

*“Coastal Prairie Wetland Restoration at Sheldon Lake State Park”*

*Final Report*

TCEQ Contract No.: 582-13-32746

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Texas A&M AgriLife Extension Service/Texas Sea Grant

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May 1, 2015



A program of TCEQ

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## Executive Summary

*Restoring the coastal prairie wetlands at Sheldon Lake State Park began with a demonstration project in 2003: approximately 10 acres with Phase 1 using the new “Sheldon-Sipocz” method. With the success of the original endeavor, further and more expansive restoration was spurred, continuing in Phase 2 and 3 of the wetland restoration at Sheldon Lake State Park.*

*Currently, this project implements the 4<sup>th</sup> and final segment of the wetland restoration for the southern portion of Sheldon Lake State park. The restoration includes the clearing of exotic Chinese tallow from the meander ridge and the adjacent prairie section, treatment of additional exotic material on the adjacent prairie, seeding of the adjacent prairie with coastal wet prairie mixes, and the excavation of the wetlands within the coastal wet prairie.*

*The successful completion of these tasks equates to the successful restoration of 57 acres of coastal freshwater prairie wetlands, the most critically endangered habitat in this region, supporting the high priority actions of the Galveston Bay Plan to restore and protect wetlands and implement NPS control programs through this restoration.*

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## Introduction/Background

Based on historical topographic maps and 1930s aerial photographs, approximately 25 to 30% of the Gulf Coast region consisted of freshwater marshes embedded in tall grass prairie<sup>1</sup>. Now, this critical wetland habitat has been significantly reduced on the landscape, likewise removing the ambient water quality, habitat and flood attenuation abilities. This cumulative loss associated with the rapid disappearance of these wetlands has and may likely continue to have detrimental effects on water quality and flood attenuation in the Galveston Bay watershed; therefore, the restoration of these wetlands can provide much-needed water quality abatement of pollutants<sup>2</sup>, as well as restore regionally critical habitat.

This project supports the implementation of the Galveston Bay Plan by restoring approximately 57 acres of coastal prairie wetlands at Sheldon Lake State Park by utilizing innovative Best Management Practices (BMPs) (restored ponds) to demonstrate cost-efficient water quality abatement through wetland restoration. The restoration of these wetlands will abate agricultural Nonpoint Source (NPS) pollution while simultaneously engaging citizens in water resources management through direct involvement in wetland restoration.

Phase 1 of the Restoration project was an experiment to test the feasibility of re-excavating buried marsh topsoils. In 2004, project partners removed fill material to expose the original wetland topsoil and restored hydrology to 10 acres of marsh within 100 acres of prairie. The wetlands and surrounding uplands were planted with native vegetation. All excavated soils were used on-site or placed in upland areas within existing agricultural fields. Phase 1 of the restoration was successful and is now the template for regional wetland mitigation projects. As part of the on-going restoration and education effort, Phase 1 is visited by hundreds of Houston area students and citizens each year.

Phase 2 and 3 of the Sheldon Lake Wetland restoration were funded in 2010 and 2011, and completed in 2012. Phase 4 is the final segment of restoration for the Park's southern management units. The completion of all 4 phases of this project will have measurable impacts on the water quality of Carpenters Bayou and the receiving water bodies, and a significant piece of habitat critical to this region will have been restored.

This project directly implements several high priority actions from the Galveston Bay Plan including HP-1: restore, create, and protect wetlands; NPS-11: implement agricultural NPS control programs; and PPE-5: continue to develop effective volunteer opportunities for citizens (Galveston Bay Estuary Program, 1995).

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<sup>1</sup> U.S. Fish and Wildlife Service, U.S. Geological Survey. 1999. *Paradise Lost? The Coastal Prairie of Louisiana and Texas*. <http://digitalmedia.fws.gov/cdm/ref/collection/document/id/77>

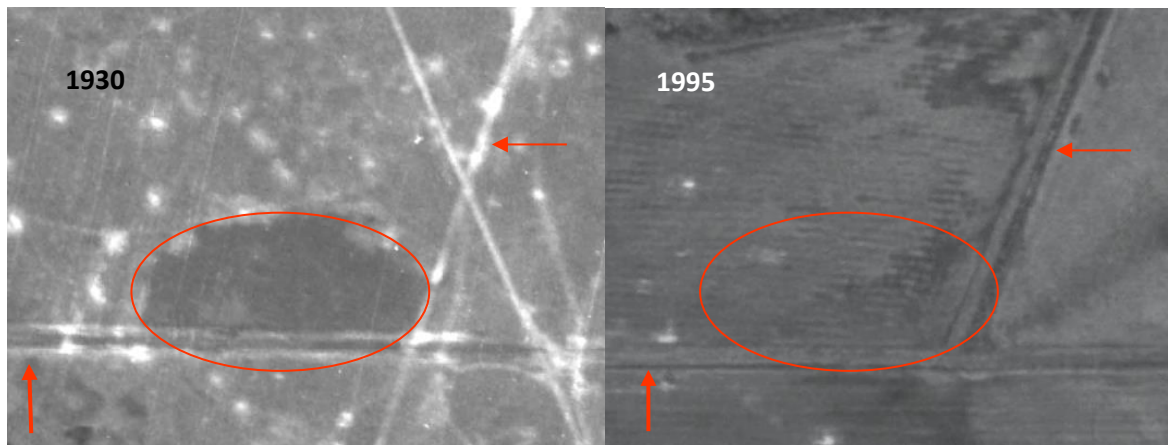
<sup>2</sup> *Conservation Practice Modeling Guide for SWAT and APEX*. Waidler, David, et.al. Texas Water Resources Institute Technical Report No. 399, Texas A&M University System, June 2011.

## Project Methodology

This project utilizes the “Sheldon-Sipocz” method for restoring wetlands. This local restoration template has changed this type of restoration. Few prior restoration projects gave consideration to the historical placement of wetlands on the landscape leading to increasing failure rates as wetlands created in non-hydric soils establish with difficulty. This method ensured that the re-exposed basins are located precisely where they had been before agricultural development had buried and blurred their existence.

Texas Parks and Wildlife Department (TPWD) Natural Resource Biologist, Andy Sipocz, developed the Sheldon-Sipocz method prior to the start of this grant. However, his work and techniques are important in understanding the process which led to the results seen during this grant.

To start, several key mapping materials were collected including: 1920 1-foot contour-interval topographic map, 1930 aerial photographs, and digitized 1994 and 1995 color infrared photographs. By aligning the photographs and analyzing them, specific photo signatures were able to be identified. Photo signatures included consistent mima mounds, upland brush, wetland brush and both shallow and deep inundations. Other photo signatures (e.g. the main irrigation canal, and pipelines) were used to corroborate the alignment of the photographs.



**Figure 2—** Comparative pictures to identify common features (e.g. arrows mark the irrigation canal and the original farm road). The 1995 photo demonstrates the difficulty in finding the original wetland boundaries which are clear in the 1930 photo.

Once the common features between the photographs were identified, less obvious, but important wetland boundaries were located on the modern map using the 1930s original photograph taken before the land was leveled. Using GIS technology, these boundaries were mapped onto the 1995 color-infrared photograph.

Further, several proposed wetland sites were groundtruthed using soil cores to verify the methodology accurately defined the potential historical wetland site locations. Appropriate excavation depths were carefully examined from soil cores to determine the depth of the original soil horizons. With verification

complete, the georectified maps were then translated into engineering (construction) documents, with accurate excavation depths that varied across each pothole. The ponds were excavated according to these plans and subsequently planted with local native wetland plants.

Texas AgriLife Extension Service (Extension) had 5 major objectives to complete with the project, including:

- Develop engineering plans and construction documents for the wetland excavation and other appropriate restoration aspects
- Contract the excavation of the wetlands
- Complete the clearing of exotic Chinese Tallow from the forested wetlands to be restored in the eastern section of the Phase 4 restoration site (meander ridge).
- Complete the clearing of exotic Chinese Tallow from the forested wetlands to be restored in the western section of the Phase 4 restoration site (adjacent prairie).
- Coordinate the seeding of the adjacent prairie areas to the restored wetlands

## Project Results

Extension contracted with Ducks Unlimited (DU) to complete all the engineering and survey work for the proposed project. In addition, DU completed the construction documents and the bidding process for the wetland excavation. DU also selected and supervised the contractor for the completion of the wetland excavation and other restoration aspects, specifically the hydrological restoration on the meander ridge.

A total of 22 acres of exotic Chinese Tallow were removed from the meander ridge from within the existing wetland ponds, and the remaining 16 acres of the meander ridge were hand-treated to kill the Chinese tallow. The hand-treatment allowed for the existing stands of native hardwood trees to remain intact and provide cover for potential future recreational development in the area (i.e. trails).

An additional herbicide treatment was utilized on the mulched zone to kill off the tallow seedlings and saplings which were not mechanically removed or destroyed (retreatment of 22 acres).

A total of 17 acres of adjacent prairie were treated for Chinese tallow and the invasive grass, Vassey grass (*Paspalum uruvillei*).

All seed material (Appendix C) needed for the reseeding of the adjacent prairie was purchased and held in storage at appropriate facilities in Junction, Texas until such time as the prairie can be prepped and seeded.

## Project Conclusions/Lessons Learned

The delayed TPWD internal review and poor weather/site conditions played a significant negative role in the completion of the tasks set forth by this contract. However, at the end of the contract, the tasks were completed.

As per the contract, Extension coordinated the proposed restoration work and tasks with TPWD on an established Memorandum of Agreement between the agencies. To complete this document, TPWD had an internal review process called a PRR (Project Review Request). The PRR had to be completed before any MOA could be signed and official. The PRR took 9 months to complete and was signed by October 2014. This extended delay meant that Extension could not execute any contractual work towards project tasks on-site.

In October 2014, the site conditions were ideal for mobilizing and completing the mulching of the 22 acres of the meander ridge and the hand-treatment of the additional 16 acres on the meander ridge. This was immediately followed by the herbicide treatment of the adjacent prairie (17 acres).

At this point (October 2014), Extension had also completed all the subawards to Ducks Unlimited for all the proposed wetland work, and all aspects of the project were ready to move forward with the last two components: wetland excavation and prairie seeding.

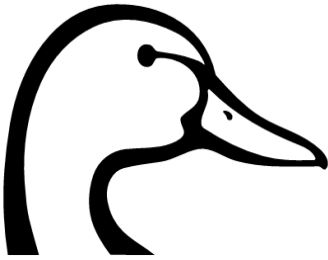
The winter months were markedly wet; and, the spring continued the wet cycle and extended into early summer 2015. This long wet period meant that the project site for the wetlands could not be excavated due to the inability to mobilize heavy equipment to prepare the project site. After a series of heavy rainfall events, the City of Houston experienced a record rainfall event at the end of May 2015 such that the City and the State of Texas declared an emergency situation and disaster conditions within the City. Sheldon Lake State Park (the project site) was included in that disaster—all the access roads were under water by at least 6 to 8 inches. This ensured no vehicle or equipment could pass.

Based on these conditions, the emergency status and the pending deadline for the contract, Extension requested an emergency extension of time which was granted by TCEQ. With the extension of time, Ducks Unlimited (subawardee to Extension) was able to hire and supervise the contractor to restore the meander ridge hydrology (hydrologic function to the 38 acres of wetlands for this section). Similarly, the re-treatment of the Chinese Tallow on the meander ridge was also completed and the necessary prairie seeding material was purchased and stored.

Due to the continued wet conditions, the wetland excavation and the prairie seeding have been delayed beyond the project timeline, but will be completed within the year with the support of Texas State Soil and Water Conservation Board 319 funding.

## **Appendix A: Engineering Documents**





**Bid Solicitation:  
DU-TX-082-05 Sheldon Lake State Park Phase IV  
Harris County, Texas**

Ducks Unlimited, Inc., the Nation's leader in wetland conservation, is seeking bids for the Sheldon Lake State Park Phase IV project located in Harris County, Texas. We are having a mandatory site showing to selected contractors at 10:00 AM on February 19, 2015. We will meet at the Sheldon Lake State Park park entrance located at 14140 Garrett Rd. in Houston, approximately 2 miles east of Beltway 8 (29°52'58.32"N, 95°09'47.10"W). Directions can be found at [www.tpwd.state.tx.us/state-parks/sheldon-lake/map](http://www.tpwd.state.tx.us/state-parks/sheldon-lake/map).

The work on this project consists of constructing 4 ponds on Texas Parks and Wildlife land within the boundaries of Sheldon Lake State Park located in Harris County, Texas. The project will include excavating approximately 6,443 cubic yards of soil, and placement of the material as described in the plans. This work shall also include performing the necessary mobilization, site preparation, and other items outlined in the plans and specifications or associated with constructing the project according to the plans.

A summary of quantities is shown below:

ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT
201	Mobilization	1	LS
203	Excavation		
	Pond Excavation	6,443	C.Y.-P
	Spoil Placement Berm	922	C.Y.-P

Preliminary construction plans are included with this solicitation. Final construction plans as well as bid documents, and specifications may be obtained from Ducks Unlimited, Inc. at the Site Showing.

Bid openings will be March 12, 2015 at 1:00 PM.

For technical information regarding the plans or specifications, contact Aaron Sutherlin at 832-595-0663.

# DUCKS UNLIMITED, INC. PRE-BID MEETING NOTIFICATION FORM

**Bid Solicitation: DU-TX-082-05**  
**Sheldon Lake State Park Phase IV**  
**Harris County, Texas**

**TO:** Karen Parker  
Ducks Unlimited, Inc.  
915 Front St.  
Richmond, TX 77469  
Phone: 832-595-0663  
Fax: 281-239-8302  
Email: kparker@ducks.org

**FROM:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Fax: \_\_\_\_\_  
Phone: \_\_\_\_\_

\_\_\_\_\_ Yes, a representative for the above referenced company will attend the pre-bid meeting for the above referenced project.

\_\_\_\_\_ No, a representative for the above referenced company will **not** attend the pre-bid meeting for the above referenced project.

Please indicate whether or not you or your representative will attend the scheduled pre-bid meeting referenced above and fax or email the attached Pre-Bid Meeting Notification Form.





# DUCKS UNLIMITED, INC.

## SHELDON LAKE STATE PARK

HARRIS COUNTY  
IN COOPERATION WITH  
**TEXAS PARKS AND WILDLIFE DEPARTMENT**  
**TEXAS A&M AGRILIFE EXTENSION SERVICE**

ITEM	DESCRIPTION	UNITS	PRELIM. QUANTITIES	FINAL QUANTITIES
201	MOBILIZATION	LS	1	
203	EXCAVATION			
	POND EXCAVATION	C.Y.-P	6,443	
	SPOIL PLACEMENT BERM	C.Y.-P	922	

TEXAS A&M  
**AGRILIFE**  
EXTENSION



PROJECT LOCATION



SITE LOCATION

### SPECIFICATIONS

- 201 MOBILIZATION
- 202 SITE PREPARATION
- 203 EXCAVATION
- 209 POLLUTION CONTROL

### INDEX

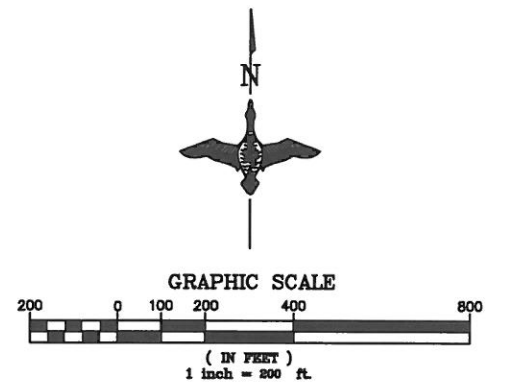
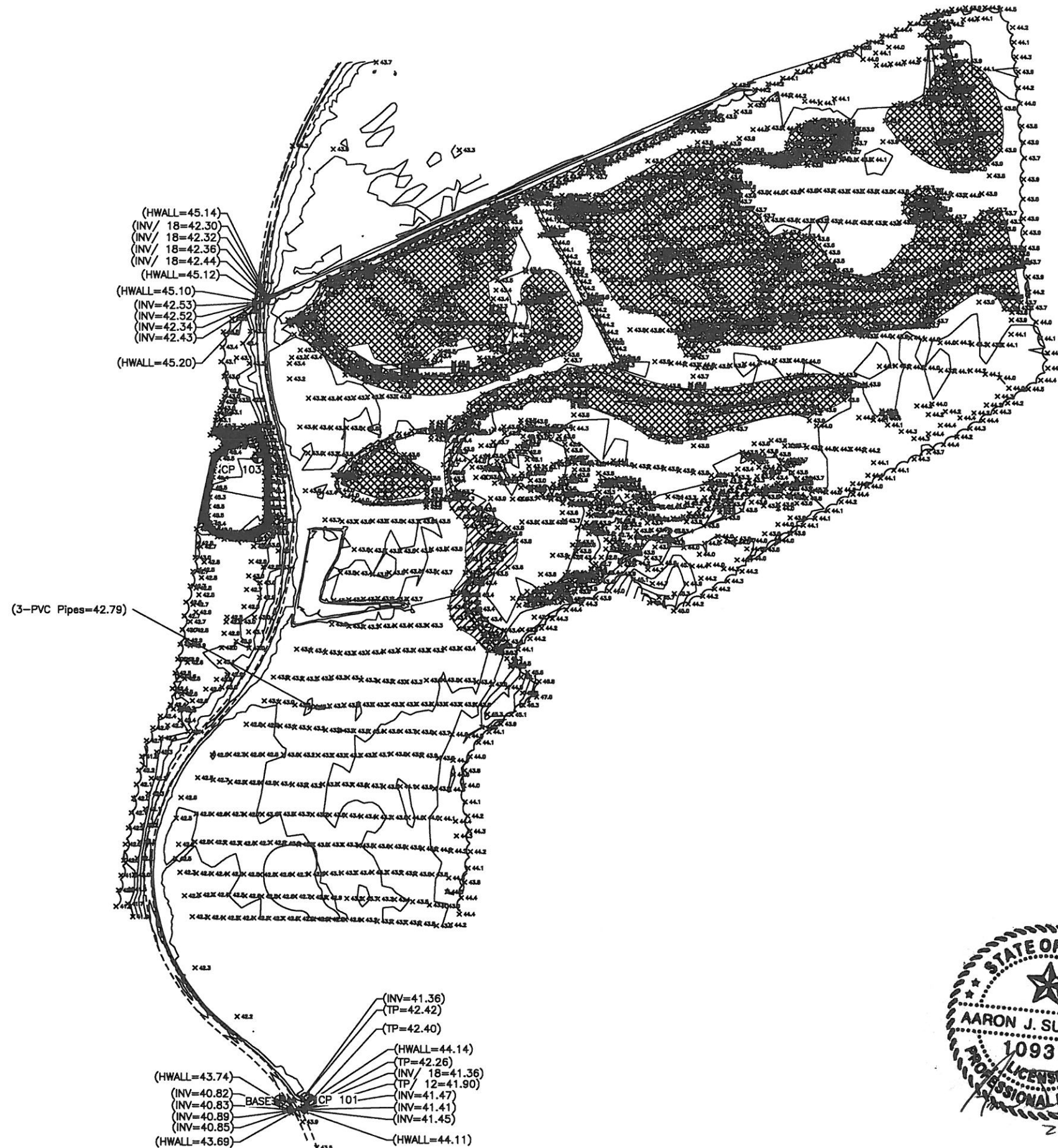
- 1 COVER SHEET
- 2 CONTOUR MAP & DESIGN
- 3 EXISTING SITE CONDITIONS



<b>DUCKS UNLIMITED INC.</b> <small>SOUTHERN REGIONAL OFFICE 1155 Southwest Pointe Drive, Suite E Birmingham, AL 35207 C.O.R. No. F-001112 EXPIRES: 8/30/18</small>	PROJECT NO. DU-TX-82-5	DESIGNED BY: <b>AJS</b>
	<b>SHELDON LAKE STATE PARK - PHASE IV</b>	DRAWN BY: <b>LSM</b>
	<b>COVER SHEET</b>	SURVEYED BY: <b>RKW</b>
	SHEET NO. <b>1 OF 3</b>	CHECKED BY: <b>DATE: 02/15</b>

**CAUTION:**  
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.





# ABBREVIATIONS

AC. - ACRES  
 CORS - CONTINUOUSLY OPERATING REFERENCE STATION  
 CP - CONTROL POINT  
 C.Y. - CUBIC YARD  
 C.Y.-P - CUBIC YARD PLANNED  
 DIA. - DIAMETER  
 DU - DUCKS UNLIMITED  
 EA. - EACH  
 EG - EXISTING GRADE  
 EL./ELEV. - ELEVATION  
 E.S. - EMERGENCY SPILLWAY  
 FG - FINISHED GRADE  
 FSL - FUNCTIONAL SERVICE LEVEL  
 ft. - FEET  
 L.F. - LINEAR FOOT  
 L.S. - LUMP SUM  
 MIN. - MINIMUM  
 NAD 83 - NORTH AMERICAN DATUM OF 1983  
 NAVD88 - NORTH AMERICAN DATUM OF 1988  
 NGS - NATIONAL GEODETIC SURVEY  
 NO. - NUMBER  
 O.D. - OUTSIDE DIAMETER  
 OPUS - ONLINE POSITIONING USER SERVICE  
 S.S. - STAINLESS STEEL  
 WCS - WATER CONTROL STRUCTURE

BENCHMARKS				
BENCHMARK #	LATITUDE	LONGITUDE	ELEVATION	DESCRIPTION
BASE	N 29° 51' 45"	W 95° 09' 41"	42.95'	IRON ROD
CP #101	N 29° 51' 45"	W 95° 09' 40"	42.74'	IRON ROD
CP #103	N 29° 52' 08"	W 95° 09' 41"	48.38'	IRON ROD

## LEGEND

- ===== EXISTING ROAD/LEVEE
- ~~~~~ TREELINE
- SHELDON LAKE - PHASE II BUILT 2009



1) Horizontal survey control is Texas State Plane Coordinates, South Central Zone, NAD83; and Vertical control is NAVD88.

Based on NGS OPUS post-processed solution from CORS data collected at autonomous Base position.

2) 0.3' Allowance for stripping is included in yardage calculations of fill material.

3) All Levees to be raised by 10% of the average fill height per 100' station to allow for settlement. This is an absorbed item. (Finished grade shown on embankment volume table reflects of 10% overbuild requirement).

4) All utilities observed at the time of survey are shown on the drawing; however, absence of utilities in drawing is not assurance that other utilities do not exist on this site. The contractor will be responsible for any damage to any utilities or structures during construction.

5) It is the contractors responsibility to call the National 811 "Call before you dig" number to verify any conflicting utilities prior to beginning any work.

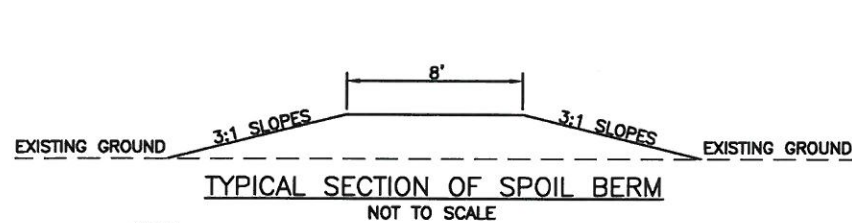
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DUCKS  
 UNLIMITED  
 INC.  
 SOUTHERN REGIONAL OFFICE  
 103 Business Park Drive, Suite E  
 Ridgeland, MS 39157  
 C.O.R. No. J-001112 EXPIRES: 9/30/19  
 SHEET NO. 2 OF 3

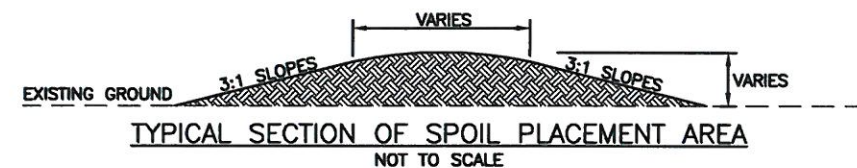
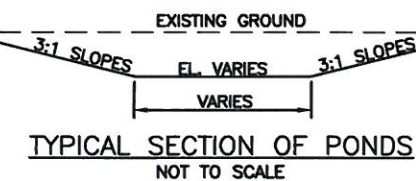
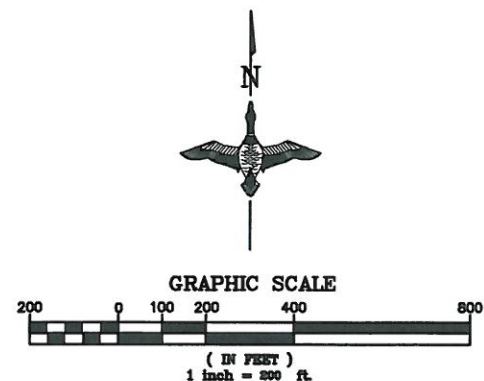
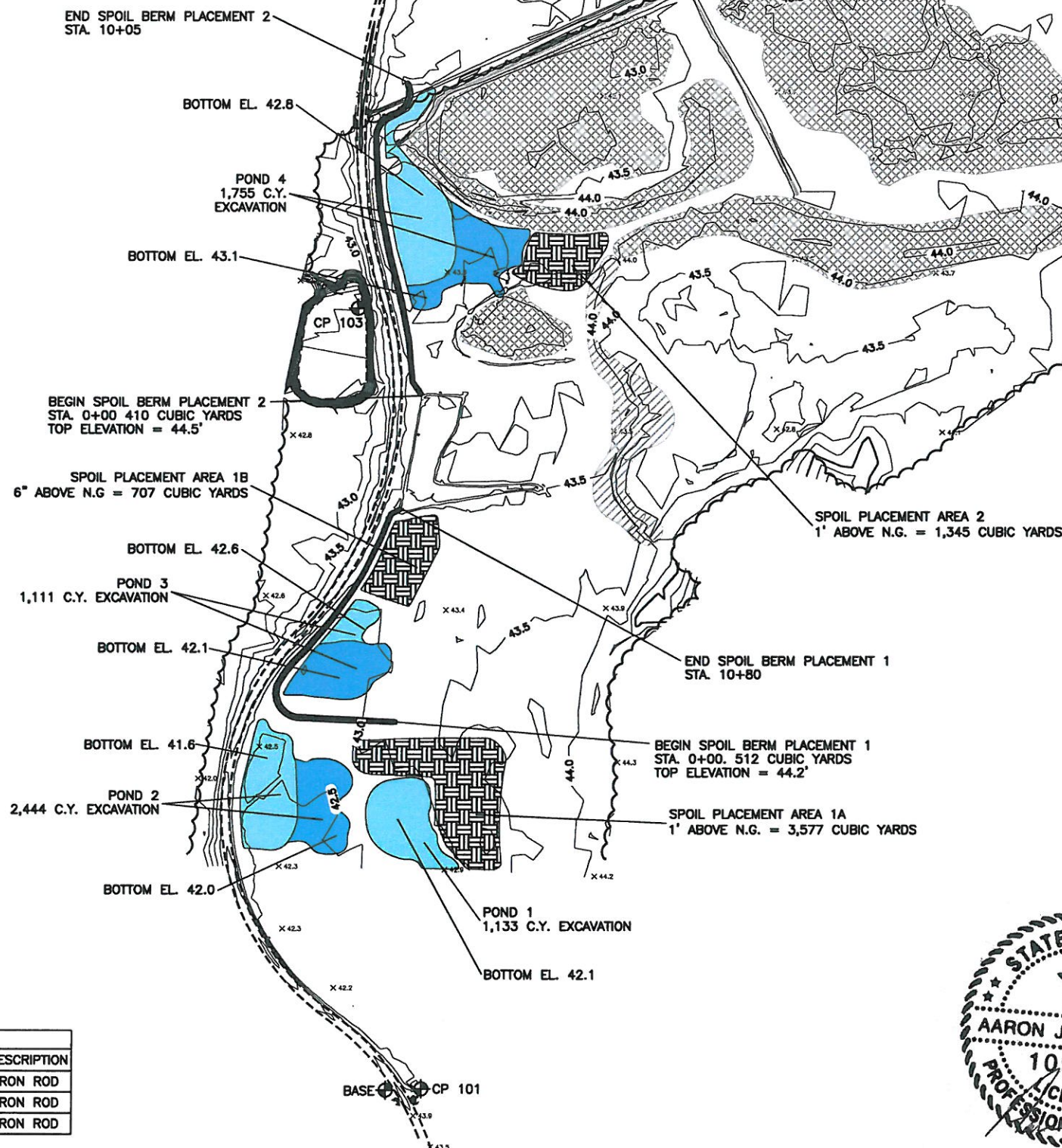
PROJECT NO. DU-TX-82-5  
**SHELDON LAKE**  
**STATE PARK - PHASE IV**  
**EXISTING SURVEY**  
 CONTRACT #

DESIGNED BY: **AJS**  
 DRAWN BY: **LSM**  
 SURVEYED BY: **RKW**  
 CHECKED BY:  
 DATE: **02/15**





NOTE:  
ALL SPOIL BERM FOOTPRINT AREAS SHALL BE SCARIFIED OR DISKED TO A DEPTH OF 6" PRIOR TO PLACEMENT OF FILL MATERIAL.



NOTE:  
SPOIL PLACEMENT AREAS SHALL BE CONSTRUCTED AS NEEDED FOR EXCAVATION. PLACEMENT CUBIC YARDAGE DISPLAYED ON THIS SHEET REFLECTS AVAILABLE VOLUME WITHIN EACH SPOIL PLACEMENT AREA, AND NOT REQUIRED FILL.

#### LEGEND

- ===== EXISTING ROAD/LEVEE
- ~~~~~ TREELINE
- ~~~~~ SHELTON LAKE - PHASE II  
BUILT 2009
- ===== PROPOSED BERM
- ~~~~~ PROPOSED POND
- ~~~~~ PROPOSED SPOIL PLACEMENT AREA

BENCHMARK #	LATITUDE	LONGITUDE	ELEVATION	DESCRIPTION
BASE	N 29° 51' 45"	W 95° 09' 41"	42.95'	IRON ROD
CP #101	N 29° 51' 45"	W 95° 09' 40"	42.74'	IRON ROD
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- Horizontal survey control is Texas State Plane Coordinates, South Central Zone, NAD83; and Vertical control is NAVD88. Based on NGS OPUS post-processed solution from CORS data collected at autonomous Base position.
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**DUCKS UNLIMITED INC.**  
SOUTHERN REGIONAL OFFICE  
163 Business Park Drive Suite E  
Midland, TX 79701  
C.O.E. No. F-001112 EXPIRES: 9/30/18  
SHEET NO. 3 OF 3

PROJECT NO. DU-TX-82-5  
**SHELTON LAKE**  
**STATE PARK - PHASE IV**  
**CONTOUR MAP & DESIGN**  
DESIGNED BY: AJS  
DRAWN BY: LSM  
SURVEYED BY: RKW  
CHECKED BY:  
DATE: 02/15

## **Appendix B: Photodocumentation of the Project Tasks**



## Mulching of the Chinese Tallow trees on the Meander Ridge



Sheldon Lake State Park  
Prairie Wetland Restoration Phase IV  
2010 True Color Aerial Photo



Sheldon Lake State Park  
Prairie Wetland Restoration Phase IV  
2010 True Color Aerial Photo

Hand-Applied Herbicide (16.7 acres)

Source: David C. Gribble, Inc., Madison, WI, USA; USGS, USGS, AISC, Geospatial Services, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662,

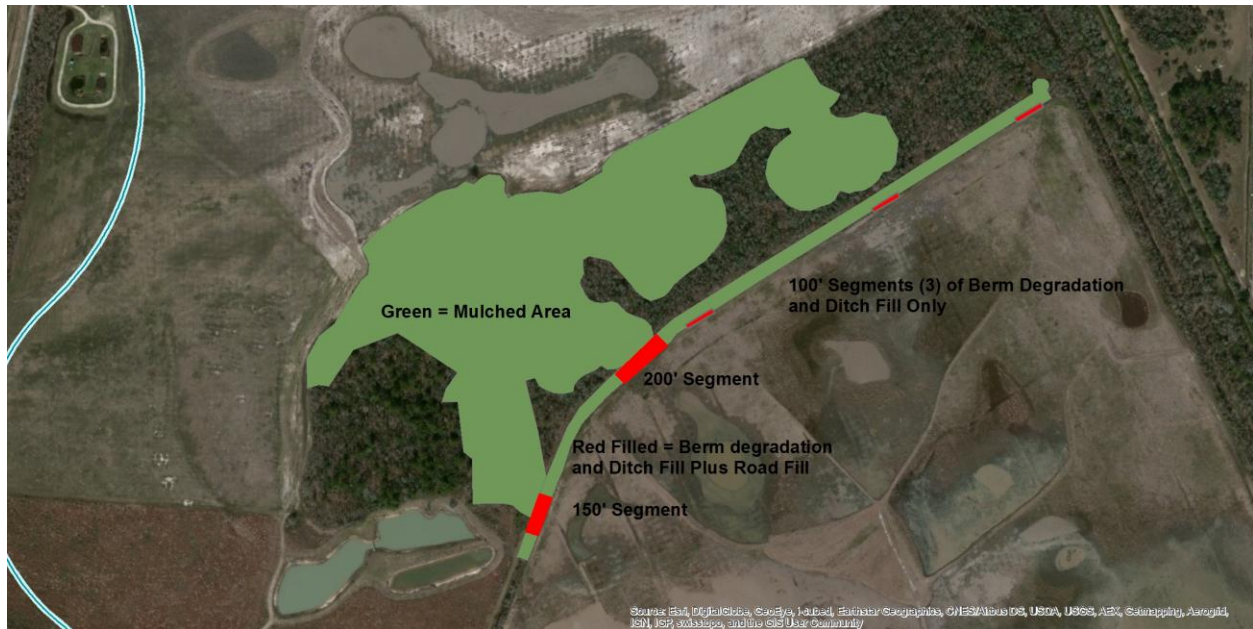




## Herbicide Treatment of the Adjacent Prairie



## Hydrologic restoration of the Meander Ridge



The strategic placement of the earthen plugs along the ditch ensures that the water does not flow off the meander ridge wetlands, but remains in the wetlands to naturally percolate through the soils or transpire.

## Appendix C: List of Native Plant Seed Material

Little Bluestem	Marsh Elder
American Aloe	Native Sedge
Balsamscale	Partridge Pea
Big Bluestem	Plains Coreopsis
Black-Eyed Susan	Prairie Agalinis
Broomsedge Bluestem	Prairie Wildrye
Brownseed Paspalum	Prairie Verbena
Bushy Bluestem	Purple Prairie Clover
Cane Bluestem	Purpletop
Clasping Coneflower	Ragweed Annual
Common Sunflower	Rattlesnake Master
Croton	Red Lovegrass
Cutleaf Daisy	Rough Buttonweed
Epazote	Sand Dropseed
Florida Paspalum	Sand Lovegrass
Gayfeather	Sideoats Grama
Giant Coneflower	Slim Tridens
Green Sprangletop	Smartweed
Gulf Coast Muhly	Splitbeard Bluestem
Gumweed	Sumpweed
Hairawn Muhlygrass*	Switchgrass
Hooded Windmill Grass	Tall Dropseed
Horned Beaksedge*	Tall Goldenrod
Illinois Bundleflower	Texas Bluebonnet
Indian blanket	Texas Cupgrass
Indian grass	Texas Yellow Star
Knotroot Bristlegrass	Three Awn
Lanceleaf Coreopsis	Vervain
Lemon Mint	Maximillian Sunflower
Longspike Tridens	White Prairie Clover