



*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

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**Texas Water Development Board  
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## INTRODUCTION

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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 (TWDB 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.

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## STUDY AREA

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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

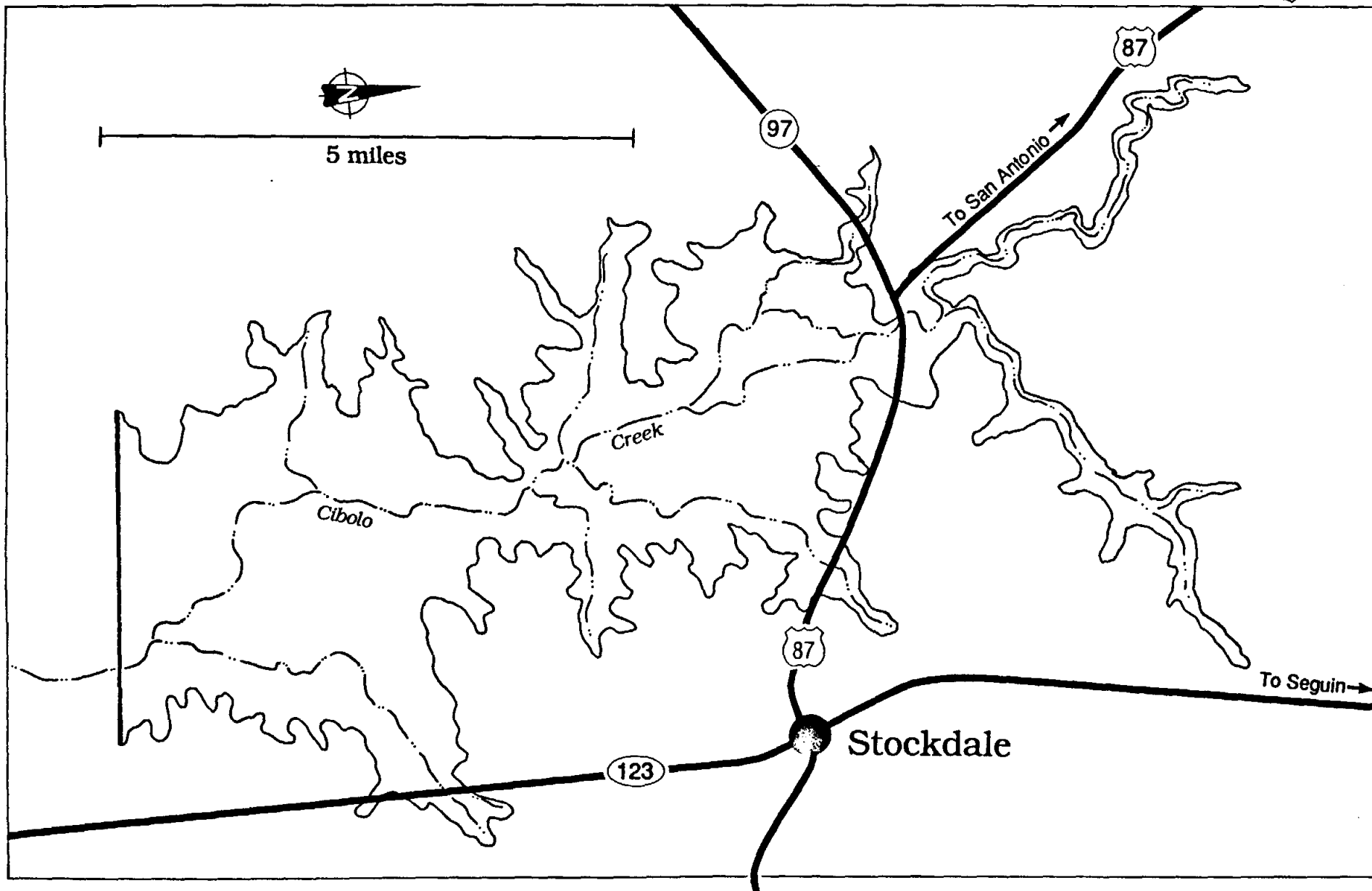
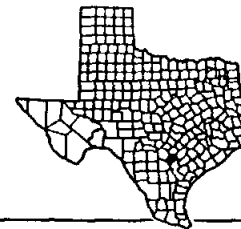


Figure 1. Site Location for Cibolo Reservoir

# Goliad

Normal Pool El.— 199 ft. MSL

Surface Acres— 28,622

Goliad and Karnes Counties

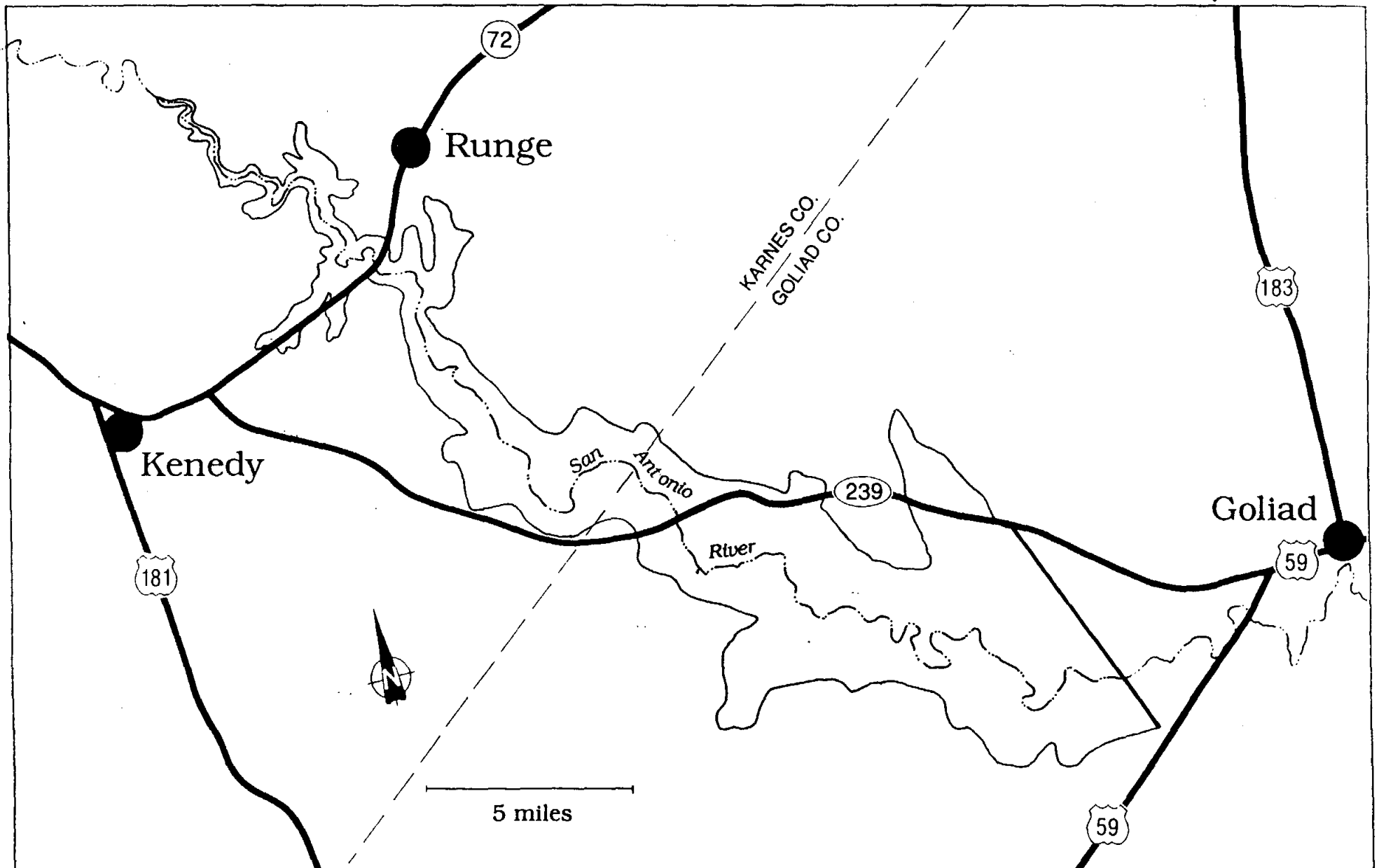
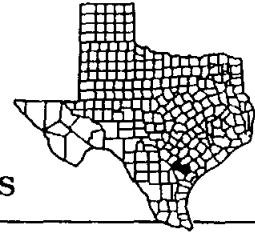


Figure 2. Site Location for Goliad Reservoir

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## METHODS

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### Vegetation Mapping and Inventory

#### Vegetation Mapping and Inventory

Classification and mapping of the occurring vegetation types were conducted through the use of aerial photography and conventional photointerpretation 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 TPWD 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 transferral 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 HU's 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.

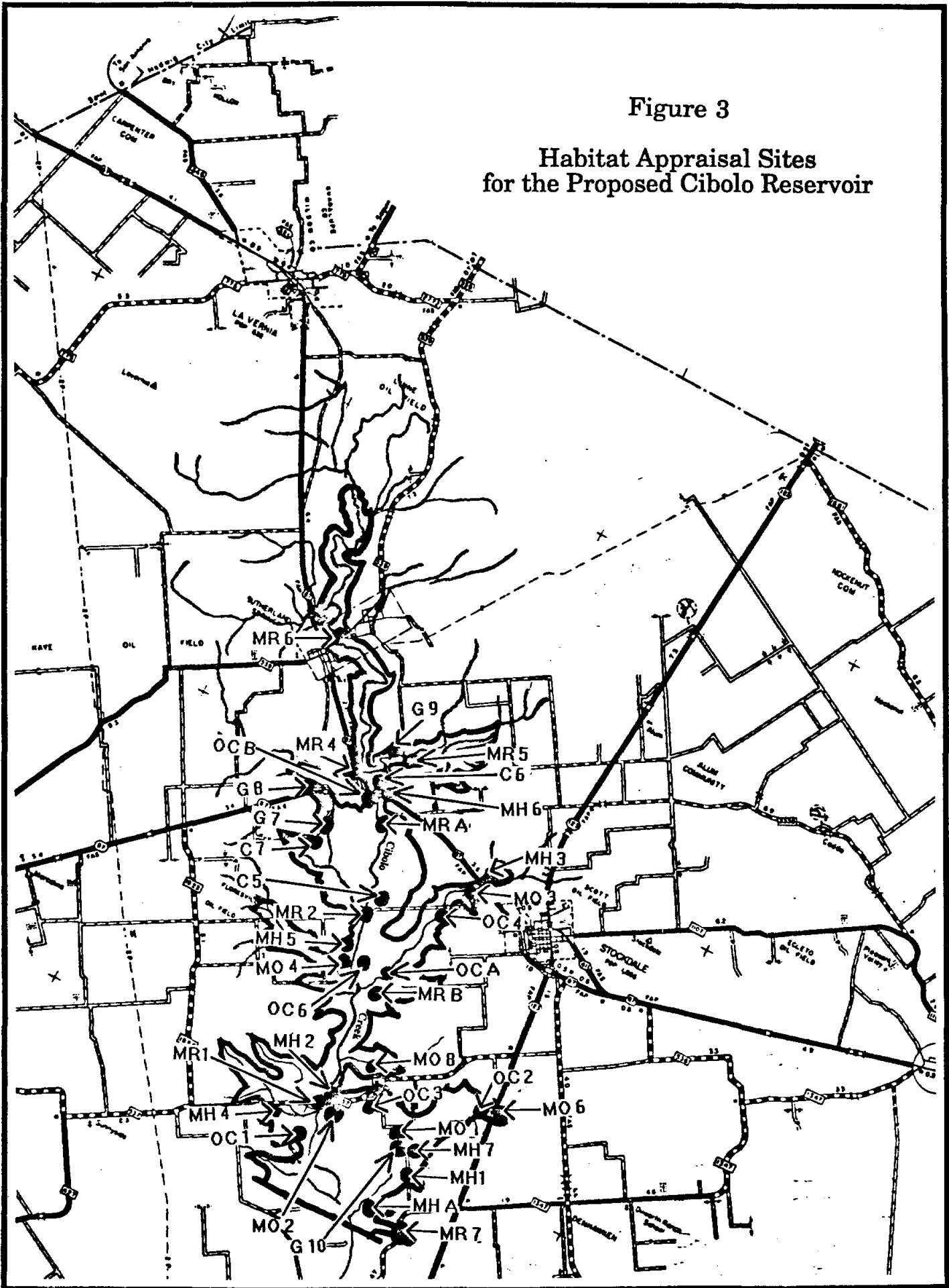
Field evaluation forms used to rate the existing cover types within the two reservoir sites are provided in Appendix 2.

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



Figure 3

Habitat Appraisal Sites  
for the Proposed Cibolo Reservoir



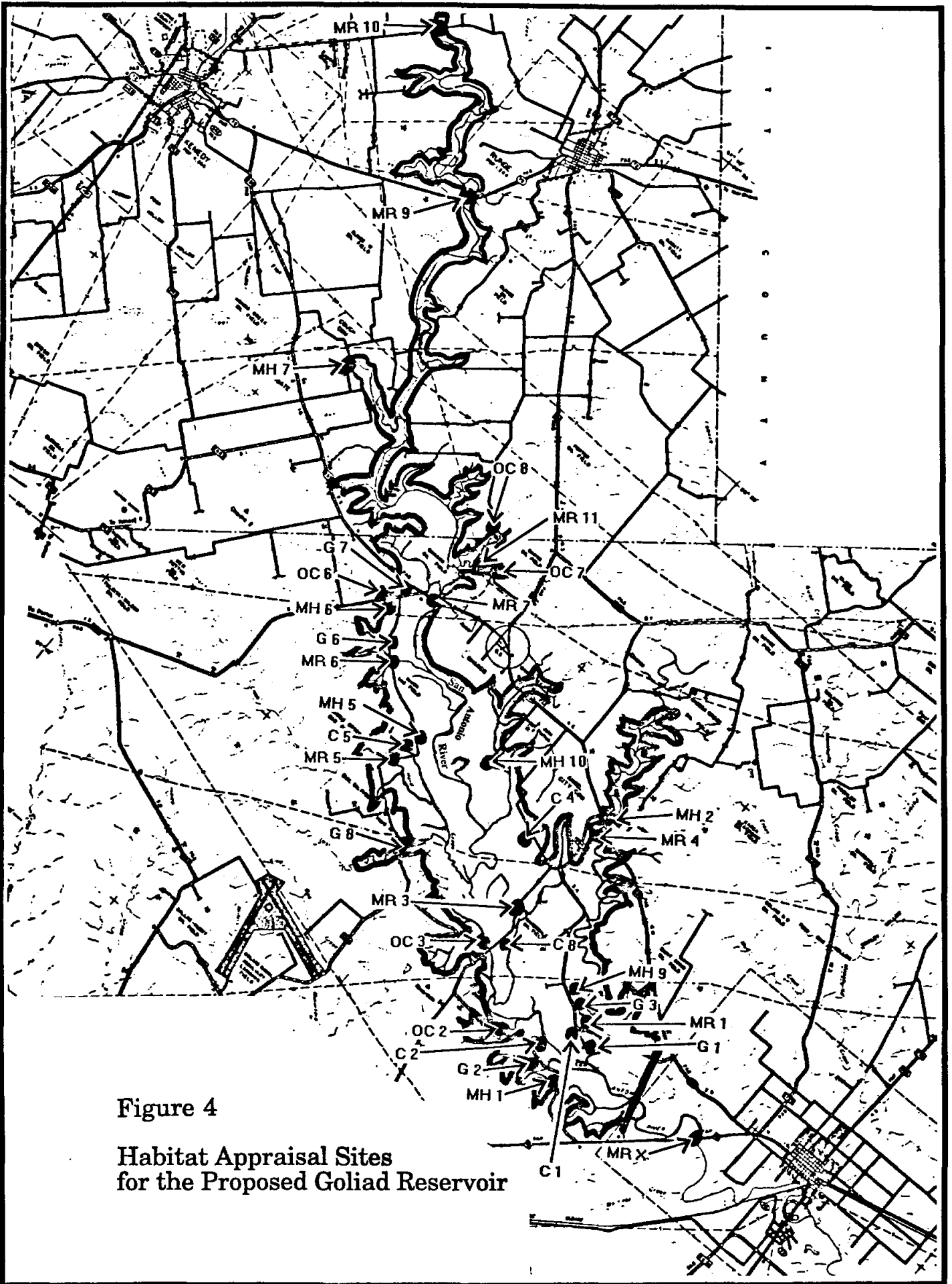


Figure 4  
 Habitat Appraisal Sites  
 for the Proposed Goliad Reservoir

Kirwin-Boydston, Robin Cypher, Jack Bauer, and Roy Frye of the Texas Parks and Wildlife Department's Resource Protection Division.

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## RESULTS

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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 Goliad 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 Goliad sites are provided respectively in Figures 5 and 6.

### Tabulated Data Summaries

Tabulated data for the Cibolo and Goliad 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

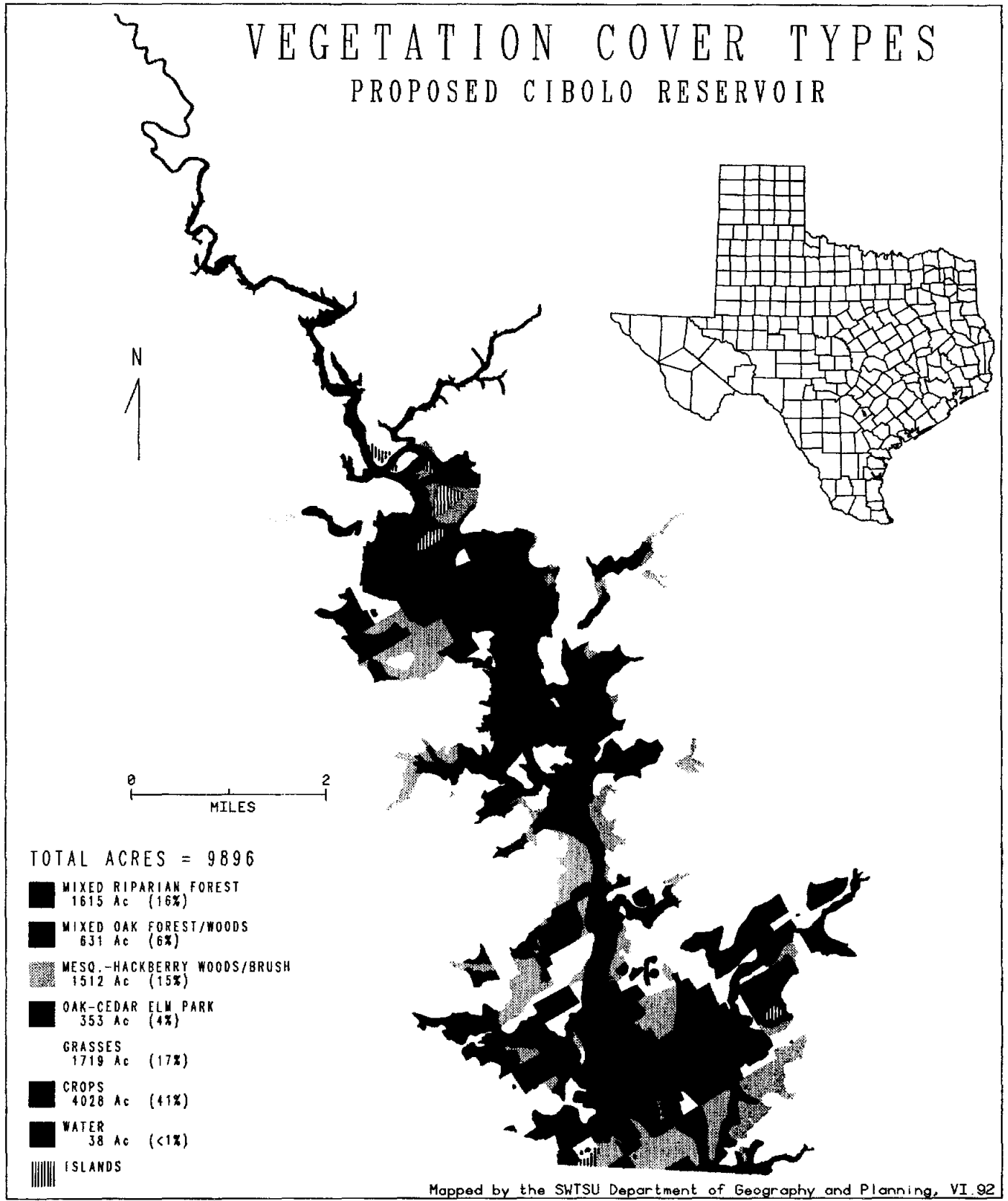
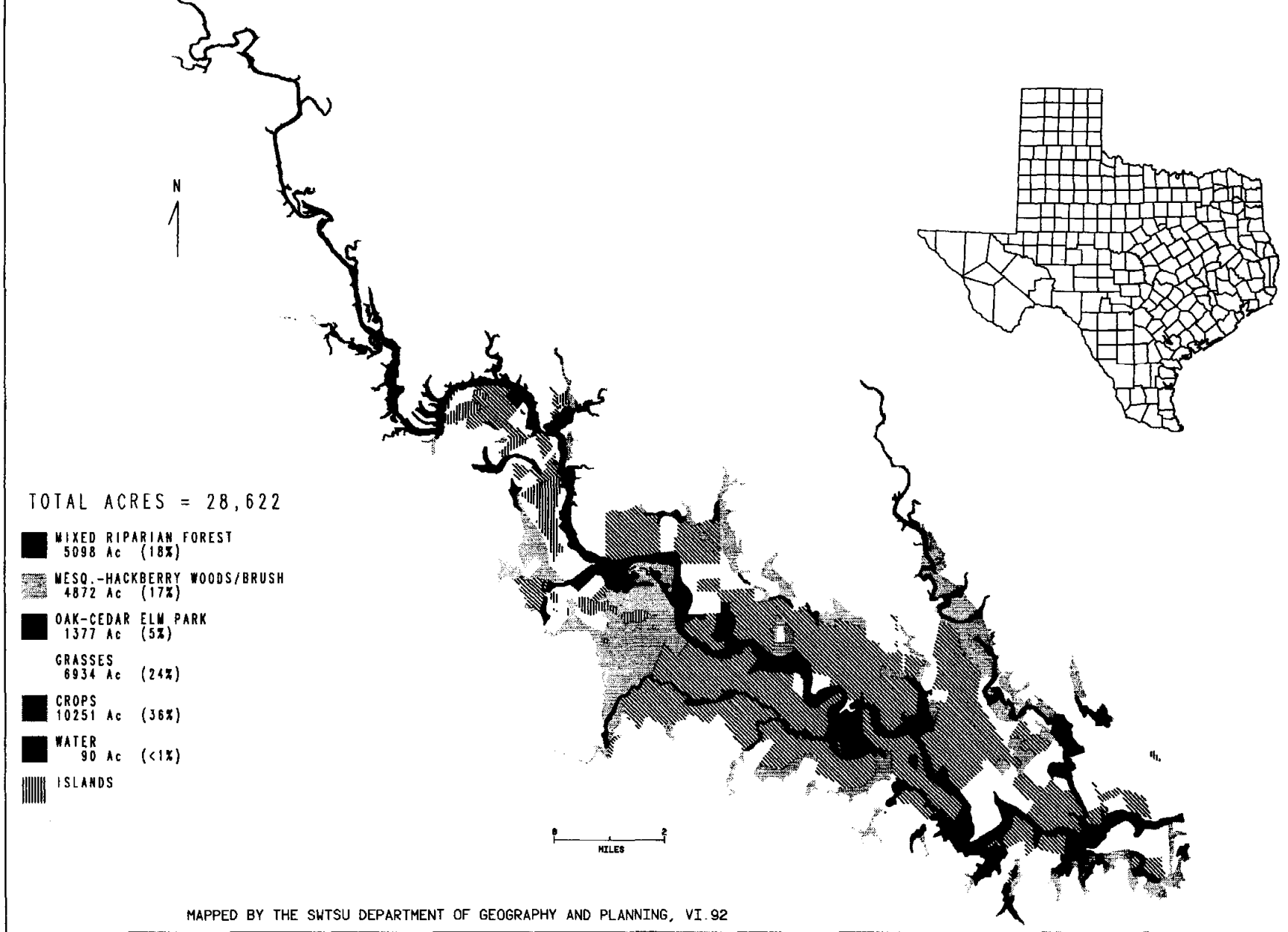


Figure 5. Vegetation Cover Types for Cibolo Reservoir

# VEGETATION COVER TYPES

## PROPOSED GOLIAD RESERVOIR



MAPPED BY THE SUTSU DEPARTMENT OF GEOGRAPHY AND PLANNING, VI. 92

Figure 6. Vegetation Cover Types for Goliad Reservoir

Table 3. Inventory of Cover Types and Habitat Quality Assessment for the Proposed Cibola Reservoir Site, 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%	.108	8,204
				Moderate 50%	.215	4,121
				Maximum 100%	.430	2,060
Grasses (4)	1,719	.36	619	Minimum 25%	.128	4,836
				Moderate 50%	.255	2,427
				Maximum 100%	.510	1,214
Mixed Riparian Forest (2)	1,615	.74	1,195	Minimum 25%	.053	22,547
				Moderate 50%	.105	11,381
				Maximum 100%	.210	5,690
Mesquite-Hackberry Woods/Brush (3)	1,512	.58	877	Minimum 25%	.093	9,430
				Moderate 50%	.185	4,741
				Maximum 100%	.370	2,370
Mixed Oak Forest/Woods (3)	631	.66	416	Minimum 25%	.073	5,699
				Moderate 50%	.145	2,869
				Maximum 100%	.290	1,434
Oak-Cedar Elm Park (3)	353	.65	229	Minimum 25%	.075	3,053
				Moderate 50%	.150	1,527
				Maximum 100%	.300	763
Water	38					
<b>Total</b>	<b>9,896</b>			Minimum 25%		53,769
				Moderate 50%		27,066
				Maximum 100%		13,531

Table 4. Inventory of Cover Types and Habitat Quality Assessment for the Proposed Goliad Reservoir Site, Normal Pool Elevation = 199.1' 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%	.100	25,630
				Moderate 50%	.200	12,815
				Maximum 100%	.400	6,407
Grasses (4)	6,934	.30	2,080	Minimum 25%	.143	14,545
				Moderate 50%	.285	7,298
				Maximum 100%	.570	3,649
Mixed Riparian Forest (2)	5,098	.69	3,518	Minimum 25%	.065	54,123
				Moderate 50%	.130	27,061
				Maximum 100%	.260	13,531
Mesquite-Hackberry Woods/Brush (3)	4,872	.55	2,680	Minimum 25%	.100	26,800
				Moderate 50%	.200	13,400
				Maximum 100%	.400	6,700
Oak-Cedar Elm Park (3)	1,377	.60	826	Minimum 25%	.088	9,386
				Moderate 50%	.175	4,720
				Maximum 100%	.350	2,360
Water	90					
Total	28,622			Minimum 25%		130,484
				Moderate 50%		65,294
				Maximum 100%		32,647

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## CONCLUSIONS

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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 Goliad Reservoir normal pool elevation was calculated at 28,622 acres. Of the four reservoirs (Cibolo, Goliad, 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 Goliad 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 Goliad site, full compensation would require 32,647 acres (1.1 acres required for each acre lost).

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## LITERATURE CITED

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- Gould, F.W., G.O. Hoffman 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.



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**APPENDIX 1**  
**Wildlife Habitat Appraisal**

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**TEXAS PARKS AND WILDLIFE DEPARTMENT**  
**WILDLIFE HABITAT APPRAISAL PROCEDURE (WHAP)**

**Background:** The Wildlife Habitat Appraisal Procedure was developed to allow a qualitative, holistic evaluation of wildlife habitat for particular tracts of land statewide without imposing significant time requirements in regard to field work and compilation of data.

Section I measures key components which contribute to the ecological condition of the evaluated tract and resulting overall suitability for wildlife. Habitat quality values are generated and combined with acreage figures to provide available Habitat Units (HU) and/or a Biological Habitat Components Score (BC) for each evaluated tract. Section II addresses the degree of presence or absence of Protected Fauna and Flora. In Section III, factors which may affect acquisition priority or overall suitability of the evaluated tract for management are addressed. Scores derived from evaluation parameters from each Section are integrated into a final summary for the evaluated tract.

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.

As designed, the Wildlife Habitat Appraisal Procedure is intended to be used for the following applications:

1. Evaluating impacts upon wildlife populations from various water development project alternatives.
2. Establishing base line data prior to anticipated or proposed changes in habitat conditions for specific areas.
3. Comparing tracts of land which are candidates for land acquisition or mitigation.
4. Evaluating general habitat quality and wildlife management potential for tracts of land over large geographical areas, including wildlife planning units.

The WHAP was not designed to evaluate habitat quality in relation to specific wildlife species. Other procedures exist or are currently being developed which utilize this approach. Such species-oriented evaluations generally require more detailed life requisite information, may not portray overall ecological conditions and could be subject to change within different geographical locations.

## SECTION I

### 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 (BC) 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).<sup>1/</sup> (See footnote citations, Appendix 2)

BIOLOGICAL HABITAT COMPONENTS  
EVALUATION KEY

**Biological Habitat Components  
Evaluation Key**

**Component 1 - Site Potential**

Evaluate for all cover types.

**Criteria 2/**

**Value**

Substrate is composed or exhibits one or more of the following: 1) at least periodically supports predominately hydrophytic vegetation; 2) is predominately undrained hydric soil and supports or is capable of supporting hydrophytic vegetation; 3) is saturated with water or covered by shallow water during 1-2 months during the growing season of each year (swamps, bogs, marshes, and hardwood bottomlands exhibiting a high frequency of flooding). 25

Alluvial substrate although less hydric than above; only temporarily or intermittently inundated or saturated for short periods (higher terraces of hardwood bottoms, riparian drainages). 20

Uplands with thick surface layer (generally greater than or equal to 10 inches) consisting of unrestricted loam (including sandy loam) or dark well structured (granulated) clay (including sandy clay). 12

Uplands with shallow surface layer (generally less than 10 inches) consisting of shallow soil over restrictive layer (rock, gravel, claypan, etc.) or deep, leached, droughty sand or, relatively light colored, poorly structured clay or gravelly/stony sand or clay. 7

Organic matter minimal or absent at the surface. (Includes undrained or saturated hydric soils not supporting vegetation i.e., mud flats). 3

Surface contains chemical compounds which would potentially limit growth of primary producers (salt, mine overburden containing heavy metals or acid compounds, surface pollution). 1

**Component 2 - Temporal Development of Existing Successional Stage**

Determine currently existing successional stage (Criteria A); evaluate for all cover types except marshes. For this habitat type use Criteria B.

<u>Criteria A<sup>3/</sup></u>	<u>Value</u>
Old timber (100 or more years)	20
Mature timber, old brush, climax prairie (40-99 years)	12
Pole and young timber, mature brush (11-39 years)	6
Grasslands in grazing disclimax* or early and mid-successional perennial grasses and forbs	5
Seedlings, saplings, young brush (3-10 years)	3
Annual native or introduced grasses, forbs, crops	1

\* Example: Texas wintergrass-silver bluestem grasslands

<u>Criteria B</u> (Marsh wetlands)	<u>Value</u>
Established mature communities within or adjacent to an enclosed coastal water body with a free connection to the sea and a measurable quantity of salt in its waters but with abundant or semi-abundant freshwater inflow (estuarine areas).	20
Established mature communities or intermediate to well advanced successional stages occurring in fresh, brackish, or saline environments; freshwater inflow limited to generally small tributaries and localized runoff or overflow from flood conditions.	10
Aquatic or semi-aquatic communities occurring in generally early to intermediate successional stages as a result of periodic changes in moisture gradients; highly dependent on seasonal weather conditions.	5

### Component 3 - Uniqueness and Relative Abundance

1. Evaluate the habitat within the site according to the categories below. Enter the value on the Acquisition Components Evaluation Summary.

<u>Category</u>	<u>Value</u>
Highly valuable for wildlife and is very uncommon, unique or irreplaceable (USFWS Mitigation Resource Category 1*)	20

\*Corresponds to scarcity and abundance criteria as contained in U.S. Fish and Wildlife Service Mitigation Policy; Federal Register Vol. 46:15, Jan. 23, 1981.

Highly valuable for wildlife but is relatively scarce or becoming scarce (USFWS Mitigation Resource Category 2)	15
Exhibits high to medium value for wildlife and is relatively abundant (USFWS Mitigation Resource Category 3)	10
Exhibits medium to low value for wildlife and is relatively abundant (USFWS Mitigation Resource Category 4)	5
Exhibits very low wildlife value regardless of abundance or scarcity	0

#### Component 4 - Vegetative Species Diversity

##### Criteria A

##### Diversity of Woody Species

Evaluate the composition of readily observable woody species in the overstory, midstory, and understory by determining the number of species groups as represented by the following categories. Evaluate for all cover types except Swamps (Criteria C) and Marsh wetlands (Criteria D). Confine search effort for Criteria A & B to an area not larger than 1 acre (circle with 39 yd. diameter). Worksheet for Criteria A & B provided on page 26.

<u>Species Group<sup>4/</sup></u>	<u>Examples</u>
Berry/Drupe	hackberry, mulberry, paw paw, hawthorn, winterberry, black haw, soapberry, persimmon, choke cherry, yaupon.
Legume/Pod	mesquite, locust, redbud, <u>Acacia</u> spp.
Acorn	white oak, red oak, live oak, water oak
Nut/Nutlike	hickory, pecan, walnut
Samara (Winged Fruit)	elm, ash, box elder
Cone	pinus, cypress
Achene	sycamore, <u>Baccharis</u> spp., sandsage
All others (capsules, follicles, burs, hairy seeds)	willow, cottonwood, sweetgum, salt cedar yucca, cactus

Value assigned is equivalent to the number of groups represented (Maximum=8, If none is represented then value is 0)

**Criteria B****Total Number of Occurring Woody Species**

Determine the total number of readily observable woody species and assign value according to the following categories. Do not use for Swamps (Criteria C) or Marsh wetlands (Criteria D)

	<u>Value</u>
15 or more species	7
10-14 species	5
5-9 species	3
1-4 species	1
None occurring	0

**Criteria C****Diversity of Vegetation in Swamps**

Evaluate swamp areas according to the following categories: 5/

	<u>Value</u>
Seasonally flooded mixed bottomland hardwoods; inundation resulting from freshwater inflow	15
Seasonally flooded vegetation dominated by cypress-tupelo; inundation resulting from freshwater inflow	10
Continually flooded or infrequent, abrasively flooded vegetation comprised of one or more species; inundation resulting from freshwater, brackish or saline inflow	6
Continually flooded vegetation; inundation resulting from stagnant or impounded freshwater, brackish, or saline water conditions	2

**Criteria D****Diversity of Vegetation in Marshes and other similar wetland areas**

Determine the major types of wetland vegetation present according to the following categories: rooted emergent vegetation, rooted submergent vegetation, rooted vegetation with floating leaves, algal mat communities (microalgae), benthic or drifting seaweeds (macroalgae).



	<u>Value</u>
<u>High</u> - includes three or more of above categories.	20
<u>Medium</u> - includes two of the above categories.	15
<u>Low</u> - includes one of the above categories.	5

#### Component 5 - Vertical Vegetation Stratification<sup>6/</sup>

Evaluate canopy coverage of the following three categories of vegetation for all cover types except crops and marsh wetlands.

- Categories:
- 1) Vegetation greater than 12 feet high
  - 2) Vegetation 3-12 feet high
  - 3) Vegetation less than 3 feet high

<u>Criteria</u>	<u>Value</u>
All three categories present, each accounting for at least 25 percent of ground cover	5
Any two of the above categories present, each accounting for at least 25 percent of ground coverage	4
Only one of the above categories present and accounting for at least 25 percent of ground coverage	3
None of the categories together account for more than 25 percent of ground cover	1

#### Component 6 - Additional Structural Diversity Components

Evaluate for all cover types except crops. Determine the presence of brush piles, rock piles, rocky crevices, snags, fallen logs, thick grass cover, brambles or thickets according to the following categories.

<u>Criteria</u>	<u>Value</u>
<u>Abundant</u> - Three or more of the above components readily apparent and observable from most locations within the site	5
<u>Moderate</u> - Any of the above components present, and observable with very little search effort	3

Sparse - Any of the above components present, but occurring infrequently or requiring significant search effort to locate 1

Absent - None of the above components observed 0

### Component 7 - Condition of Existing Vegetation - Other

Use: Criteria A&B for cover types (other than crops and marsh wetlands) containing woody and/or herbaceous vegetation.  
Criteria C for cropland only.  
Criteria D for marsh wetlands.

Criteria A Value  
Degree of Utilization of Woody Vegetation by vertebrates and invertebrates

Not evident - little or no evidence of plant utilization 5

Moderate - Plant utilization observable with minimal damage to leaves and/or stems. 3

Severe - Damage to leaves and/or stems readily observable. 1

Criteria B Value  
Availability of Herbaceous Vegetation. Do not evaluate for Crops (Criteria C) or Marsh Wetlands (Criteria D)

Good - Eight or more combined species of grasses and forbs readily observable. 5

Fair - Four to seven combined species of grasses and forbs readily observable. 3

Poor - One to three combined species of grasses and forbs readily observable 1

None - Herbaceous vegetation lacking or absent 0

Criteria C Value  
Available Biomass (Evaluate for croplands only)

High - Biomass removed periodically, although not necessarily annually; removed biomass supplanted by other vegetation resulting from natural succession of invading species or overseeding of introduced species; (Ex. Rice or other crop on multi-year rotational system allowing for additional biomass accumulations between harvests). 10

**Moderate** - Most biomass removed annually or semi-annually but with some residual amount remaining during portions of the rotational period. Minimal bare ground conditions (Hay operations, crops grown for pasture or grazing, chiseled crops). 5

**Low** - Most biomass removed annually due to clean farming practices creating significant bare ground conditions (intensive row crop farming). 1

**Criteria D**

**Value**

**Condition of Marsh Wetlands**

**Unaltered** - Quality of water and/or associated vegetation good, no immediate danger of environmental intrusion including pollution, contamination, sedimentation, or stagnation. 10

**Stable** - Quality of water and/or associated vegetation good, although evidence exists that pollution, contamination sedimentation or stagnation could occur in the future or has occurred in the past. 5

**Degraded** - Quality of water and/or associated vegetation poor or declining or degradation imminent. 1

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**APPENDIX 2**  
**Field Evaluation Forms**

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**WHAP  
Biological Components  
Field Evaluation Form**

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Crops

Habitat Components

Component Points (From Key)

Site No.	C <sub>6</sub>	C <sub>7</sub>	C <sub>5</sub>					TOTAL
	1. Site Potential	20	12	20				
2. Temporal Development								
Criteria A	1	1	1					3
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance	0	0	5					5
4. Vegetative Species Diversity								
Criteria A	1	1	1					3
Criteria B	0	0	0					0
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification	1	1	1					3
6. Additional Structural Diversity Components								
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)	0	0	0					0
Criteria B (Herbaceous Vegetation)	0	0	0					0
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \underline{.22}$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Bauer / Cypher 7/6-7/93

Cover Type Crops

Site No.	C6	C7	C5		
Berry/Drupe					
Legume/Pod		Bean			
Acorn					
Nut/Nutlike					
Samara					
Cone					
Achene					
All Others	Sorghum				

Corn

soils -

Terrace

Terrace-  
Alluvial

Terrace-  
Upland Transition

Bauer/Cypher

WHAP  
Biological Components  
Field Evaluation Form

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Grasses

Habitat Components

Component Points (From Key)

	Site No.	G7	G8	G9	G10				TOTAL
1. Site Potential		12	20	20	12				64
2. Temporal Development									
Criteria A		5	5	5	6				21
Criteria B (Marsh Wetlands Only)									
3. Uniqueness and Relative Abundance		0	0	5	5				10
4. Vegetative Species Diversity									
Criteria A		2	0	2	1				5
Criteria B		1	0	1	1				3
Criteria C (Swamps Only)									
Criteria D (Marsh Wetlands Only)									
5. Vertical Stratification		3	3	3	3				12
6. Additional Structural Diversity Components		1	1	3	1				6
7. Condition of Existing Vegetation									
Criteria A (Woody Vegetation)		1	0	3	5				9
Criteria B (Herbaceous Vegetation)		1	1	5	5				12
Criteria C (Croplands Only)									
Criteria D (Marsh Wetlands Only)									

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{72}{200} = .36$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Bauer/Cypher 7/6-7/95

Cover Type Grasses

Site No.	G 7	G 8	G 9	G 10	
Berry/Drupe	Hackberry		Anaqua		
Legume/Pod	Mesquite		Mesquite		
Acorn				Live Oak	
Nut/Nutlike					
Samara					
Cone					
Achene					
All Others					

Coastal Bermuda



WHAP  
Biological Components  
Field Evaluation Form

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Mixed Riparian Forest

Habitat Components

Component Points (From Key)

Site No.	MR6	MR4	MRA	MR2	MRB	MRS	MR7	TOTAL
	1. Site Potential	20	20	20	20	15	20	12
2. Temporal Development								
Criteria A	12	12	20	12	12	12	10	90
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance	15	15	15	15	15	15	10	100
4. Vegetative Species Diversity								
Criteria A	5	4	5	4	3	3	3	27
Criteria B	5	5	5	3	5	5	3	31
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification	5	4	4	4	5	5	4	31
6. Additional Structural Diversity Components	5	3	5	5	5	5	5	33
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)	5	5	5	5	5	5	3	33
Criteria B (Herbaceous Vegetation)	3	5	5	5	5	5	3	31
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} =$  \_\_\_\_\_

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

WHAP  
Biological Components  
Field Evaluation Form

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Mixed Riparian Forest

Habitat Components

Component Points (From Key)

	Site No.	MRI						TOTAL
1.	Site Potential	20						20
2.	Temporal Development							
	Criteria A	20						20
	Criteria B (Marsh Wetlands Only)							
3.	Uniqueness and Relative Abundance	15						15
4.	Vegetative Species Diversity							
	Criteria A	6						6
	Criteria B	5						5
	Criteria C (Swamps Only)							
	Criteria D (Marsh Wetlands Only)							
5.	Vertical Stratification	5						5
6.	Additional Structural Diversity Components	5						5
7.	Condition of Existing Vegetation							
	Criteria A (Woody Vegetation)	5						5
	Criteria B (Herbaceous Vegetation)	5						5
	Criteria C (Croplands Only)							
	Criteria D (Marsh Wetlands Only)							

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{76}{100} = .74$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Mixed Riparian Forest

Site No.	MR6	MR4	MR A	MR 2	MRB
Berry/Drupe	<ul style="list-style-type: none"> <li>• Hackberry</li> <li>• Soapberry</li> <li>• Chinaberry</li> <li>• Dewberry</li> <li>• Lotebush</li> <li>• Grape</li> </ul>	<ul style="list-style-type: none"> <li>• Hackberry</li> <li>• Mulberry</li> <li>• Grape</li> <li>• Greenbriar</li> <li>• Poison Ivy</li> <li>• Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>• Hackberry</li> <li>• Anagua</li> <li>• Grape</li> <li>• Virginia Creeper</li> <li>• Greenbriar</li> <li>• Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>• Hackberry</li> <li>• Anagua</li> <li>• Grape</li> <li>• Poison Ivy</li> <li>• Soapberry</li> <li>• Virginia Creeper</li> </ul>	<ul style="list-style-type: none"> <li>• Hackberry</li> <li>• Anagua</li> <li>• Grajano</li> <li>• Green Cordalia</li> <li>• Brazil</li> <li>• Bumelia</li> <li>• Persimmon</li> </ul>
Legume/Pod	Mesquite		Mesquite		• Mesquite
Acorn		• Live Oak			
Nut/Nutlike	• Pecan	• Pecan	Pecan	• Pecan	
Samara	<ul style="list-style-type: none"> <li>• American Elm</li> <li>• Winged Elm</li> </ul>	<ul style="list-style-type: none"> <li>• Cedar Elm</li> <li>• Common Hop</li> </ul>	<ul style="list-style-type: none"> <li>• American Elm</li> <li>• Cedar Elm</li> <li>• Common Hop</li> </ul>	• Cedar Elm	<ul style="list-style-type: none"> <li>• American Elm</li> <li>• Winged Elm</li> </ul>
Cone					
Achene					
All Others	Prickly Pear		Black Willow Cottonwood	• Cottonwood	

• - Dominant

Cover Type Mixed Riparian Forest

Site No.	MR5	MR7*	MR1		
Berry/Drupe	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anagua</li> <li>● Granjeno</li> <li>● Brazil</li> <li>● Chinaberry</li> <li>● Greenbriar</li> <li>● Virginia Creeper</li> <li>● Persimmon</li> <li>● Grape Sap-1</li> <li>● Grape Sap-2</li> </ul>	<ul style="list-style-type: none"> <li>● Brazil</li> <li>● Green Cordalia</li> <li>● Prickly Ash</li> <li>● Hackberry</li> <li>● Grape</li> <li>● Anagua</li> <li>● Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anagua</li> <li>● Chinaberry</li> <li>● Common Hop</li> <li>● Greenbriar</li> <li>● Grape</li> <li>● Virginia Creeper</li> </ul>		
Legume/Pod	● Mesquite	● Mesquite	Mesquite		
Acorn			Live Oak		
Nut/Nutlike			● Pecan		
Samara	● Cedar Elm		● American Elm		
Cone					
Achene					
All Others		Prickly Pear	● Black Willow Prickly Pear		

● - Dominant

\* - Narrow, isolated, upland; Highly impacted by agriculture

WHAP  
Biological Components  
Field Evaluation Form

Sheet LoF 2

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Mesquite-Hackberry Woods/Brush

Habitat Components

Component Points (From Key)

Site No.		MH3	MH6	MH5	MHA	MH1	MH7	MH2	TOTAL
1.	Site Potential	20	20	12	12	12	12	12	100
2.	Temporal Development								
	Criteria A	12	3	15	12	8	12	10	72
	Criteria B (Marsh Wetlands Only)								
3.	Uniqueness and Relative Abundance	10	5	10	10	10	10	10	65
4.	Vegetative Species Diversity								
	Criteria A	4	1	3	3	3	3	5	22
	Criteria B	3	1	3	3	3	7	3	23
	Criteria C (Swamps Only)								
	Criteria D (Marsh Wetlands Only)								
5.	Vertical Stratification	4	4	3	4	4	5	5	29
6.	Additional Structural Diversity Components	5	3	3	5	5	5	3	29
7.	Condition of Existing Vegetation								
	Criteria A (Woody Vegetation)	3	3	3	3	5	5	4	26
	Criteria B (Herbaceous Vegetation)	5	5	5	5	5	5	5	35
	Criteria C (Croplands Only)								
	Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{266}{100} = 2.66$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

WHAP  
Biological Components  
Field Evaluation Form

Sheet 2 of 2

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Mesquite-Hackberry Woods/Brush

Habitat Components

Component Points (From Key)

	Site No.	MH4						TOTAL
1. Site Potential		15						15
2. Temporal Development								
Criteria A		12						12
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance		10						10
4. Vegetative Species Diversity								
Criteria A		4						4
Criteria B		5						5
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification		5						5
6. Additional Structural Diversity Components		1						1
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)		4						4
Criteria B (Herbaceous Vegetation)		5						5
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \underline{.58}$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Mesquite-Hackberry Woods/Brush

Site No.	MH3	MH6**	MH5*	MHA	MH1
Berry/Drupe	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anagua</li> <li>● Granjeno</li> <li>● Virginia Creeper</li> </ul>		<ul style="list-style-type: none"> <li>● Prickly Ash</li> <li>● Anagua</li> <li>● Bumelia</li> <li>● Granjeno</li> </ul>	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anagua</li> <li>● Granjeno</li> <li>● Brazil</li> <li>● Green Condalia</li> <li>● Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>● Granjeno</li> <li>● Green Condalia</li> <li>● White Bush</li> <li>● Persimmon</li> </ul>
Legume/Pod	<ul style="list-style-type: none"> <li>● Mesquite</li> </ul>	<ul style="list-style-type: none"> <li>● Mesquite</li> </ul>		<ul style="list-style-type: none"> <li>● Mesquite</li> </ul>	<ul style="list-style-type: none"> <li>● Mesquite</li> <li>● Huisache</li> </ul>
Acorn	<ul style="list-style-type: none"> <li>● Live Oak</li> </ul>		<ul style="list-style-type: none"> <li>● Post Oak</li> <li>● Live Oak</li> </ul>		
Nut/Nutlike					
Samara					
Cone					
Achene					
All Others	<ul style="list-style-type: none"> <li>● Prickly Cactus</li> <li>● Prickly Pear</li> </ul>		<ul style="list-style-type: none"> <li>● Prickly Cactus</li> <li>● Prickly Pear</li> </ul>	<ul style="list-style-type: none"> <li>● Prickly Pear</li> </ul>	<ul style="list-style-type: none"> <li>● Prickly Pear</li> </ul>

- - Dominant
- \* - Not characteristic of cover type description; more like a Post Oak Upland
- \*\* - Site appears to have been recently (less than 15 years) taken out of crop production; new growth mesquite and herbaceous layer

Cover Type Mesquite-Hackberry Woods/Brush

Site No.	MH7	MH2	MH4		
Berry/Drupe grape spp. - 1 Grape spp. - 2	Hackberry Anagua Granjeno Brazil Virginia Creeper Green Condalia Persimmon Bumelia Prickly Ash White Bush	Hackberry Anagua Granjeno Prickly Ash Persimmon	Hackberry Brazil Granjeno Greenbiter ● Anagua Virginia Creeper Persimmon		
Legume/Pod	● Mesquite Huizache	● Mesquite	● Mesquite		
Acorn		Live Oak	● Live Oak		
Nut/Nutlike					
Samara		Common Hop			
Cone					
Achene					
All Others	Prickly Pear	Prickly Pear	Prickly Pear		

● - Dominant



WHAP  
Biological Components  
Field Evaluation Form

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Mixed Oak Forest/Woods

Habitat Components

Component Points (From Key)

Site No.	MO <sub>2</sub>	MO <sub>4</sub>	MO <sub>6</sub>	MO <sub>1</sub>	MO <sub>7</sub>	MO <sub>8</sub>	MO <sub>9</sub>	TOTAL
1. Site Potential	20	20	20	20	12	12	12	116
2. Temporal Development								
Criteria A	12	12	12	15	12	12	12	87
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance	10	12	12	15	10	12	10	81
4. Vegetative Species Diversity								
Criteria A	3	5	4	5	4	5	3	29
Criteria B	3	5	5	5	5	5	3	31
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification	4	3	5	5	5	4	4	30
6. Additional Structural Diversity Components	5	5	5	5	5	5	5	35
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)	1	1	5	5	5	4	5	26
Criteria B (Herbaceous Vegetation)	5	5	5	5	3	3	3	29
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{63}{100} = .63$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Mixed Oak Forest/Woods

Site No.	MO3*	MO4**	MO6	MO1	MO7
Berry/Drupe	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>Virginia Creeper</li> <li>● Anaqua</li> <li>Green Condalia</li> </ul>	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anaqua</li> <li>Grape</li> <li>Granjeno</li> <li>Green Condalia</li> <li>Poison Ivy</li> <li>Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>Hackberry</li> <li>● Anaqua</li> <li>Grape</li> <li>Poison Ivy</li> <li>China-berry</li> <li>Virginia Creeper</li> <li>Bumelia</li> <li>Greenbrier</li> <li>Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anaqua</li> <li>Grape</li> <li>Poison Ivy</li> <li>Soapberry</li> <li>Virginia Creeper</li> <li>Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>Hackberry</li> <li>● Anaqua</li> <li>● Granjeno</li> <li>Grape</li> <li>Green Condalia</li> <li>Virginia Creeper</li> <li>White Bush</li> </ul>
Legume/Pod	Mesquite	Mesquite	● Mesquite	Mesquite	● Mesquite
Acorn		● Live Oak	● Live Oak	● Live Oak	Live Oak
Nut/Nutlike				Pean	
Samara		elm			
Cone					
Achene					
All Others	<ul style="list-style-type: none"> <li>Rail Cactus</li> <li>Prickly Pear</li> </ul>	Prickly Pear	Rail Cactus	Prickly Pear	Prickly Pear

● - Dominant

\* - Brambles and brush piles from recent high water

\*\* - Site characterized more accurately as Mixed Riparian woodland

Cover Type Mixed Oak Forest/Woods

Site No.	MO8	MO2			
Berry/Drupe	<ul style="list-style-type: none"> <li>● Hackberry</li> <li>● Anagua</li> <li>● Brazil</li> <li>● Prickly Ash</li> <li>● Grape</li> <li>● Granjeno</li> <li>● Green Cordalia</li> <li>● Persimmon</li> </ul>	<ul style="list-style-type: none"> <li>● Granjeno</li> <li>● Brazil</li> <li>● Grape</li> <li>● Green Cordalia</li> <li>● Prickly Ash</li> <li>● Persimmon</li> </ul>			
Legume/Pod	<ul style="list-style-type: none"> <li>● Mesquite</li> </ul>	<ul style="list-style-type: none"> <li>● Mesquite</li> </ul>			
Acorn	<ul style="list-style-type: none"> <li>● Live Oak</li> </ul>				
Nut/Nutlike					
Samara	<ul style="list-style-type: none"> <li>● Cedar Elm</li> </ul>				
Cone					
Achene					
All Others	<ul style="list-style-type: none"> <li>● Prickly Pear</li> </ul>	<ul style="list-style-type: none"> <li>● Prickly Pear</li> </ul>			

● - Dominant

WHAP  
Biological Components  
Field Evaluation Form

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Oak-Cedar Elm Park

Habitat Components

Component Points (From Key)

	Site No.	OC4	OC6	OCA	OC2	OCB	OC3	OC1	TOTAL
1. Site Potential		20	12	20	15	20	12	12	111
2. Temporal Development									
Criteria A		20	6	12	15	20	12	12	97
Criteria B (Marsh Wetlands Only)									
3. Uniqueness and Relative Abundance		10	8	10	12	15	8	10	73
4. Vegetative Species Diversity									
Criteria A		4	4	5	4	6	3	4	30
Criteria B		5	3	3	5	7	3	5	31
Criteria C (Swamps Only)									
Criteria D (Marsh Wetlands Only)									
5. Vertical Stratification		5	4	4	4	5	3	4	29
6. Additional Structural Diversity Components		5	5	5	5	5	3	5	33
7. Condition of Existing Vegetation									
Criteria A (Woody Vegetation)		3	1	3	5	5	1	5	23
Criteria B (Herbaceous Vegetation)		5	5	3	5	5	3	4	30
Criteria C (Croplands Only)									
Criteria D (Marsh Wetlands Only)									

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} =$  \_\_\_\_\_

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

WHAP  
Biological Components  
Field Evaluation Form

Project Proposed Cibola Reservoir Site Date: 7/6-7/93

Cover Type or Plant Association Oak-Cedar Elm Park

Habitat Components

Component Points (From Key)

	Site No.	Component Points (From Key)						TOTAL
1. Site Potential	OC7*	25						
2. Temporal Development								
Criteria A		8						
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance		15						
4. Vegetative Species Diversity								
Criteria A		2						
Criteria B		3						
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification		4						
6. Additional Structural Diversity Components		1						
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)		5						
Criteria B (Herbaceous Vegetation)		3						
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

\*Not representative - throw out

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \underline{.65}$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Oak-Cedar Elm Park

Site No.	OC4	OC6	OCA*	OC2	OCB
Berry/Drupe	● Hackberry ● Anagua Virginia Creeper Green Candalia Greenbriar Grape Prickly Ash	● Hackberry Brazil Anagua ● Granjeno Bumelia Persimmon	● Hackberry Bumelia Green Candalia	Hackberry Prickly Ash Poison Ivy Grape Virginia Creeper Persimmon	Hackberry Dewberry Greenbriar TX Calubrina Grape Spp.-1 Brazil Grape Spp.-2
Legume/Pod	Mesquite	● Mesquite	Huisache	Mesquite	Mesquite Locust
Acorn	● Live Oak	● Live Oak	Live Oak	● Live Oak	● Live Oak
Nut/Nutlike					● Pecan
Samara	● American Elm	Cedar Elm	American Elm Cedar Elm		Cedar Elm ● American Elm Winged Elm Box Elder Green Ash
Cone					
Achene					
All Others			● Blackwillow	● Cottonwood Blackwillow	Blackwillow Prickly Pear ● Cottonwood

● - Dominant

\* - Considerable agricultural disturbance on all sides of site

Cover Type Oak-Cedar Elm Park

Site No.	OC3*	OC1	OC7**		
Berry/Drupe	<ul style="list-style-type: none"> <li>• Anagua</li> <li>• Grape</li> <li>• Granjeno</li> <li>• Hackberry</li> <li>• Chinaberry</li> </ul>	<ul style="list-style-type: none"> <li>• Anagua</li> <li>• Hackberry</li> <li>• Granjeno</li> <li>• Persimmon</li> <li>• Common Hop</li> <li>• Prickly Ash</li> <li>• Brazil</li> <li>• Agave</li> <li>• White Bush</li> <li>• Grape</li> </ul>	<ul style="list-style-type: none"> <li>• Hackberry</li> </ul>		
Legume/Pod	<ul style="list-style-type: none"> <li>• Mesquite</li> </ul>	<ul style="list-style-type: none"> <li>• Mesquite</li> </ul>	<ul style="list-style-type: none"> <li>• Mesquite</li> </ul>		
Acorn	<ul style="list-style-type: none"> <li>• Live Oak</li> </ul>	<ul style="list-style-type: none"> <li>• Live Oak</li> </ul>	<ul style="list-style-type: none"> <li>• Live Oak</li> </ul>		
Nut/Nutlike					
Samara					
Cone					
Achene					
All Others		<ul style="list-style-type: none"> <li>• Rascal Cactus</li> <li>• Prickly Pear</li> </ul>			

NOT REPRESENTATIVE - THROW OUT

• Coastal Bermuda

- - Dominant
- \* - Overgrazed
- \*\* - Not representative of cover type

**WHAP  
Biological Components  
Field Evaluation Form**

Project Goliad Date: 7/6/93

Cover Type or Plant Association Crops

Habitat Components	Site No.	Component Points (From Key)					TOTAL
		C	C	C	C	C	
1. Site Potential		5	8	2	1	4	84
		12	20	12	20	20	
2. Temporal Development							
Criteria A		1	1	1	1	1	5
Criteria B (Marsh Wetlands Only)							
3. Uniqueness and Relative Abundance		5	5	5	5	5	25
4. Vegetative Species Diversity							
Criteria A		0	0	0	0	0	0
Criteria B		0	0	0	0	0	0
Criteria C (Swamps Only)							
Criteria D (Marsh Wetlands Only)							
5. Vertical Stratification		-	-	-	-	-	-
6. Additional Structural Diversity Components		-	-	-	-	-	-
7. Condition of Existing Vegetation							
Criteria A (Woody Vegetation)		-	-	-	-	-	-
Criteria B (Herbaceous Vegetation)		-	-	-	-	-	-
Criteria C (Croplands Only)		1	1	1	1	5	9
Criteria D (Marsh Wetlands Only)							

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{123}{27} \times \frac{1}{100} = .25$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.



Cover Type Crops

Site No.	C 5	C 8	C 2	C 1	C 4
Berry/Drupe	0	0	0	0	0
Legume/Pod	0	0	0	0	0
Acorn	0	0	0	0	0
Nut/Nutlike	0	0	0	0	0
Samara	0	0	0	0	0
Cone	0	0	0	0	0
Achene	0	0	0	0	0
All Others	0	0	0	0	0

**WHAP  
Biological Components  
Field Evaluation Form**

Project Goliad Date: 7/6/93

Cover Type or Plant Association Grasses

Habitat Components

	Site No.	Component Points (From Key)						TOTAL
		G 7	G 6	G 8	G 2	G 1	G 3	
1. Site Potential		12	12	12	12	20	12	80
2. Temporal Development								
Criteria A		1	1	1	1	1	1	6
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance		0	5	0	0	5	0	10
4. Vegetative Species Diversity								
Criteria A		1	1	1	1	1	1	6
Criteria B		1	1	1	1	1	1	6
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification		3	3	3	3	3	3	18
6. Additional Structural Diversity Components		3	0	1	1	3	3	11
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)		5	5	5	3	5	5	28
Criteria B (Herbaceous Vegetation)		1	5	1	1	3	1	12
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								
		27	33	25	23	42	27	177

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{177}{100} = .30$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Grasses

Site No.	G 7	G 6	G 8	G 2	G 1?
Berry/Drupe	Opacua Hackberry Mustang grape	Neisache	Hackberry	Hackberry	
Legume/Pod					Neisache Mesquite
Acorn					
Nut/Nutlike					
Samara					
Cone					
Achene					
All Others					

Cover Type Grasses

Site No.	63				
Berry/Drupe					
Legume/Pod	Mesquite				
Acorn					
Nut/Nutlike					
Samara					
Cone					
Achene					
All Others					

1 of 3

WHAP  
Biological Components  
Field Evaluation Form

Sheet 1 of 2

Project Goliad Date: 7/6/93

Cover Type or Plant Association Mixed Riparian Forest ~~Riparian~~

Habitat Components

Site No.	Component Points (From Key)							TOTAL
	MR	MR	MR	MR	MR	MR	MR	
1. Site Potential	10	9	7	6	5	3	X	140
2. Temporal Development								
Criteria A	12	12	12	6	12	12	20	86
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance	15	15	15	10	15	15	15	100
4. Vegetative Species Diversity								
Criteria A	3	3	4	4	2	2	4	22
Criteria B	3	3	3	3	3	5	3	23
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification	5	5	4	5	5	5	5	34
6. Additional Structural Diversity Components	5	5	3	5	3	5	3	29
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)	3	5	3	5	5	5	5	31
Criteria B (Herbaceous Vegetation)	3	3	1	1	3	1	1	13
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{.69 + .71 + .65 + .59 + .68 + .70 + .76}{7} = \frac{478}{100} = 0.68$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

0.68

WHAP  
Biological Components  
Field Evaluation Form

Project Goliad Date: 7/7/93

Cover Type or Plant Association Mixed Riparian Forest

Habitat Components

Component Points (From Key)

Site No.	MR	MR	MR					TOTAL
	1	4	11					
1. Site Potential	20	20	20					60
2. Temporal Development								
Criteria A	12	12	12					36
Criteria B (Marsh Wetlands Only)								
3. Uniqueness and Relative Abundance	15	15	15					45
4. Vegetative Species Diversity								
Criteria A	4	3	3					10
Criteria B	5	3	5					13
Criteria C (Swamps Only)								
Criteria D (Marsh Wetlands Only)								
5. Vertical Stratification	5	5	5					15
6. Additional Structural Diversity Components	5	5	5					15
7. Condition of Existing Vegetation								
Criteria A (Woody Vegetation)	5	5	3					13
Criteria B (Herbaceous Vegetation)	1	3	5					9
Criteria C (Croplands Only)								
Criteria D (Marsh Wetlands Only)								

Average Habitat Quality Score for all sites within this cover type =  $\frac{.72 + .71 + .73}{3} \times \frac{216}{100} = .69$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

2 of 2  
 Moonseed Vine  
 Anacua  
 Pepper Vine  
 Poison Ivy

Cover Type Mixed Riparian Forest

Site No.	MR 3	MR X	MR 1	MR 4	MR 11	
Bumelia Berry/Drupe Soapberry Unknown 1 Mulberry Poison Ivy Legume/Pod	Anacua Mustang Grape Virginia Creeper Hackberry #1 Greenbriar?	Poison Ivy Hackberry Mulberry Pepper Vine	Mustang Grape Mulberry Hackberry Smilax Bumelia	Hackberry Mustang Grape Poison Ivy Moonseed Vine	Soapberry Poison Ivy Anacua Hackberry	Bumelia Mustang Grape
Acorn					Huisache Retama Mesquite Samba Bean	Unknown Acac
Nut/Nutlike		Pecan	Pecan		Ephedra	
Samara	Cedar Elm American Elm	Box Elder Ash Cedar Elm	Cedar Elm Hop Tree	Hop Tree Cedar Elm		
Cone						
Achene						
All Others		Black Willow	Black Willow	Black Willow		

Cover Type Mixed Riparian Forest

Site No.	MR 10	MR 9	MR 7	MR 6	MR 5
Berry/Drupe	Poison Ivy Hackberry Mustang Grape	Hackberry 1 Hackberry 2 Poison Ivy Mulberry	Mulberry Hackberry Poison Ivy	Hackberry	Hackberry Mulberry Poison Ivy
Legume/Pod				Huisache	
Acorn					
Nut/Nutlike				Ephedra	
Samara	Cedar Elm American" Box Elder Ash	American Elm Box Elder Cedar Elm	Cedar Elm American" Box Elder	Cedar Elm American"	Cedar Elm Hop Tree
Cone					
Achene					
All Others	Cottonwood Black Willow		Cottonwood Blk Willow		



**WHAP  
Biological Components  
Field Evaluation Form**

Project Goliad Date: 7/6/93

Cover Type or Plant Association Mesp. - Hackberry Woods / Brush

Habitat Components	Site No.	Component Points (From Key)							TOTAL
		MH	MH	MH	MH	MH	MH	MH	
1. Site Potential		7	6	5	1	9	2	10	92
2. Temporal Development									
Criteria A		12	9	3	6	6	12	12	60
Criteria B (Marsh Wetlands Only)									
3. Uniqueness and Relative Abundance		10	10	5	10	10	10	10	65
4. Vegetative Species Diversity									
Criteria A		4	2	2	3	2	3	3	19
Criteria B		5	3	1	3	3	3	3	21
Criteria C (Swamps Only)									
Criteria D (Marsh Wetlands Only)									
5. Vertical Stratification		5	5	4	5	5	5	5	34
6. Additional Structural Diversity Components		3	3	3	3	5	5	5	27
7. Condition of Existing Vegetation									
Criteria A (Woody Vegetation)		5	5	5	5	5	5	5	35
Criteria B (Herbaceous Vegetation)		5	5	5	5	5	5	3	33
Criteria C (Croplands Only)									
Criteria D (Marsh Wetlands Only)									

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{386}{100} = .55$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Mesq. Hackberry Woods/Brush

Site No.	MH 7	MH 6	MH 5	MH 1	MH 9
Berry/Drupe Chili Petene TX Persimmon Hackberry →	Drayeno Unknown 1 Poison Ivy Cordia Coma?	Lime prickly ash Drayeno Hackberry		Brazil TX Persimmon Hackberry Mustang Grape Bumelia	Hackberry Drayeno Brazil
Legume/Pod 2. Blackbrush	Unknown Mesquite	Huisache Acacia Unknown Acacia Mesquite	Mesquite Huisache	Huisache Blackbrush	Mesquite Senha Bean
Acorn					
Nut/Nutlike					
Samara					
Cone					
Achene	Clematis		Baccharis		
All Others	Taxilla			Prickly Pear	

Cover Type Mesq. - Hackberry Woods / Brush

Site No.	MH 2	MH 10			
Berry/Drupe	Hackberry TX Persimmon Amelanchier Lime Pickly Oak	Hackberry			
Legume/Pod	Huisache Mesquite	Retama Huisache Mesquite			
Acorn					
Nut/Nutlike		Ephedra			
Samara					
Cone					
Achene					
All Others	Prickly Pear Tasajio				

WHAP  
Biological Components  
Field Evaluation Form

Project Goliad Date: 7/6/93

Cover Type or Plant Association Oak-Cedar Elm Park

Habitat Components Live Oak-Huisache Component Points (From Key)

	Site No.	* oc 6	* oc 3	oc 2	oc 7	oc 8			TOTAL
1. Site Potential		12	20	12	12	12			68
2. Temporal Development									
Criteria A		6	12	20	12	20			70
Criteria B (Marsh Wetlands Only)									
3. Uniqueness and Relative Abundance		10	10	10	10	10			50
4. Vegetative Species Diversity									
Criteria A		1	3	3	2	5			14
Criteria B		1	3	5	3	5			17
Criteria C (Swamps Only)									
Criteria D (Marsh Wetlands Only)									
5. Vertical Stratification		3	4	3	5	5			20
6. Additional Structural Diversity Components		3	3	3	5	5			19
7. Condition of Existing Vegetation									
Criteria A (Woody Vegetation)		5	5	5	3	5			23
Criteria B (Herbaceous Vegetation)		3	3	5	5	5			21
Criteria C (Croplands Only)									
Criteria D (Marsh Wetlands Only)									

Average Habitat Quality Score for all sites within this cover type =  $\frac{\text{Total Points}}{\text{Total number of sites}} \times \frac{1}{100} = \frac{302}{500} = .60$

Enter this score in column 3, Wildlife Habitat Appraisal Summary Sheet.

Cover Type Oak-Cedar-Ealm Park

Site No.	OC 6	OC 3	OC 2	OC 7	OC 8	
Berry/Drupe	Anacua Hackberry Sapberry	Hackberry Poison Ivy	Unknown 1 lime prickly ash TX Persimmon Anacua Cometis	Hackberry Anacua Brazil Ilex Lajans	Lime prickly ash Mustang Grape Bumelot Anacua Brazil	Bison Ivy TX Persimmon Hackberry
Legume/Pod		Huisache Mesquite	Huisache Black brush Sophora	Huisache	Huisache	Unknown Acaci
Acorn			Live Oak		Live Oak	
Nut/Nutlike		Ephidra			Pecan	
Samara						
Cone						
Achene						
All Others					Prickly Pear	

\* (Elbow Bush?)  
 ↓  
 Monarda  
 Mustang Grape