 50% Maximum 100%	.053 .105 .210	22,547 11,381 5,690
Mesquite-Hackberry Woods/Brush (3)	1,512	.58	877	Minimum 25% Moderate 50% Maximum 100%	.093 .185 .370	9,430 4,741 2,370
Mixed Oak Forest /Woods (3)	631	.66	416	Minimum 25% Moderate 50% Maximum 100%	.073 .145 .290	5,699 2,869 1,434
Oak-Cedar Elm Park (3)	353	.65	229	Minimum 25% Moderate 50% Maximum 100%	.075 .150 .300	3,053 1,527 763
Water	38					
Total	9,896			Minimum 25% Moderate 50% Maximum 100%		53,769 27,066 13,531

SECTION 1

BIOLOGICAL HABITAT COMPONENTS

Procedures:

1. The WHAP method requires evaluating representative sites of each cover type present within the area of interest. Obtain or produce a vegetation /cover map of the entire tract to be evaluated. Procurement of aerial photography may be required. Cover types are delineated according to floristics that signify dominant plant species and physiognomy according to the categories listed in Appendix 1.
2. A minimum number of sites representing each delineated cover type must be inspected to ensure an acceptable appraisal. Detailed statistical analyses would require establishment of a compatible sampling procedure. Determination of the number of inspection sites for each cover type should be governed by the objective of the evaluation, size of the area to be evaluated, and constraints imposed by available time and resources.
3. View each site sufficiently to assure that an overall evaluation can be made. Consider each habitat component carefully as provided by the Field Evaluation Key. Confine search effort for criteria A & B of Component 4 to an area representative of the site but not larger than one acre (circle with 39 yd. diameter).
4. Determine the number of points to assign various habitat components according to the listed criteria on the Evaluation Key.
5. Enter the number of points assigned to each of the components on the appropriate line of the Field Evaluation Form (p. 16).

NOTE: A Field Evaluation Form must be completed for each delineated cover type. Data for up to 7 inspection sites of a particular cover type may be included on the form.

6. After all sites are inspected, calculate average habitat quality for each cover type as guided by the Field Evaluation Form.
7. Average habitat quality values are summarized on the Wildlife Habitat Appraisal Summary Sheet. Total Habitat Units (HU) and an overall Biological Habitat Components (BO score are also computed. Overall value of the tract is obtained by examining the scores of the Biological Habitat Components, Protected Fauna and Flora, and Acquisition/Administration sections either individually or in combination.
8. Where impacts due to changes in future conditions are anticipated, habitat components for each cover type may be reevaluated with different "projected" numerical ratings. This tabulated data will yield values which may be compared with baseline conditions to determine the extent of projected impacts. To allow such comparisons Average Annual Habitat Units (AAHU) may also be computed in a manner similar to the USFWS Habitat Evaluation Procedure (HEP) 1980 version (USFWS 1980). (See footnote citations, Appendix 2)

Table 4. Inventory of Cover Types and Habitat Quality Assessment for the Proposed Goliad Reservoir Site, Normal Pool Elevation = 207.1 msl.

Cover Type/ Resource Category	Acres Inventoried	Habitat Quality Value	Habitat Units Lost	Management Option	Potential Habitat Quality Gain	Compensation Requirements (Acres)
Crops (4)	10,251	.25	2,563	Minimum 25% Moderate 50% Maximum 100%	.100 .200 .400	25,630 12,815 6,407
Grasses (4)	6,934	.30	2,080	Minimum 25% Moderate 50% Maximum 100%	.143 .285 .570	14,545 7,298 3,649
Mixed Riparian Forest (2)	5,098	.69	3,518	Minimum 25% Moderate 50% Maximum 100%	.065 .130 .260	54,123 27,061 13,531
Mesquite- Hackberry Woods/Brush (3)	4,872	.55	2,680	Minimum 25% Moderate 50% Maximum 100%	.100 .200 .400	26,800 13,400
Oak-Cedar Elm Park (3)	1,377	.60	826	Minimum 25% Moderate 50% Maximum 100%	.088 .175 .350	9,386 4,720 2,360
Water		90				
Total	28,622			Minimum 25% Moderate 50% Maximum 100%		130,484 65,294 32,647

Conclusion

The total area inundated by Cibolo Reservoir at the proposed normal pool elevation and subsequently digitized was 9,896 acres. Total acreage within the proposed Gohad Reservoir normal pool elevation was calculated at 28,622 acres. Of the four reservoirs (Cibolo, Gohad, Cuero, and Lindenau) included in the Texas Water Plan for the South Texas-San Antonio regional area, Cibolo contains the least amount of riparian forest at 1,615 acres, but the habitat quality rating for this important cover type (0.74) was higher than the Gohad site (0.69) and equivalent to the Cuero site (0.75) and the Lindenau site (0.74). Requirements for full compensation varied significantly between cover types, ranging from 0.5 acres required for each acre lost of grasslands in the Goliad site to 3.5 acres required for each acres lost of the mixed riparian forests in the Cibolo site. In-kind acquisition and associated high management levels would also be necessary to minimize the land acquisition requirements. Total compensation requirements (assuming a high management level) for the Cibolo site was 13,531 acres (1.4 acres required for each acre lost). For the Gohad site, full compensation would require 32,647 acres (1.1 acres required for each acre lost).

Literature Sited

Gould, F.W., G.O. Hoffinan and C.A. Rechenthin. 1960. Vegetational areas of Texas. Tex. A&M Univ., Tex. Agric. Exp. Sta. Leaflet 492.

Larkin, T.J., and G.W. Bomar. 1983. Climatic atlas of Texas. Tex. Dep. Water Res. LP-192, 149p.

McMahan, C.A., R.G. Frye and K.L. Brown. 1984. The vegetation types of Texas including cropland. Tex. Parks and Wildl. Dep. Bull. 7000-120, 40p.

Texas Water Development Board. 1990. Water for Texas-today and tomorrow. Tex. Water Dev. Board Doc. No. GP-5-1.