An Inventory of Riparian and Wetland Areas in Southwestern and South-central Oklahoma: Final Report

Bruce W. Hoagland[1], Newell A. McCarty and Ian Butler

Oklahoma Biological Survey/Oklahoma Natural Heritage Inventory

([1] and Department of Geography)

University of Oklahoma

Introduction

The acreage of wetlands in the United States have greatly decreased since settlement (Tiner 1984). As a result, wetland ecosystems are now considered a priority for conservation efforts (Kusler 1983, Tiner 1984). It is estimated that the United States has lost more than 50% of the wetlands extant in the eighteenth century and is currently losing 400,000 acres per year (Tiner 1984, Dahl 1990). Sixty-seven percent of Oklahoma's original wetlands were lost in the last 200 years (Dahl 1990). Bottomland hardwood forests have suffered an 85% loss in acreage (Brabander, et al. 1985, Neal 1990). Many factors have contributed to the loss and degradation of wetland ecosystems, including real estate development, industrialization, agricultural conversion, and timber harvest (Mitch and Gosselink 1993).

The destruction of wetlands has produced a fragmented landscape which can reduce biological diversity and ecosystem function (Saunders 1991). Wetland ecosystems harbor a higher portion of species relative to terrestrial ecosystems, enhancing the value for biodivesity conservation. As a result, a greater number of plant and animal species are imperiled by the destruction of wetland plant communities. Angermeier and Karr (1994) report that among animal taxa found in wetlands, 20% of fishes, 36% of crayfishes, and 55% of mussels and 7% of mammals and birds were extinct or imperiled.

Objectives

The objective of this study was to locate and document the current vegetation of extant wetland plant communities. We censussed wetlands in 10 southwestern Oklahoma counties. Potential wetland sites were located using a combination of aerial photography, ground reconnaissance, and consultation with local experts. Once located, quantitative data were collected from the wetland site. In addition to multivariate statistical analysis, site data were deposited in the Oklahoma Natural Heritage Inventory Element Occurrence database. The ONHI database serves as a centralized and continually updated inventory of biological diversity in Oklahoma.

Study Area

Geology and geomorphology is a key factor determining the distribution of vegetation. The study area consisted of 1 counties in southwestern Oklahoma (Figure 1). The topography of the study area consists of broad plains and low rolling hills. The surface geology is dominated by gypsum and sandstone formations. The bulk of the study area falls within either the western sandstone hills, western redbed plains, or the central redbed plains. The Western Sandstone Hills and Western Redbed Plains provinces are composed of redstone and shale of Permian age and can be found in Caddo, Grady, Washita, and Beckham counties. The western sandstone hills are most extensive in Caddo County which contains deeply eroded conyons supporting relict populations of sugar maple (Acer saccharum) and other mesophytic species. The Central Redbed Plains is a region of red Permian shale and sandstone, forming rolling hills and broad floodplains (Curtis and Ham 1979). Most wetlands in the sandstone dominated areas are limited to riparian areas and man-made reservoirs.

Gypsum formations occupy a smaller percentage of the study area, but exert and important ecological influence. Many gypsiophilic plant species inhabit outcrops and small salt plains along streams. Gypsum hills are most prominent in Harmon, Beckham., Jackson, Greer, and Washita Counties. The Western Sand Dune Belts follow major stream in the study area (i.e., Canadian, North Canadian, Cimarron, and Salt Fork Rivers) and are composed of Quaternary sand and alluvium (Curtis and Ham 1979). In addition to riparian vegetation, interdunal swale ponds occur in the province, but are more limited in extent than in northwest Oklahoma.

Finally, the Granite Mountains geomorphic province occurs is in Comanche and Kiowa counties. This is a region of rugged topography composed of cambrian granites. Very few wetlands occur in this region and are limited to riparian areas.

Major streams draining the study area include the North Salt, and Elm Forks of the Red River, the Red River itself, Washita River, Cache Creek, and Deep Red Creek. Some of the more prominent impoundments include Altus-Lugert reservoir, and Fort Cobb Lake.

Potential natural vegetation in the study area ranges from grassland to various types of forest and woodland. In the western extent of the study area, and restricted to gypsum substrates, redberry juniper (*Juniperus pinchotti*) woodlands are common (Hoagland 2000). Mesquite (*Prosopis glandulosa*) dominated grasslands are common in the gypsum hills and central redbed plains geomorphic provinces (Duck and Fletcher 1945). Post oak (*Quercus stellata*) - blackjack (*Q. marilandica*) forests occur in the western and central sandstone hills as well as the granite mountains region (Duck and Fletcher 1945, Rice and Penfound 1959). This vegetation, often referred to as cross timbers, forms a mosiac of forest, woodland and grassland (Hoagland et al. 1999).

Grassland vegetation is scattered throughout with varying degrees of woody plant encroachment. The primary grassland type is mixed grass prairie with inclusions of tallgrass prairie (Duck and Fletcher 1945). Mixedgrass prairie vegetation is dominated by little bluestem (*Schizachyrium scoparium*), dropseeds (*Sporobolus* spp.), and sideoats grama (*Bouteloua curtipendula*). Mixed grass prairie is found on a broad range of substrate, including sandstone, gypsum, and deep sand deposits. On the deeper sand deposits, mixed grass prairie often gives way to sandsage (*Artemisia filifolia*) scrublands. Tallgrass prairie is often restricted to subirrigated sites, particularly in the western tier of the study area, and becomes more prominent to the east. The dominant species are big bluestem (*Andropogon gerardii*), little bluestem, and Indian grass (*Sorghastrum nutans*). In mesic to moist sites, prairie cordgrass (*Spartina pectinata*) and switchgrass (*Panicum virgatum*) are common (Bruner 1931, Hoagland 2000).

Methods

Wetland sties were identified by review of USGS 7.5 minute topographic quadrangles and National Wetland Inventory (NWI) maps. In addition, knowledgeable individuals were contacted from the following state and federal agencies: USDA Natural Resource Conservation Service District/County Offices, Oklahoma Commission District/County Offices, Oklahoma Department of Wildlife Conservation, and United States Fish and Wildlife Service (members of these agencies were extremely helpful and their assistance was deeply appreciated). Potential sites were then reconnoitered and prioritized for evaluation. Landownership was determined in order to gain access to potential sites.

Quantitative data were gathered at wetland sites using five 10M x10M guadrats arranged in a “cluster.” A cluster consisted of a central quadrat, with an additional quadrat placed in each of the four cardinal directions 20m from the central quadrat. Whether five quadrats used depended upon the shape and size of a site. Every species within the quadrat is recorded and percent coverage visually estimated in increments of 5% (Mueller-Dumbois and Ellenberg 1974, Barbour et. al 1987, Kent and Coker 1992). When trees were present, the diameter at breast height (DBH = 1.5m) for stems exceeding 2.0 cm in diameter was recorded.

Vegetation data were compiled into a species-by-site matrix for multivariate analysis. Data were analyzed using TWINSPAN (Hill 1979, Gauch 1982, Kent and Coker 1992) to determine wetland vegetation types (dominance types, sensu, Cowardin et al., 1979). Species importance values were averaged for each TWINSPAN cluster in order to describe the vegetation types they represented. Nomenclature for plant species follows Kartesz (1994).

Results and Discussion

A total of 21 sites were selected for quantitative sampling (Table 1) and 50 species were encountered. Seven major and three vegetation subtypes were recognized based upon TWINSPAN results (Table 2). One site was initially removed to reduce outlier effects. In addition, sites were placed into the Cowardin et al. (1979) classification scheme (Table 3). A descriptions of each vegetation association follows.

Herbaceous vegetation associations

1. Saltgrass (*Distichlis spicata*) herbaceous vegetation

Habitat: saline soils along floodplains. Often grades into American bulrush herbaceous vegetation.

Associated species: western ragweed (*Ambrosia psilostachya*), saltmarsh aster (*Aster subulatus*), rabbitfoot grass (*Polypogon monospeliensis*), and American bulrush (*Schoenoplectis americana*).

2. Common spikerush (*Eleocharis palustris*) herbaceous vegetation

Habitat: lake shorelines and ponds. Although found at one site, is most likely more common in the study area.

Associated species: barnyard grass (*Echinochloa crus-galli*), smartweed (Polygonum *pensylvanicum*), dock (*Rumex altissimus*), spangletop (*Leptochloa filiformis*), and umbrella sedge (*Cyperus* spp.).

3. Blue mud plantain (*Heteranthera limosa*) - longlobed arrowhead (*Sagittaria longiloba*) herbaceous vegetation

Habitat: interdunal ponds. Intact interdunal ponds were of limited extent in the study area, despite potential habitat north of Fort Cobb and along Otter Creek in Tillman County.

Associated species: toothcup (*Ammania coccinea*), barnyard grass (*Echinochloa crus-galli*), spangletop (*Leptochloa fascicularis*), water hyssop (*Bacopa rotundifolia*), and pepperwort (*Marsilea vestita*).

4. Swamp knotweed (*Polygonum amphibium*) herbaceous vegetation

Habitat: wet depressions, lakes and ponds. Of limited occurrence in the study area.

Associated species: salt marsh (*Aster subulatus*), camphorweed (*Pluchea odorata*), dock (*Rumex altissimus*), American bulrush (*Schoenoplectis americana*), and cattails (*Typha* spp.).

5. Arrowhead (*Sagittaria latifolia*) herbaceous association

Habitat: ponds, interdunal swales, and sloughs. The most common broadleaf wetland vegetation type in the study area.

Associated species: barnyard grass(*Echinochloa crus-galli*), common spikerush (*Eleocharis palustris*), and blue mud plantain (*Heteranthera limosa*).

6. American bulrush (*Schoenoplectis americana*) herbaceous association

Habitat: floodplains, backswamp, and lake margins. Common throughout the study area.

Associated species: salt marsh aster (*Aster subulatus*), saltgrass (*Distichlis spicata*), common spikerush (*Eleocharis palustris*), Torrey's rush (*Juncus torreyi*), and rabbitfoot grass (*Polypogon monospeliensis*).

7. Cattail (*Typha* species) herbaceous vegetation

Note: three subtypes were described (Table 3). However, they will be considered collectively here. This is because cattails hybridize readily and can be difficult to identify in the field as a result.

Habitat: floodplains, backswamp, and lake margins. The cattail dominated vegetation is the most common emergent vegetation in the study area.

Associated species: water hemlock (*Cicuta maculata*), cardinal flower (*Lobelia cardinalis*), water lotus (*Nelumbo lutea*), frogbit (*Phyla nodiflora*), camphor flower (*Pluchea odorata*), dock (*Rumex altissimus*), American bulrush (*Schenoplectis americana*) and softstem bulrush (*Schoenoplectis tabernaemontani*).

Most riparian areas in the study area have been displaced by the invasion of saltcedar (*Tamarix* spp.). Indeed, this is probably the most common shrubland vegetation type in southwestern Oklahoma. Given the paucity of information for herbaceous vegetation in this region of the state (Hoagland 2000), sampling focused on emergent vegetation. The influence of gypsum is reflected in the prevalence of American bulrush dominated vegetation, a plant tolerant of high salt concentrations. It is surprising that we did not encounter more vegetation dominated by salt grass, which is more tolerant of high salinity than American bulrush. The remaining vegetation types represent species with a low tolerance of salinity.

In applying this classification, the user must remember that more than one of these vegetation types could occur at a site. The vegetation types listed here reflect both varying tolerance of inundated soils and well as the temporal aspect of wetland drawdown. For example, saltgrass vegetation often gives way to American bulrush vegetation as soil salinity decreases.

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Table 1: Location of wetland and riparian in southwestern Oklahoma.

Site #	Site Name	Date Surveyed	County	Township & Range	River
1	Crock Pond	18 May 2000	Tillman	T1N, R18W, S35	Red
2	Spikerush Slough	18 May 2000	Jackson	T1N, R23W, S34	Red
3	Lake Chickasha	31 May 2000	Caddo	T8N, R9W, S27	Washita
4	Lake Chickasha	31 May 2000	Caddo	T8N, R9W, S28	Washita
5	Limnosa Marsh	31 May 2000	Caddo	T9N, R12W, S18	Washita
6	Rocky Lake	14 June 2000	Washita	T18N, R18W, S14	Washita
7	Sweetwater Marsh	7 June 2000	Beckham	T11N, R26W, S27/34	Red
8	No. Fork Red River	7 June 2000	Beckham	T10N, R26W, S31	Red
9	Gypsum Pond	8 June 2000	Beckham	T7N, R26W, S17	Red
10	Lost swale	8 June 2000	Beckham	T9N, R25W, S13	Red
11	Umble Marsh	8 June 2000	Beckham	T9N, R24W, S18	Red
12	Lost oxbow	21 June 2000	Cotton	T4S, R11W, S6	Red
13	Ft. Cobb WMA	27 June 2000	Caddo	T9N, R12W, S28	
14	Ducks Ltd.	27 June 2000	Caddo	T9N, 13W, S23	Washita

Site #	Site Name	Date Surveyed	County	Township & Range	River
15	Bullfrog marsh	27 June 2000	Washita	T11N, R14W, S23	Washita
16	Bullfrog Marsh No.	27 June 2000	Washita	T11N, R14W, S14	Washita
17	Sandy Sander's	27 June 2000	Greer	T6N, R25W, S16	Red
18	Nitro Pond	19 July 2000	Harmon	T5N, R26W, S31	Red
19	Brave-heart	20 July 2000	Greer	T5N, R24W, S35	Red
20	Fields of Scirpus	26 July 2000	Caddo	T9N, R9W, S6	Washita
21	Tortilla Flats	26 September 2000	Washita	T8N, R18W, S11	Red

Table 2: Wetland and riparian vegetation types from southwestern Oklahoma.

Herbaceous vegetation

1. Saltgrass (*Distichlis spicata*) herbaceous vegetation	1
2. Common spikerush (*Eleocharis palustris*) herbaceous vegetation	1
3. Blue mud plantain (*Heteranthera limosa*) - longlobed arrowhead (*Sagittaria longiloba*) herbaceous vegetation	1
4. Swamp knotweed (*Polygonum amphibium*) herbaceous vegetation	1
5. Broadleaf arrowhead (*Sagittaria latifolia*) herbaceous vegetation	3
6. American bulrush (*Schoenoplectus americanus*) herbaceous vegetation	6
7. Cattail (*Typha* spp.) herbaceous vegetation	
7a. Narrowleaf cattail (*Typha angustifolia*) herbaceous vegetation	3
7b. Southern cattail (*Typha domingensis*) herbaceous vegetation	3

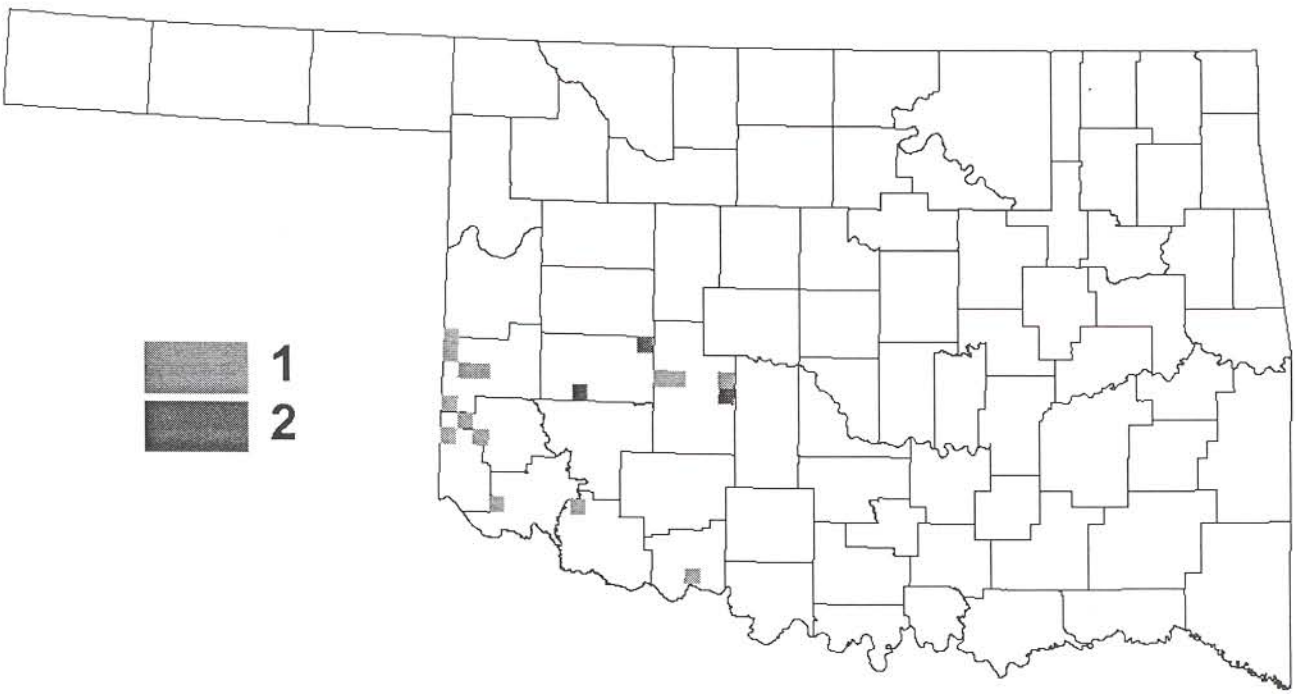
7c. Broadleaf cattail (*Typha latifolia*) herbaceous vegetation	1

Table 3: Wetland classification and heritage rank for southwestern Oklahoma wetland and riparian sites.

Site #	Cowardin et al. (1979) classification unit			
	System	Subsystem	Class	Site rank
1	System	Subsystem	Class	rank
2	Palsutrine		Emergent	C
3	Palsutrine		Emergent	C
4	Palsutrine		Emergent	B
5	Palsutrine		Emergent	B
6	Palsutrine		Emergent	C
7	Palsutrine		Emergent	B
8	Palsutrine		Emergent	B
9	Palsutrine		Emergent	B
10	Palsutrine		Emergent	C
11	Palsutrine		Emergent	C
12	Palsutrine		Emergent	C
13	Palsutrine		Emergent	B

Site #	Cowardin et al. (1979) classification unit			
	System	Subsystem	Class	Site rank
14	Palsutrine		Emergent	B
15	Palsutrine		Emergent	C
16	Palsutrine		Emergent	B
17	Palsutrine		Emergent	B
18	Palsutrine		Emergent	B
19	Palsutrine		Emergent	B
20	Palsutrine		Emergent	B
21	Palsutrine		Emergent	B

Figure 1: Location of sites. Each site is identified by a number which corresponds to the sample plots listed Table 1.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