January 2000

DRAFT REPORT

ENVIRONMENTAL ASSESSMENT

SECTION 1135 RIVERINE RESTORATION PROJECT
NORTH CANADIAN RIVER
OKLAHOMA CITY, OKLAHOMA
MAY AVENUE TO WEST OF MERIDIAN AVENUE

U. S. Army Corps of Engineers
Tulsa District

January 2000

DRAFT

ECOSYSTEM RESTORATION REPORT AND INTEGRATED ENVIRONMENTAL ASSESSESSMENT SECTION 1135 RIVERINE RESTORATION PROJECT NORTH CANADIAN RIVER OKLAHOMA CITY, OKLAHOMA

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SECTION 1. PROJECT BACKGROUND

1.1 Project Authority. This study is authorized under the continuing authority provided to the Chief of Engineers by Section 1135 (B) of the Water Resources Development Act of 1986, as amended. By letter dated April 1, 1999, Oklahoma City expressed its desire to participate in an ecosystem restoration study for the North Canadian River/May Avenue Dam.

1.2 Study Purpose and Scope. This Ecosystem Restoration Report and Integrated Environmental Assessment (ERR) addresses the need for and desirability of undertaking a plan to restore the riverine ecosystem habitat along the North Canadian River Floodway from May Avenue to just west of Meridian Avenue. Emphasis was placed on riverine ecosystem restoration because it would best contribute to Oklahoma City's master plan for the North Canadian River corridor restoration initiative. The consideration of various management alternatives that would improve ecological resources within this portion of the floodway are documented in this ERR. Alternatives include measures to restore riverine, bottomland hardwoods, wetlands, and riparian habitats.

The North Canadian River Floodway is located in Oklahoma County in central Oklahoma. Figure 1 depicts the North Canadian River Floodway in relation to Oklahoma City. The riverine ecosystem restoration study area extends 2.8 miles along the North Canadian River from May Avenue to just west of Meridian Avenue within the Oklahoma City metropolitan area (Figure 2).

This ERR is provided to the general public, agencies, and interested parties to review and comment on the plan formulation process and recommended riverine ecosystem restoration plan. The 30-day public review is in accordance with the National Environmental Policy Act (NEPA). After comments have been received, the Tulsa District Engineer will determine if all environmental concerns have been adequately addressed and, if appropriate, sign the Finding of No Significant Impact, completing the NEPA process.

1.3 Project History. The North Canadian River Floodway was authorized by the Flood Control Act approved on July 24, 1946 as amended by Section 204 of the Flood Control Act of May 17, 1950. It carries flood flows from several tributary streams within Oklahoma City. The floodway serves a drainage area of about 13,222 square miles and has a maximum water surface area of 10,346 acres.

The United States Army Corps of Engineers constructed the North Canadian River floodway to contain the 100-year flood flows. Construction began in January 1953 and was completed in March 1958. Construction principally consisted of straightening, widening, and realigning the North Canadian River.

Figure 1: Location Map

GSRC GULF SOUTH RESEARCH CORPORATION

SCALE: NTS

DATE: September 1999

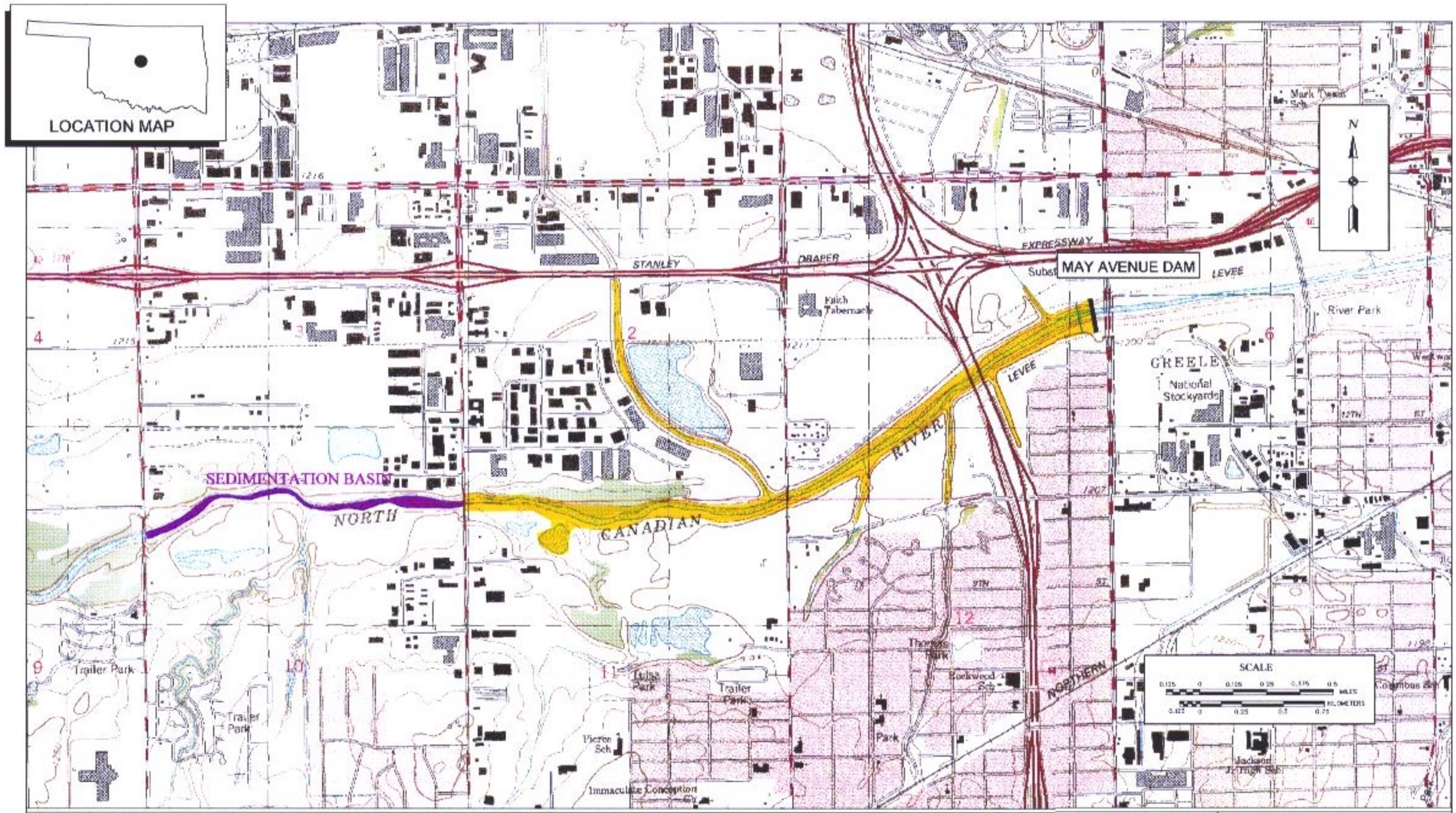

Figure 2: Location of Riverine Restoration Project, North Canadian River.

gsrc/ GULF SOUTH RESEARCH CORPORATION

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The project also includes berms, drainage structures, laterals, and spoil banks. The floodway begins just upstream of Portland Avenue and continues downstream for 13.6 miles to near Spencer, Oklahoma. During construction of the floodway, excavated material was used to fill natural river meanders and wetlands. Excess material was used to construct spoil banks (berms) adjacent to the channel.

The flood control channel has provided Oklahoma City residents with significant reductions in flood damages; however, in an attempt to restore habitat and enhance aesthetic resources along the channel, Oklahoma City approved Ordinance No. 20,045 in December 1993. This ordinance provided funding for nine Metropolitan Area Projects (M.A.P.S.) plan venues which includes the development of the North Canadian River Riverfront. The riverfront development plans include the construction of three low water dams and river-lake environments. Construction began on the first low water dam at Eastern Avenue in June 1999. Construction of the Western Avenue and May Avenue dams are scheduled to begin in the spring of 2000.

1.4 Ecological Resource Losses and Problems. Historically, the riparian habitat of the North Canadian River in the vicinity of Oklahoma City consisted of riverine wetlands, palustrine forested wetlands, palustrine emergent wetlands, and open water (oxbows or ponds). Oil exploration activities, construction of the Oklahoma City Floodway, urbanization, development of adjacent lands, agricultural conversions, and channelization of tributaries have caused extensive losses of riparian habitat, waters of the U.S., and wetlands. During construction of the floodway, riverine, wetland, and bottomland hardwood habitats were removed as the natural bends of the river and natural cutoffs were filled and straightened. Excess excavated material from the floodway was placed parallel to the channel forming berms that prohibited natural reestablishment of bottomland hardwood and riparian habitat. The U.S. Army Corps of Engineers (USACE) estimated that 1,700 acres of riverine habitat were altered by construction of the Oklahoma City Floodway. Of this total, an estimated 650 acres of riparian and bottomland hardwood habitat and 400 acres of wetlands were removed or converted to other uses within the entire floodway (USACE 1992). The degraded and fragmented condition of the existing riverine, bottomland hardwood and wetland riparian habitat along the North Canadian River has reduced the habitat value for common wildlife species found in riverine, wetland, and bottomland hardwood forest habitats to unacceptable levels. Representative photographs of the project area are given in Appendix A.

1.5 Expected Success of Restoration. The expected benefits of restoring riverine, wetland, and bottomland hardwood habitats include restoring habitat diversity; creating riverine habitat for native aquatic species; restoring the value and function of wetlands in the form of flood water retention, filtration of sediments, nutrient recycling and waste assimilation, and groundwater recharge and discharge

into the North Canadian River; improving habitat conditions for resident and migratory waterfowl and shorebirds; improving food and cover for a variety of wildlife including small mammals, birds, reptiles, and amphibians; improving critical nesting habitat for bird species; and creating travel corridors for wildlife.

SECTION 2. EXISTING CONDITIONS

2.1 Surface Water. The North Canadian River originates in the high plateau region of the Sangre de Cristo Mountains in northeastern New Mexico, near Des Moines. From its source, the river flows in an easterly direction through New Mexico, across the Texas panhandle and across Oklahoma. The river drains to Eufaula Lake and flows through Optima Lake (river mile 623.2), Fort Supply Lake (river mile 487.2), Canton Lake (river mile 394.3), Lake Overholser (river mile 281.5), and Shawnee Reservoir. It serves as storm water drainage and carries flood flows from Lake Overholser and multiple tributaries within Oklahoma City. The Oklahoma City Floodway is located between river miles 257.5 and 273.7. The main tributaries to the North Canadian River within the project area are Lightning Creek, Twin Creek, and Brock Creek. The natural stream bed slope is about 3.3 feet per mile, with a sandy channel about 200 feet in width. The banks vary from 10 to 15 feet in height and provide a channel capacity of about 8,500 cubic feet per second.

2.2 Water Quality. Water quality problems in the corridor area include silt, pesticides, nutrients, and suspended particles. Agriculture is the leading source of pollution in the state's rivers and streams, followed by petroleum extraction and hydrologic/habitat modifications. According to reports by the Environmental Protection Agency (EPA), the area of the North Canadian River within the project corridor has no toxic contaminant exceedences and no fish consumption advisories (EPA 1999).

2.3 Groundwater. Groundwater in the study area is derived from the two major aquifers located under Oklahoma County. The North Canadian River (east-central) aquifer is an alluvial and terrace aquifer, which consists of unconsolidated deposits of sand, silt, clay, and gravel [Oklahoma Water Resources Board (OWRB) 1998]. This aquifer typically has a very shallow depth to water, is very permeable, and well yields range from 10 to 1,200 gpm (OWRB 1998). The Central Oklahoma aquifer is a bedrock aquifer that consists of Permian-age Garber Sandstone, Wellington Formation, and the Chase, Council Grove, and Admire Groups (OWRB 1998). Currently, there is no municipal use of groundwater within the study area.

2.4 Prime Farmland. The U.S. Department of Agriculture defines prime farmland soils as those soils best suited to producing food, feed, forage, fiber, and oilseed crops. No unique farmlands or farmlands of statewide or local importance occur within the study area.

2.5 Soils. The Natural Resource Conservation Service soil survey information for Oklahoma County (1969), was reviewed to determine the general soil types found within the proposed project corridor. The primary soil association within the project area is the Dale-Canadian-Port association. This association has deep, nearly level, loamy soils on low benches along the North Canadian River. Other soil associations found slightly within or on the edge of the project area include the Dougherty-Norge-Teller and Renfro-Vernon-Bethany associations.

2.6 Air Quality. The Clean Air Act, which was last amended in 1990, requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. Oklahoma County is located within EPA Region 6 and is currently in attainment with established national and state air quality standards for all criteria pollutants (EPA 1999).

2.7 Flora and Fauna

2.7.1 Vegetation. The North Canadian River is located in an Oak-Bluestem Parkland ecoregion and Mixed-grass Plains biotic district (Bailey 1980). The dominant cover types occurring in the riverine ecosystem restoration study area are disturbed sites and introduced pasture. Scrub-shrub habitat and riparian forested habitat also exists mainly around riparian areas. Bermuda grass dominates most of the pastureland areas. Common plants in disturbed areas within the floodway include smooth sumac, giant ragweed, Johnson grass, ironweed, goldenrod, pokeweed, partridge pea, yarrow, pigweed, bristlegrass, blackberry, and several species of sunflowers (scientific names of floral and faunal species are contained in Appendix B). Scrub shrub habitat areas are dominated by black willow directly adjacent to the floodway and on sandbars while species such as eastern hackberry, sugarberry, smooth sumac, American elm, green ash, box elder, roughleaf dogwood, silver maple, coralberry, poison ivy, indigo bush, Virginia creeper, and greenbriar are common on higher terraces. Scattered clusters and individual specimens of eastern cottonwood also occur.

2.7.2 Wildlife. The dominant habitat types in the study area, pastureland and disturbed habitat, support certain wildlife species which include cattle egret, Northern bobwhite, mourning dove, rock dove,

American kestrel, common crow, scissor-tailed flycatcher, western and eastern kingbird, European starling, field sparrow, eastern cottontail, plains pocket gopher, hispid cotton rat, and deer mouse.

Fragmentation of the riparian habitat by urban development and construction of the floodway has reduced the abundance and diversity of wildlife in the area. However, a limited population of birds is still supported by the exiriparian habitat within the floodway. Bird species occurring within the floodway are mallard, Mississippi kite, Cooper's hawk, red-tailed hawk, snowy egret, great egret, great blue heron, killdeer, yellow-billed cuckoo, great horned owl, barred owl, common flicker, red-headed woodpecker and downy woodpecker, belted kingfisher, barn swallow, common crow, boat-tailed grackle, blue jay, Carolina chickadee, tufted titmouse, Northern mockingbird, American robin, hermit thrush, Eastern bluebird, blue-gray gnatcatcher , kinglets, Northern cardinal, blackbirds, and numerous warblers, sparrows, and other songbirds. Mammals such as fox squirrel, raccoon, Eastern cottontail, armadillo, striped skunk, opossum, Eastern woodrat, and white-tailed deer are common within the floodway but their populations are limited due to the lack of existing habitat.

2.7.3 Aquatic. A healthy aquatic ecosystem includes food webs consisting of organisms ranging from micro-invertebrates to predator type fish species. Due to the modified channel consisting of flattened, featureless substrates, the existing aquatic ecosystem in the project area is drastically limited. Common fish species within the study area include limited populations of white crappie, white bass, green sunfish, channel catfish, and minnows. Rough fish, tolerant to severe aquatic ecosystem conditions, are dominant within the study area.

2.8 Endangered or Threatened Species. According to the U.S. Fish and Wildlife Service (1999), the species listed in Table 1 have historically utilized the study area or similar areas, primarily as a migratory corridor during fall and/or spring migrations. Thus, it is necessary to determine the potential to adversely impact any of the listed species by implementation of proposed restoration project features. According to the Oklahoma Natural Heritage Inventory (1999), the Texas horned lizard is the only state listed threatened species known to occur within Oklahoma County.

Table 1.
Endangered or Threatened Species Potentially Occurring in Oklahoma County

Common Name	Scientific Name	Federal Status
Interior Least Tern	*Sterna antillarum*	Endangered
Peregrine Falcon	*Falco peregrinus anatum*	De-listed
Whooping Crane	*Grus americana*	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Proposed De-listed
Piping Plover	*Charadrius melodus*	Threatened
Arkansas River Shiner	*Notropis girardi*	Threatened

2.9 Recreation, Scenic and Aesthetic Resources. As mentioned in the previous section, the natural attributes of the North Canadian River were removed as part of previous flood control measures in the 1950s. Essentially, all that remains are riparian zones (i.e. riverbanks) of grasses and weeds that occur in excavated material used to construct berms adjacent to the channel. The riverbanks are steeply sloped. Currently, there are no recreational facilities within the project corridor such as public boating, camping, or fishing facilities. Also there are no municipal parks in the project area.

2.10 Socio-economics. The region of influence for the riverine ecosystem restoration project is Oklahoma City, which lies within Oklahoma County, and is part of the Oklahoma City Metropolitan Statistical Area. The population of Oklahoma County is 632,988 (U.S. Bureau of the Census 1999). This represents 19% of the total population of the state of Oklahoma. Oklahoma City's population of 472,220, counts for more than 65% of the population of Oklahoma County (Oklahoma Chamber of Commerce 1999).

This area is characterized by industries that include oil and natural gas, chemical refineries, stockyards, agriculture, and waste management. The areas south of the river are comprised of single-family residential housing, and small pockets of commercial and industrial development. Several large interstate highways provide easy access for commerce and public transportation.

2.11 Cultural Resources. The central Oklahoma culture has been influenced by six major Native American cultural stages. Those stages recognized as being applicable in central Oklahoma include Paleo-Indian, Archaic, Plains Woodland, Plains Village, Protohistoric and Early Historic.

A Phase I cultural resource survey and visual reconnaissance was conducted to identify any potential cultural resources within the project area. In addition to the intensive Phase I survey and visual reconnaissance, a geoarchaeological assessment was conducted within the project area. As a result of the Phase I intensive survey, visual reconnaissance, and geoarchaeological survey no significant cultural materials were identified within the proposed project area. More detailed information on the potential impacts to cultural resources is given in Section 6.8.

2.12 Hazardous, Toxic and Radioactive Waste (HTRW). Industrial development has occurred in the North Canadian River valley since the turn of the century. This presents a need for awareness regarding the potential for existing HTRW in local soils, at industrial sites, and in groundwater.

To address these concerns associated with implementing restoration measures, a 1998 HTRW investigation selected an Environmental Search Corridor based on the physical characteristics of the river valley and the predicted change in groundwater elevations following dam and reservoir construction. Within the corridor, the HTRW investigation identified and evaluated facilities with potential environmental impacts to surface and groundwater quality, groundwater discharge quality and construction worker health and safety (Espey, Huston & Associates 1998).

An additional Phase I Environmental Site Assessment (ESA) was completed in order to identify potential HTRW concerns for the corridor and surrounding area. The objective of the assessment was to document any sites within, or near, the corridor that could potentially be affected by the construction of the riverine ecosystem restoration project.

SECTION 3. PLANNING OBJECTIVES

The goal of this project is to restore natural ecosystem processes to create a dynamic and self-maintaining environment that is hospitable to fish and wildlife without compromising the flood control aspects of the North Canadian River Floodway. The following planning criteria were established as necessary components of the proposed restoration project: (1) Should provide suitable habitat for most native wildlife species and/or provide a travel corridor to other larger tracts upstream and downstream of the project; (2) Must be compatible with Oklahoma City's M.A.P.S. Program; (3) Should provide the least amount of long-term maintenance for Oklahoma City; (4) Should use on-site water sources to the fullest extent; (5) Should be located on Oklahoma City property to the fullest extent practicable; (6) Should utilize native vegetation to restore previous communities; (7) Must not require relocation of existing structures or infrastructure; (8) Must avoid hazardous, toxic, and radioactive waste sites to the extent practicable; and (9) Must meet Federal criteria.

SECTION 4. PLAN FORMULATION

4.1 Riverine Ecosystem Restoration Alternatives. Restoration measures include creation of riverine habitat, wetland construction, corridor and block planting of bottomland hardwoods, and construction of appropriate recreational facilities. The project area would be restored to a more natural state, and a protected corridor would be established for wildlife, migratory neotropical birds, and migratory waterfowl. Numerous alternatives were identified and considered during the planning stages of the restoration project including the No Action Alternative. Each alternative considered was then evaluated to determine if it met the planning objectives discussed in Section 3. The alternatives that

reasonably met the planning objectives were then compared to the no action plan to access potential improvements in environmental quality. Additional criteria considered included local sponsor input and support, reasonableness of project cost, professional judgement, and environmental benefits.

4.2 No Action Alternative. If no action is taken, the riverine habitat would continue to support an imbalanced and unproductive fishery dominated by rough fish tolerant of extreme environmental conditions. Sheltered shoreline areas, which are vital as nursery and feeding areas for the survival of native fish species, would continue to be scarce or nonexistent. It is very unlikely that historic aquatic or bottomland hardwood habitat would reestablish or that an extant aquatic habitat or bottomland hardwood habitat would improve. The scattered remnant of wetlands and bottomland hardwood habitat within the riparian area of the floodway would continue to have little ecological value or diversity.

4.3 Alternatives Considered but Eliminated. Various alternatives were identified and considered during the plan formulation process. The following paragraphs describe these alternatives and the factors that eliminated them from consideration.

4.3.1 Alternate Restoration Sites. Riverine ecosystem restoration was considered at alternate locations outside of the metropolitan area of Oklahoma City. Alternative restoration sites would not address the degraded riverine, wetland, and bottomland hardwood habitat concerns within the Oklahoma City area and violates two planning criteria. Habitat restoration at alternate locations would require utilization of property not owned by Oklahoma City. Furthermore, these alternatives would not be compatible or complimentary to Oklahoma City's M.A.P.S. Program and is unacceptable to the project sponsor.

During the process of refining the proposed alternative, multiple sites within the study area were considered for wetlands and bottomland hardwood restoration. Figure 3 depicts the initial sites considered for restoration. Sites A and B are potential wetland construction areas; Sites C and D have been eliminated. Site C was eliminated due to a limitation on dimensions. I –40 lies to the west and an existing city street lies to the east. Site C also lies on a portion of a closed landfill area. Site D was eliminated because it was situated on a closed landfill area.

4.3.2 Alternate Management Concepts. Restoring riverine habitat by other means than utilizing the backwater pool that will be created by Oklahoma City's construction of the May Avenue dam were considered. Ideally, recreating the natural meandering path of the river by linking the river with historic oxbows would increase riverine habitat and quality. Such an alternative could restore the native

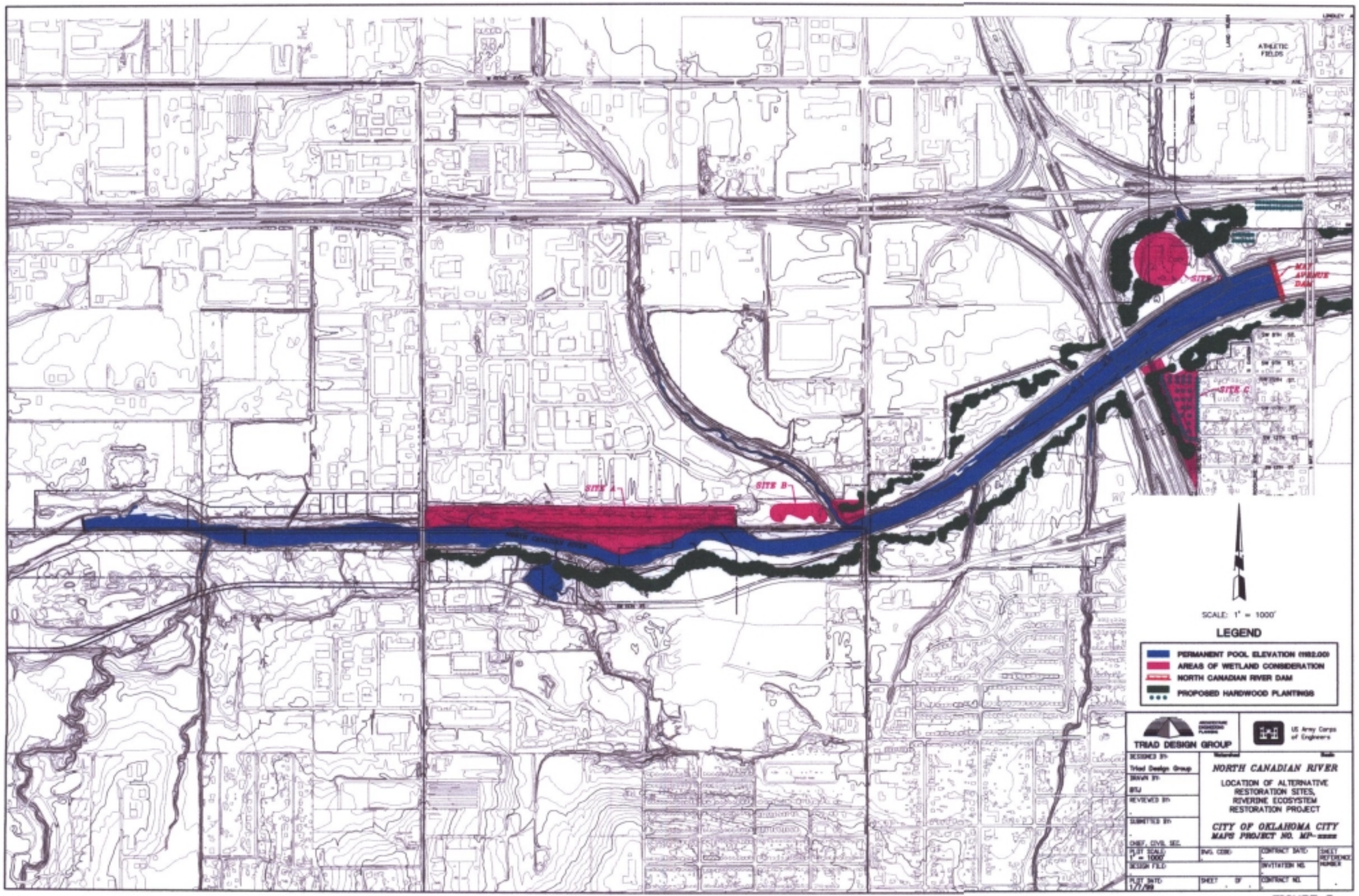

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FIGURE 3

prairie fishery in this 2.8-mile stretch if it were connected to a larger scale similar type project. However, this alternative conflicts with the flood control design of the original North Canadian River Floodway Project. Conceptual designs for developing a reliable local water source for wetlands and aquatic habitat other than utilizing the backwater pool that will be created by Oklahoma City's construction of the May Avenue dam were considered. Measures such as pumping water from the municipal water supply or using drilled wells to provide water for wetland and aquatic restoration would be expensive and would require long-term maintenance. In addition, drilled water wells may provide an unreliable water source. Potential wildlife benefits gained by using either pumping or drilled wells would be limited in comparison to utilization of the backwater pool created by the May Avenue dam where aquatic restoration and riparian corridor restoration benefits could be obtained.

Another alternative considered was the creation and use of excavated detention ponds to collect high flows and a distribution system that would supply water to wetland areas. This alternative would be cost prohibitive, and it would require land acquisition outside of the floodway and Oklahoma City's property boundary.

SECTION 5. RECOMMENDED PLAN

5.1 Description of the Recommended Plan. The recommended alternative for the riverine ecosystem restoration project includes the restoration of: (1) 105 acres of open water, riverine habitat, (2) 9.2 acres of wetlands; and (3) 20 acres of bottomland hardwoods that would line the river on both sides to provide a riparian corridor.

Incorporated into the restoration is the utilization of the backwater pool that will be created by the May Avenue low water dam, which will be constructed by Oklahoma City in the spring of 2000. The restoration measures would include dredging and aquatic plantings in the river-lake to create a riverine environment that would support a native fishery. The river-lake would also be the source of water for the wetlands. Figure 4 illustrates the recommended riverine ecosystem restoration alternative. This alternative is a comprehensive solution to improve degraded habitat conditions within the Oklahoma City area along the North Canadian River Floodway. It is also compatible with all planning criteria listed in Section 3.0. The following paragraphs summarize proposed restoration measures.

5.1.1 Riverine and Wetland Restoration Measures. Proposed riverine ecosystem restoration measures include the utilization of the backwater pool created by Oklahoma City's May Avenue low

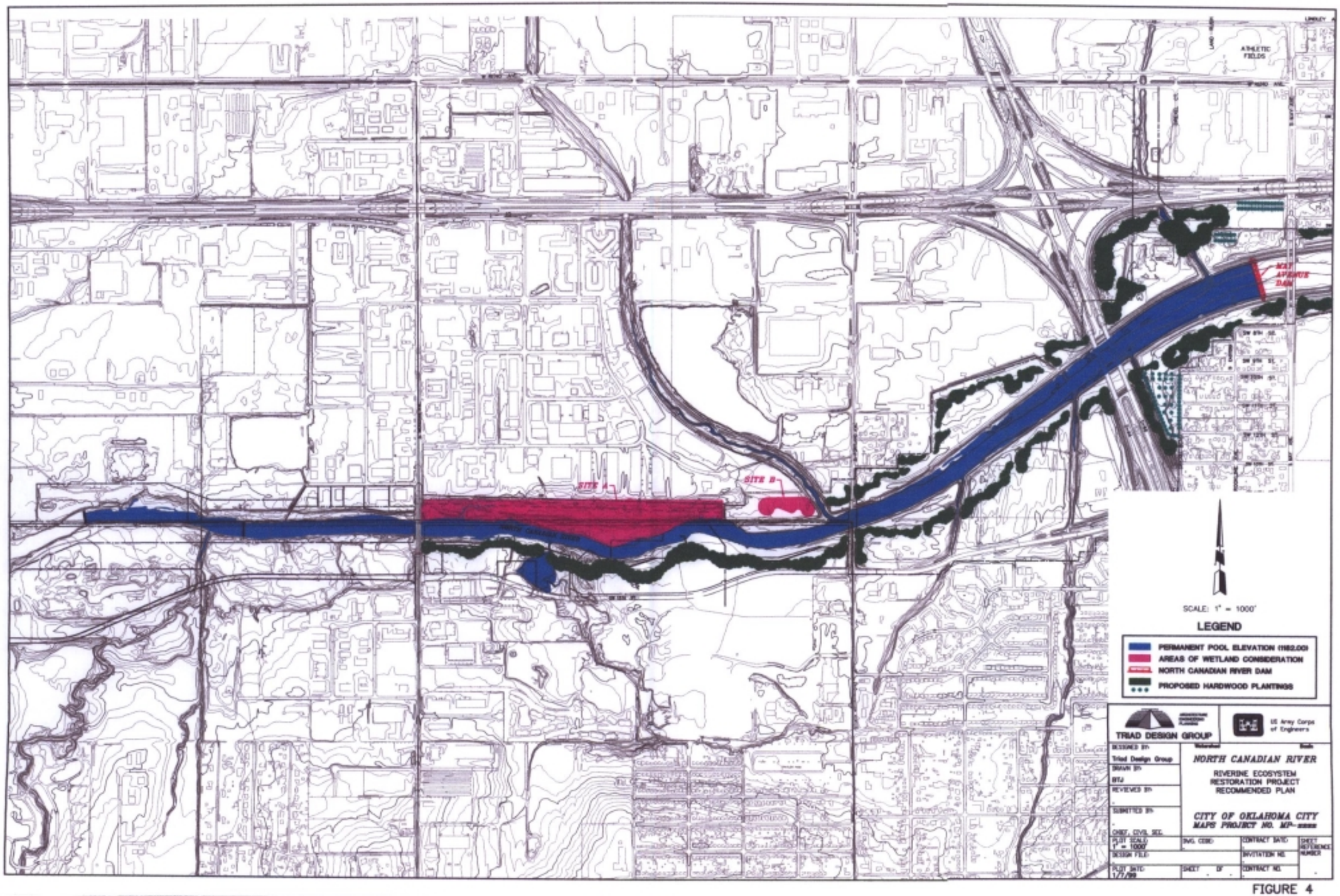

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FIGURE 4

water dam and upstream sediment basin to create an estimated 105 acres of open water riverine habitat along the 2.8-mile stretch of river. The restoration project would include dredging the river-lake to provide a depth of water that will support a native fishery. The backwater pool would also be used to provide a reliable source of water for an additional 9.2 acres of wetlands.

Proposed wetlands would be created in areas where existing drainages connect to the floodway. Some of the proposed wetland areas would have water control structures to manage the water levels and overall productivity of wetland areas. Water control structures would trap water during flood events and store water to ensure a water supply to wetland areas during the dry season. The wetland areas would have varied elevations providing a diversity of deep and shallow water habitats. Approximately 10 to 40 percent of the surface area of larger wetland restoration areas would be open water with depths up to 10 feet. Revegetation efforts on the perimeter of the wetland restoration areas would include planting wetland tree species such as green ash, black willow, and Shumard oak, and allowing existing seed banks to reestablish. Intensive planting of emergent, floating-leafed, and submerged wetland native vegetation may include about 50 percent of water surface area that averages less than four feet deep.

5.1.2 Riparian Corridor Plantings. Reforestation efforts along both sides of the river would improve and reestablish a contiguous riparian corridor throughout the project area. Approximately 20 acres of bottomland hardwood habitat would be planted over this 2.8-mile reach. The riparian corridor would serve as a greenbelt vegetation buffer between restoration areas and adjacent urban land and connect the riparian corridor with larger riparian areas upstream and downstream of the project area. This would also improve area aesthetics by screening incompatible land uses from the river corridor. Tree species recommended for reforestation efforts include black willow, green ash, eastern cottonwood, American elm, black walnut, pin oak , Shumard oak, bur oak, chinkapin oak, eastern hackberry, and pecan. Proposed riparian corridor plantings would also include native shrubs such as red mulberry, and redbud, native tall and short grasses, and forbs.

5.1.3 Real Estate Requirements. The riverine ecosystem restoration project requires approximately 360 acres of land for construction, operation, and maintenance. Most of the real estate interests required for this project were previously acquired in cooperation with the Federal Government for the Oklahoma City Local Protection Project and are currently owned by the City. The City is in the process of acquiring additional lands. All required real estate interests will be made available to the Federal Government prior to construction. No residential properties will be included in the area required for this project.

A Real Estate Plan will be prepared in accordance with Engineering Regulation 405-1-12, paragraph 12-16, and will be incorporated in the final *Ecosystem Restoration Report and Integrated Environmental Assessment* as an appendix. This Plan will address, among other things, a description of the lands required for the construction, operation, and maintenance of the project; the sufficiency of those real estate interests already owned by the local sponsor; the estates to be acquired; the effect of the previous Federal cost-shared Project upon the current project; the presence, if any, and effect of contaminated lands in the project area; utility relocations/alterations; cost estimates; relocation benefits to be paid displacees; mineral exploration activity; capability of the local sponsor to provide necessary lands; easements and rights-of-way; and, zoning.

SECTION 6 ENVIRONMENTAL EFECTS OF THE RECOMMENDED PLAN

The recommended plan will result in long-term improvements to the environment and is in full compliance with applicable environmental statutes and regulations (Table 2).

6.1 Water Quality. No long-term adverse impacts to local water supply, surface waters, groundwater, or aquatic environment are anticipated from implementing the recommended riverine ecosystem restoration alternative. Short-term impacts associated with run-off from construction areas would likely elevate turbidity levels and lower dissolved oxygen levels in the North Canadian River and associated drainages. After project construction phases are complete and restoration measures are in place, overall water quality would return to pre-project conditions. Proposed wetlands, aquatic restoration, and riparian corridor and wetland perimeter bottomland hardwood plantings would likely increase overall water quality in the project area. Native trees, shrubs, grasses and wetland vegetation would protect large areas by reducing run-off and increasing filtration and groundwater absorption.

Groundwater modeling results show that following construction of the May Avenue Dam river-lake, groundwater tables would rise (EH&A, 1998). Currently, the average depth of groundwater in the alluvial formation surrounding the project site is approximately 18 feet and the groundwater depth slopes toward the North Canadian River at an oblique angle to the river channel. Models show that following river impoundment, the reservoir begins to lose water to the surrounding alluvial aquifer. As this happens, groundwater ceases to discharge to the river and groundwater elevations adjacent to the river begin to rise. For example, modeling results show an estimated decrease in the depth to groundwater of up to 14 feet adjacent to the proposed Eastern Avenue dam which is currently under construction. In general, higher groundwater elevations would not measurably influence the total mass of chemical substances that become dissolved in groundwater and migrate from most sites. In relatively permeable

Table 2.
Applicable Environmental Statutes and Regulations

Policies	Compliance of Recommended Plan
Archaeological and Historical Preservation Act, 1974, as amended, 16 U.S.C. 469	Plan in full compliance
Clean Air Act, as amended, 42 U.S.C. 7609	Plan in full compliance
Clean Water Act, 1977, as amended, (Federal Water Pollution Control Act), 33 U.S.C. 1251	Plan in full compliance
Department of Transportation Ac, 1966, as amended	Plan in full compliance
Endangered Species Act, 1973, as amended, 16 U.S.C. 1531	Plan in full compliance
Farmland Protection Policy Act, 7 U.S.C. 4201	Plan in full compliance
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1-12	Plan in full compliance
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661	Plan in full compliance
Land and Water Conservation Fund Act, 1965, as amended 16 U.S.C. 4601	Plan in full compliance
National Historic Preservation Act, 1966, as amended, 16 U.S.C. 470a	Plan in full compliance
National Environmental Policy Act, as amended, 42 U.S.C. 4321	Plan in full compliance
Native American Graves Protection and Repatriation Act, 1990, 25 U.S.C. 3001-13	Plan in full compliance
Rivers and Harbors Act, 33 U.S.C. 401	Plan in full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001	Plan in full compliance
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271	Not Applicable
Water Resources Planning Act, 1965	Plan in full compliance
Floodplain Management (E.O. 11988)	Plan in full compliance
Protection of Wetlands (E.O. 11990)	Plan in full compliance
Environmental Justice (E.O. 11990)	Plan in full compliance
Environmental Health and Safety (E.O. 13045)	Plan in full compliance

Note: Full compliance – Having met all requirements of the statues, Executive Orders, or other environmental requirements for the current state of planning.

soils, such as those that commonly occur in the North Canadian River valley, soluble chemical compounds and liquid chemicals are likely to be flushed or leached to the water table by infiltrating precipitation, regardless of the elevation of the water table levels. However, rising groundwater may cause contaminants to impact groundwater sooner than might otherwise occur, particularly in areas where the water table would rise relatively quickly (i.e., adjacent to the North Canadian River). Also, groundwater impacts could occur at sites where a relatively low-permeability stratum has previously prevented substances from reaching the water table, as the water table rises into, or above, that stratum [Espey, Huston & Associates, (EH&A) 1998].

In most areas, temporary changes in the direction of groundwater flow would not, in the long term, significantly affect the direction in which chemical contaminants migrate. While the direction in which contaminants migrate may change temporarily, the distance they travel during the interim is likely to be

very limited. Modeling of the dam under construction at Eastern Avenue also indicated the direction of groundwater flow would be permanently altered in areas that are close to the dam. Within this zone, the direction of groundwater flow would either be away from the river or roughly parallel to the river channel in the downstream direction depending on time elapsed following dam construction. Similar conditions are anticipated to occur upstream of the May Avenue Dam, but the affected areas may vary in size.

6.2 Soils. Construction activities associated with the proposed riverine ecosystem restoration project (excavating, grading, and contouring) involve removal and relocation of soil. Soils within and immediately surrounding the May Avenue dam site and wetland restoration areas would be temporarily denuded and subject to wind and/or water erosion. Erosion control measures such as watering construction areas to minimize wind erosion and subsequent fugitive dust releases would be utilized. Also, water erosion control measures such as water diversion, silt screen, silt fences, and straw bales would be utilized to limit soil loss and erosion impacts. These potential erosion impacts would be temporary, occurring only during construction activities. After construction, planned herbaceous wetland and bottomland hardwood reforestation would provide ground cover to promote soil stability. Post monitoring of the dam site and aquatic ecosystem restoration areas would be conducted.
The proposed riparian corridor bottomland hardwood plantings would have no adverse impacts to soils as no ground clearing would be required. Proposed revegetation restoration measures would provide long-term benefits such as soil stabilization.

6.3 Prime Farmlands. No prime farmlands would be impacted or removed from production by implementing the proposed ecosystem restoration alternative.

6.4 Air Quality. The proposed riverine ecosystem restoration project would have two minor short-term construction related effects on air quality: an increase in emissions caused by heavy construction equipment and an increase in dust associated with earth moving operations. The increased levels of particulate matter may be the greatest cause of air quality impact from construction and the greatest annoyance to the residents near the construction site. Dust emissions may vary daily depending on the level of activity, specific operations, and weather conditions. Most dust emissions result from equipment traffic over temporary roads at the proposed sites. Dust emissions from the site may also be directly affected by the size of the disturbed area, vehicle speed, silt content of the soil, and the surface moisture of the temporary road. All activities will be performed in accordance with state and local laws and regulations pertaining to the minimization of the effect of construction on air quality. In view of the short duration of these activities, the type of equipment to be used, and the good dispersion patterns of the

region, air emissions would be *de minimus*. Oklahoma County would remain in attainment with national and state air quality standards.

6.5 Biological Resources. The ecosystem restoration goals are to protect the existing natural habitat areas and restore a portion of the riverine, wetland and bottomland hardwood habitats degraded or lost as a result of the channelization of the North Canadian River. The expected benefits of restoring the ecosystem habitats are multifold.

6.5.1 Riverine Resources. Instream aquatic restoration efforts would restore approximately 105 acres of open water, riverine aquatic habitat. The increased riparian perimeter and increased shallow water areas created from the river-lake formed by Oklahoma City's May Avenue dam would increase available aquatic habitat and architectural diversity, thus increasing biodiversity. The riverine habitat, along with the establishment of shallow water wetlands in combination with rock and rip-rap habitats will significantly increase the habitat diversity. These improved habitat conditions would provide for a more sustainable fishery by increasing fish production, improving winter survivability and provide more diverse nursery, rearing, and feeding habitat for aquatic organisms. The project would also improve the ecological balance of desirable predator-prey-rough fish species by improving the abundance of fish species such as white bass, largemouth bass, sunfish, black crappie, white crappie, channel catfish, flathead catfish, and blue catfish. There would be temporary adverse effects to benthic and fish communities from increased turbidity and lower dissolved oxygen levels during construction. However, these adverse water quality-related impacts would be temporary; beneficial long-term aquatic resource impacts of the proposed restoration measures far surpass construction-related impacts.

6.5.2 Wetland Resources. Approximately 9.2 acres of wetland habitat would be restored along the riverine ecosystem restoration project. Lost functions and values such as floodwater runoff detention, nutrient recycling and waste assimilation, and filtration of sediments into the North Canadian River would be partially restored.

6.5.3 Terrestrial Resources. Approximately 20 acres of riparian and bottomland hardwood habitat would be restored through bottomland hardwood plantings Both riparian and bottomland trees and shrubs are the fundamental controlling factor to wildlife, especially in urban areas. Riparian corridors provide essential habitat that form buffer/filter barriers in urban areas by providing substantial food, shelter, resting, and transit corridor areas for wildlife. In urban stream corridors a wide forest buffer is an essential component of any protection strategy. Its primary value is to provide physical protection from

encroachment along the stream channel. A network of buffers acts as the right-of-way for a stream and functions as an integral part of the stream ecosystem (Stream Corridor Restoration, 1998).

Wetland and reforestation restoration efforts would introduce a substantial amount of herbaceous material to the entire corridor area. Input of organic material into the aquatic system would occur through deposition of leaf litter and woody debris. Aquatic food webs are improved by vegetated riparian ecosystems that provide organic materials and stream habitat structure through inputs of woody debris. Sedimentation and related adverse storm water impacts would be reduced due to improved percolation and retention rates resulting from revegetation and landscaping efforts (trees, shrubs, groundcover, swales, sub-surface drainage, etc.) throughout the project corridor.

The reestablishment of riparian and bottomland hardwoods would eventually provide large areas of canopy that have a shading effect, providing cooler microclimates both for terrestrial and aquatic environments in the area. Herbaceous layers of groundcover and shrubs would have the same effect. Water temperature is a crucial factor in stream corridor restoration for a number of reasons. First, cooler water holds more oxygen. Second, increased temperatures may increase food demand and may change reproduction in unpredictable ways. These changes are reflected throughout the food chain. Third, many aquatic species can tolerate only a limited range of temperatures, and shifting the maximum and minimum temperatures within a stream can have profound effects on species composition. Finally, temperature also affects many abiotic chemical processes, such as re-aeration rates, sorption of organic chemicals to particulate matter, and volatilization rates. Temperature increases can lead to increased stress from toxic compounds, for which the dissolved fraction is usually the most bioactive fraction.

The following environmental benefits to the riparian system within the proposed riverine ecosystem restoration project could be realized by the proposed corridor, block, and wetland perimeter plantings (U. S. Army Corps of Engineers 1991):

- Increased stream shading restoring normal stream water temperature.
- Increased deposition of sediments and other contaminants.
- Reduced nutrient loads of streams.
- Stabilized streambanks.
- Reduced erosion caused by uncontrolled runoff.
- Increased riparian wildlife habitat quantity and quality.
- Protected fish spawning and nursery areas.
- Increased aquatic food webs.
- Creation of a visually appealing greenbelt.
- Creation of recreational opportunities.

The expected benefits to wildlife by restoring wetland, aquatic, and bottomland hardwood habitat types include: improving habitat conditions for resident and migratory waterfowl and shorebirds; restoring aquatic habitat for native species; improving nesting habitat for bird species; creating travel corridors for wildlife; restoring habitat diversity of a severely degraded environment and; improving food and cover for a variety of wildlife, including small mammals, birds, reptiles and amphibians. Other benefits to restoring the bottomland hardwood habitat include improving water quality, reducing erosion and water turbidity, and improving the general aesthetics of natural areas surrounding the floodway.

6.5.4 Evaluation of Biological Resource Habitat Values. To evaluate the riverine ecosystem restoration benefits discussed above, it was necessary to establish a numerical baseline value of existing habitat quality in the study area to compare with the value of the expected increase in habitat quality that would be provided by the recommended restoration plan. The evaluation process used was the Habitat Evaluation Procedure (HEP). HEP evaluates habitat based on Habitat Suitability Index (HSI) models for wildlife species that typify a targeted habitat type. A HEP team selected a group or guild of species representative of the project area habitat types. As recommend in HEP, the representative guild of species allowed the HEP team to quantify Habitat Suitability Index (HSI) values for each habitat type (bottomland hardwood, wetlands, and aquatic). HSI values are numerical representations of habitat quality based on a 0 to 1 scale, where 0 represents habitat conditions of no usable value and 1 represents optimum habitat conditions. The HSI value is then multiplied by the number of acres of habitat type to obtain Habitat Units (HUs). The existing condition HUs are then compared to the HUs that would be provided by the proposed restoration plan.

Since riverine, wetland, and bottomland hardwood habitat types currently within the North Canadian River corridor between May Avenue and Meridian Avenue are of extremely poor quality, HSI values for existing habitat types were estimated using professional judgement of Biological Scientists. HSI values for the habitat types that would be improved by the implementation of the proposed aquatic ecosystem restoration plan are based on relative information from previous studies (U. S. Army Corps of Engineers, 1992) and consideration of the improvements to wildlife habitat in an urban setting.

According to the HEP results (Table 3), it is estimated that the proposed restoration would increase the overall habitat unit outputs by about 843 percent. Because existing habitat types of good quality are essentially nonexistent along the North Canadian River Floodway, the percent gain of the proposed restoration is substantial.

Table 3.
Estimated Fish and Wildlife Restoration Habitat Outputs in Habitat Units (HU)

		Existing		With Project		Net Gain	
Habitat Type	Acres	HSI	HU	HSI	HU	HU	(%)
Riverine Habitat	105.0	0.10	10.5	0.75	78.8	68.3	750
Wetlands	9.2	0.05	0.5	0.80	7.4	6.9	1480
Riparian and Bottomland Hardwoods	20.0	0.05	1.0	0.75	15	14.0	1500
Totals	134.2	--	12.0	--	101.2	89.2	843

6.5.5 Endangered or Threatened Species. The proposed project has been reviewed and is supported by the U.S. Fish and Wildlife Service, the Oklahoma Department of Wildlife Conservation, and the Oklahoma Conservation Commission. No Federal or state listed species were observed during field surveys conducted within the aquatic restoration project area. The proposed restoration plan is not likely to adversely affect Federal or state listed threatened or endangered species. By creating bottomland hardwood and riparian habitat and emergent and semi-emergent riverine habitat, this plan would benefit the five Federally protected birds, which include the interior least tern, peregrine falcon, whooping crane, bald eagle, and piping plover. The proposed bottomland hardwood, wetland, and aquatic habitats could be used as potential nesting sites for peregrine falcons and bald eagles and also as potential feeding grounds for interior least terns and piping plovers.

6.6 Recreation, Scenic and Aesthetic Resources. The proposed riverine ecosystem restoration features would provide the unique opportunity to incorporate nature related recreational and aesthetic benefits to the Oklahoma City metropolitan area. Currently, public access to existing municipal parks in the area is limited. The provision of accessible links along the river would help to integrate not only the existing park facilities but to also add natural recreational corridors and amenities. Nature related recreational opportunities such as nature study, bird watching, and nature walk corridors in urban areas are unique and provide the public with substantial educational and recreational benefits.

There are 2 multi-purpose trails that will be designed for maintenance vehicle access but would also serve as hiking tails (refer to paragraph 7.4). Sidewalks, and parking lots would be linked to the multi-purpose trails and would efficiently and conveniently connect the river corridor with adjacent neighborhoods and other points of interest. These multi-purpose trails would allow the public freedom to utilize the river for many different activities while affording pedestrian safety and myriad vistas.

Fishing piers are proposed along the river corridor to facilitate recreational angling or other types of water related enjoyment. These piers, which may be funded by alternative sources, would be located away from boating areas, but would be serviced by easily accessible parking areas.

A few picnic areas and shelters would be selectively placed throughout the project corridor to coincide with site amenities and serve as gathering places for outdoor activities and outdoor class rooms for nature studies. The outdoor classrooms would benefit school children, interest groups, and individuals. These shelters would be in close proximity to restroom facilities and trail connections. Recreational boating would be realized through construction of boating facilities that are compatible with the intended restoration features of the project.

All recreational and educational features will be carefully incorporated into the ecosystem restoration project to insure that they do not adversely impact or lessen the benefits of the fish and wildlife restoration features. The Corps of Engineers Policy Guidance Letter number 59, which prohibits recreational development cost to increase the Federal construction costs of ecosystem restoration projects by more than 10 percent (without approval of the Assistant Secretary of the Army Civil Works), will be used in designing and planning recreational features. All recreational amenities incorporated into the project are secondary to the primary restoration purposes.

6.7 Socio-economics. Implementing the riverine ecosystem restoration project would provide short-term direct economic benefits to the companies and employees involved in construction and, through economic multiplier effects, to the broader economy. Costs of construction include contracting costs and physical costs associated with constructing the preferred alternative. The construction and materials would likely be performed/provided by individuals from the private sector and mostly drawn from the Oklahoma City Metropolitan Statistical Area.

It is anticipated by the city of Oklahoma City that the proposed riverine ecosystem restoration project, in conjunction with two other habitat restoration projects proposed for the North Canadian River Floodway, would attract approximately 70,000 people per annum to the river corridor. These visitors would likely increase economic commerce and employment opportunities in the downtown area. There are no expected housing impacts or displacement expected from the implementation of this project.

The project would not result in any violations of the intent of Executive Order 12898 that addresses Environmental Justice. This order requires Federal agencies to identify and address disproportionately high or adverse human health and environmental effects of federal programs, policies, and activities on

minority or low-income populations. Present land use along this stretch of the floodway consists of city parks, open space, spoil berms from construction of the floodway project, oil and gas development, and unauthorized trash dumping. One interstate highway, numerous city and county roads, state highways, and utilities cross the floodway and floodplain of the North Canadian River. The proposed project would not have any adverse impacts to land use in the area. It is hoped that the project would serve as a model to local landowners and citizens for incorporating simple improvements on their own lands and in their own yards to improve the quality of wildlife habitat.

6.8 Cultural Resources. A Phase I cultural resource survey and visual reconnaissance was conducted to evaluate any potential effects on cultural resources within the project area. Seven shovel tests were excavated in two portions of the project area. The area showed signs of extensive disturbance. There were no positive shovel tests recorded within the study area and no cultural remains were located during this survey.

In addition to the intensive Phase I survey and visual reconnaissance, a geoarchaeological assessment was conducted within the project area. The areas along the river have been heavily disturbed due to channelization, dumping and borrow activities. Undisturbed areas suitable for archaeological backhoe trenching within the proposed project area were difficult to locate, limiting the number of trenches dug. Two backhoe trenches were excavated in one location along the river as part of a larger basin geoarchaeological study. The trenches revealed that significant disturbance has occurred along this segment of the North Canadian River, limiting the likelihood for the presence of intact prehistoric sites. The sediments in the area are highly erodible, further decreasing the likelihood of locating intact sites.

The Community Assistance Program staff at the Oklahoma Archeological Survey also reviewed the proposed project to identify potential areas that may contain prehistoric or historic archaeological materials. They found that no archaeological sites were listed as occurring within the project area, and based on the topographic and hydrologic setting, no archaeological materials are likely to be encountered.

As a result of the Phase I intensive survey, visual reconnaissance, and geoarchaeological survey no significant cultural materials were identified within the proposed project area. The geoarchaeological analysis revealed that the portion of the North Canadian River within the project area has undergone significant, extensive disturbance, severely curtailing the potential for intact subsurface archaeological deposits. Therefore, the project is not expected to affect any significant archaeological deposits. Unexpected discoveries of cultural materials during construction would require that work stop immediately. The State Historic Preservation Officer (SHPO) would be contacted for consultation on

appropriate measures to be followed under these circumstances. Clearance to proceed would be required from the SHPO prior to continuing construction activities.

6.9 Hazardous, Toxic and Radioactive Wastes (HTRW). Historic land use practices, such as oil exploration and various small industries, within and adjacent to the wetland ecosystem restoration project area require the analysis of soil samples to determine the potential for HTRW contamination at locations where there will be significant excavation during construction of the proposed wetlands. The purpose of the soil analysis is to reduce the risk of establishing wetlands in areas where contaminants could be reintroduced to the environment. Additionally, the unexpected discovery of HTRW material and the resulting special handling and disposal requirements could significantly increase the local sponsor costs. The sampling and analysis are tentatively scheduled for completion in February 2000.

Soil samples will be collected at each of the proposed wetland sites and analyzed to determine the potential for presence of contaminants. Samples will be collected from the surface, at a depth of 5 feet below ground surface, and at a depth which correlates with the proposed depth of excavation for each specific wetland site, generally about 10 feet below ground surface. The results of the HTRW sampling will be used to help make final decisions on wetland site locations. If significant contamination is found, then an alternate wetland site will be considered. If an alternate site is not practical, then alternative restoration, such as aquatic plantings in the river-lake and/or additional bottomland hardwood plantings, will be considered.

If HTRW material is discovered, the local sponsor would be responsible for any and all necessary cleanup and response costs for contamination. The estimated local sponsor share of the project cost identified in Section 7 does not take into account any potential HTRW response measures during construction.

6.10 Regulatory Requirements. The proposed project has been reviewed in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. In addition, Executive Order 11990, Protection of Wetlands, and Executive Order 11988, Floodplain Management, were considered during the development of the proposed project. The recommended plan would impact waters of the United States and is subject to provisions of Section 404 of the Clean Water Act. The project's terrestrial restoration activities would meet the conditions of Nationwide Permit 27, Wetland and Riparian Restoration and Creation Activities. The State of Oklahoma has issued a water quality certificate for Nationwide Permit 27; therefore, no further coordination is required under Section 404. The proposed activities would not induce commercial or private development in, alter boundaries of, or significantly impact the 100-year floodplain. The proposed project is in compliance with Executive Order 11988,

Floodplain Management. The proposed project complies with Executive Order 11990 as it would neither adversely impact nor result in any loss in wetland areas.

SECTION 7 PROJECT COSTS AND IMPLEMENTATION

7.1 Project Costs. The estimated total project cost is approximately $6,670,000. The project would be cost shared at the Federal limitation ($5,000,000) with Oklahoma City (the local sponsor) providing the remainder ($1,670,000). The local share does not include potential costs associated with required HTRW response actions.

7.2 Project Schedule. The project schedule for the riverine ecosystem restoration project, is presented in Table 4. The schedule assumes that no HTRW response actions will be required.

Table 4.
Project Milestone Schedule

Task	Date
Complete Preliminary Restoration Report	August 1999
Initiation of Ecosystem Restoration Project	August 1999
Public Scoping Meetings	September 1999
Initiate review of Draft ERR/EA by Public, Sponsor, and Corps	January 2000
Complete Final ERR/EA	March 2000
Execute Project Cooperation Agreement	March 2000
Complete Plans and Specifications	April 2000
Initiate Construction	September 2000
Complete Construction	February 2002

7.3 Monitoring. An important component of project implementation is the monitoring of the ecosystem's response to the restoration measures. By connecting the ecosystem response to the restoration as well as the management measures, potential beneficial adaptations and adjustments to the project or management plan can be identified to ensure continued success of the project. To accomplish this goal, periodic monitoring of the restoration measures will be conducted by the U.S. Army Corps of Engineers Lewisville Aquatic Ecosystem Research Facility in Lewisville, Texas. It is suggested that planting should be spread over two growing seasons to ensure a higher rate of overall survivability of the plantings in case the initial planting season conditions are abnormally harsh. Restoration efforts

implemented will be periodically surveyed to provide feedback on the response of the ecosystem and make necessary adaptations and adjustments.

7.4 Operation and Maintenance. The local sponsor is responsible for all project operation, maintenance, repairs, replacement, and rehabilitation. Operation and maintenance activities of the proposed project will be varied and are expected to include the following activities: 1) monitoring and management activities associated with plants health and growth of the vegetation to include periodic replanting; 2) picking up trash throughout the project area; 3) removal of debris from maintenance access paths, such as tree limbs or brush, after flood events, hard rainstorms and wind storms; 4) the tree and shrubs seedlings planted to improve the existing forest stands will need to be regularly monitored and forest management techniques, such as additional thinning will need to be applied periodically as the planted trees and shrubs mature; 5) some of the trees and shrub may need to be trimmed, pruned, removed or replaced over time; and 6) monitoring and management activities associated with the operation and maintenance of the water control structures and wetland cells.

To provide vehicle access for the operation and maintenance activities discussed above, 2 multi-purpose trails are planned. A 12-foot wide asphalt trail would be constructed above the 100-year floodplain elevation and designed to accommodate fully loaded water trucks. An 8-foot wide concrete multi-purpose trail would be constructed between the 50-year and 100-year floodplain elevation and designed to accommodate loaded pick-ups and other maintenance vehicles (5 ton capacity).

SECTION 8. LOCAL SUPPORT AND COORDINATION

8.1 Views of Sponsor. The city of Oklahoma City (Oklahoma City Public Property Authority) would be the local sponsor. The city supports the recommended plan and intends to participate in the implementation of the recommended plan.

8.2 Coordination. Public Involvement and Agency Coordination Representatives from the U.S. Fish and Wildlife Service, the Oklahoma Department of Wildlife Conservation, the Oklahoma Conservation Commission, the City of Oklahoma, USACE, Tulsa District, and personnel from the USACE Lewisville Aquatic Ecosystem Research Facility participated in the development and evaluation of the potential restoration measures. Agency coordination letters or this project are contained in Appendix C. In addition, information on water and air quality was obtained from the U.S. Geological Survey, the Center for Environmental Information and Statistics, and the Oklahoma Water Resources Board.

A Public Information Workshop and Scoping Meeting for the Western Avenue Wetland Ecosystem Restoration Project was held on September 2, 1999 at the Police/Fire Training Center, 800 North Portland, Oklahoma City, Oklahoma. The goals of the public meeting were to: (1) inform the public about the restoration project; (2) solicit comments and questions about the study; and (3) gather ideas and questions about the environmental impacts of project alternatives being considered. The USACE also solicited public input on two other North Canadian River ecosystem restoration projects at this workshop. Approximately 30 people attended the public meeting and eight public comment sheets were received as a result of the meeting. No adverse comments or statements of opposition to the proposed action were received. The individuals that provided comments indicated that the restoration projects were very worthwhile. A copy of the workshop announcement and letters of support from the U.S. Fish and Wildlife Service and the Oklahoma Department of Wildlife Conservation are provided in Appendix C.

SECTION 9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions. This report documents and includes an examination of all practical alternatives and addresses the environmental effects of restoring wetland ecosystem habitats along the North Canadian River corridor between Western Avenue and May Avenue. As a result of the Federal flood control project constructed in the 1950's, and associated urban encroachment, most of the natural aquatic-bottomland hardwood ecosystem along the flood plain within Oklahoma City has been destroyed. The recommended plan would restore 9.2 acres of wetlands, 105 acres of open water, riverine aquatic habitat, and 20 acres of riparian and bottomland hardwoods. Accordingly, it is estimated that the proposed restoration would increase the overall fish and wildlife habitat value by about 843 percent. The plan also incorporates two multipurpose maintenance trails that would also provide the unique opportunity for nature-related recreation and educational opportunities (nature study, bird watching, and nature walk corridors). The recommended plan provides significant fish and wildlife benefits, at a reasonable construction and operation and maintenance cost. The plan does not impair and is compatible with the original North Canadian River flood control project and is consistent with national policy and goals. The estimated project cost is $6,670,000. The Federal share of the project would be $5,000,000 with the local sponsor (Oklahoma City Public Property Authority) providing $1,670,000. The sponsor would assume all operation and maintenance responsibilities. The project has had extensive input, support, and cooperation of local, state, and Federal agencies in developing the recommended plan.

9.2 Recommendations. Subject to public review comments and results of the soil analysis at potential wetland sites, the proposed plan will be recommended for construction approval and funding.

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APPENDIX A

PHOTOGRAPHS

Photo 1. Basin 3

Photo 2. Basin 3 – exposed pipes

APPENDIX B

SCIENTIFIC NAMES OF FLORAL AND FAUNAL SPECIES

SCIENTIFIC NAMES OF FLORAL AND FAUNAL SPECIES

Common Name	Scientific Name
Flora	
American elm	*Ulmus americana*
beans	*Phaseolus spp.*
Bermuda grass	*Cynodon dactylon*
black walnut	*Juglans nigra*
black willow	*Salix nigra*
blackberry	*Rubus cuneifolius*
box elder	*Acer negundo*
bristlegrass	*Setaria* sp.
bur oak	*Q. macrocarpa*
catalpa	*Catalpa speciosa*
chinkapin oak	*Q. muehlenbergii*
coralberry	*Lonicera sempervirens*
corn	*Zea mays*
eastern cotttonwood	*Populus deltoides*
Eastern hackberry	*Celtis occidentalis*
giant ragweed	*Ambrosia trifida*
goldenrod	*Solidago* sp.
green ash	*Fraxinus pennsylvanica*
greenbriar	*Smilax rotundifolia*
indigo bush	*Baptisia australis*
ironweed	*Vernonia acaulis*
Johnson grass	*Sorghum halepense*
partridge pea	*Cassia fasciculata*
pecan	*Carya illinoiensis*
pigweed	*Chenopodium album*
pin oak	*Quercus palustris*
poison ivy	*Toxicodendron radicans*
pokeweed	*Phytolacca americana*
red mulberry	*Morus rubra*
redbud	*Cercis canadensis*
roughleaf dogwood	*Cornus drummondii*
Shumard oak	*Q. shummardii*
silver maple	*Acer saccharinum*
smooth sumac	*Rhus glabra*
squash	*Cucurbita pepo*
sugarberry	*Celtis laevigata*
sunflowers	*Helianthus* sp.
tobacco	*Nicotiana spp.*
Virginia creeper	*Parthenocissus quinquefolia*
Western soapberry	*Sapindus drummondii*
yarrow	*Achillea millefolium*
Fauna	
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
Arkansas river shiner	*Notropis girardi*
armadillo	*Dasypus novemcinctus*
bald eagle	*Haliaeetus leucocephalus*
barn swallow	*Hirundo rustica*
barred owl	*Strix varia*
bass	*Micropterus* spp.
belted kingfisher	*Ceryle alcyon*

SCIENTIFIC NAMES OF FLORAL AND FAUNAL SPECIES

Common Name	Scientific Name
bison	*Bison bison*
blue jay	*Cyanocitta cristata*
bluegill	*Lepomis* spp.
blue-gray gnatcatcher	*Polioptila caerulea*
boat-tailed grackel	*Quiscalus major*
Carolina chickadee	*Parus carolinensis*
catfish	*Ictalurus* spp.
cattle egret	*Bubulcus ibis*
common crow	*Corvus corax*
common flicker	*Colaptes auratus*
Cooper's hawk	*Accipiter cooperii*
deer mouse	*Peromyscus maniculatus*
downy woodpecker	*Picoides pubescens*
Eastern bluebird	*Sialia sialis*
eastern cottontail	*Sylvilagus floridanus*
eastern kingbird	*Tyrannus tyrannus*
Eastern woodrat	*Neotoma floridana*
European starling	*Sturnus vulgaris*
field sparrow	*Spizella pusilla*
fox squirrel	*Sciurus niger*
great blue heron	*Ardea herodias*
great egret	*Casmerodius albus*
great horned owl	*Bubo virginianus*
hermit thrush	*Catharus guttatus*
hispid cotton rat	*Sigmodon hispidus*
interior least tern	*Sterna antillarum*
killdeer	*Charadrius vociferus*
kinglets	*Regulus* sp.
mallard	*Anas platyrhynchos*
Mississippi kite	*Ictinia mississippiensis*
mourning dove	*Zenaida macroura*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis cardinalis*
Northern mockingbird	*Mimus polyglottos*
opossum	*Didelphis virginiana*
peregrine falcon	*Falco peregrinus anatum*
piping plover	*Charadrius melodus*
plains pocket gopher	*Geomys bursarius*
raccoon	*Procyon lotor*
red-headed woodpecker	*Melanerpes formicivorus*
red-tailed hawk	*Buteo jamaicensis*
rock dove	*Columba livia*
scissor-tailed flycatcher	*Tyrannus forficatus*
snowy egret	*Egretta thula*
striped skunk	*Mephitis mephitis*
Texas horned lizard	*Phrynosoma cornutum*
tufted titmouse	*Parus bicolor*
Western kingbird	*Tyrannus verticalis*
white-tailed deer	*Odocoileus virgianus*
whooping crane	*Grus americana*
yellow-billed cuckoo	*Coccyzus americanus*

APPENDIX C

PUBLIC INVOLVEMENT

PUBLIC MEETING
ANNOUNCEMENT AND HANDOUTS

Notification

PUBLIC INFORMATION WORKSHOP AND SCOPING PROCESS
as related to the
Riverine Habitat Restoration Project
North Canadian River Floodway, Oklahoma City
in compliance with
The National Environmental Policy Act

Workshop

Purposes: To: (1) Inform the public about the restoration project; (2) Solicit comments and questions about the study; and (3) Gather ideas and questions about the environmental impacts of project alternatives being considered. The Corps is also taking this opportunity to solicit public input on two other North Canadian River projects at this workshop.

Host: U.S. Army Corps of Engineers, Tulsa District and City of Oklahoma City

Place: Police/Fire Training Center; 800 N. Portland; Rooms 101 and 102; Oklahoma City, Oklahoma

Time and Date: 6:30 PM-9:00 PM **Thursday September 2, 1999**

Format: Open house format, with no formal presentation. Arrive anytime between 6:30 p.m. and 9:00 p.m. Please note: If you have any needs in terms of language interpretation, physical access, sight or hearing assistance, or other special needs, please contact either of the persons listed at the bottom of this page two (2) days prior to the date of the workshop.

Scoping Process

The Corps and the City of Oklahoma City are evaluating alternatives that primarily address restoration of riverine habitat in and along the North Canadian River in Oklahoma City. The alternatives focus on portions of the river between May Avenue and Meridian Avenue. One alternative includes no action. The evaluation includes consideration of the environmental impacts that may occur as a result of the project and is conducted in compliance with the National Environmental Policy Act. The first step is to gather input from the public about potential impacts. As part of the scoping process, the evaluation team requests that the public, interested parties, and Federal, State, and local agencies help identify environmental issues related to the project alternatives. Please plan to attend the workshop or send comments and questions to either;

Mr. David L. Combs
U.S. Army Corps of Engineers, Tulsa District
1645 S. 101 E. Ave ATTN: CESWT-PE-E
Tulsa, OK 74128-4629 Phone: 918-669-7660
E-mail: David.L.Combs@usace.army.mil
or
Mr. John Rhodes
City of Oklahoma City
Public Works Department
420 W. Main Street, 7th Floor
Oklahoma City, OK 73102
Phone: 405-297-3596

Public Scoping Meeting Handout

U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT AND OKLAHOMA CITY ECOSYSTEM RESTORATION REPORT AND INTEGRATED ENVIRONMENTAL ASSESSMENT SECTION 1135 RIVERINE RESTORATION PROJECT NORTH CANADIAN RIVER, OKLAHOMA CITY, OKLAHOMA

The U.S. Army Corps of Engineers (USACE), Tulsa District completed the Oklahoma City Local Flood Protection Project on the North Canadian River in 1958. The 13.6-mile long channel was constructed to reduce urban flooding in Oklahoma City. In 1993, the City of Oklahoma City was successful in passing a bond issue, which was designed to finance the construction and operation of three low-head dams on the North Canadian River. The purpose of these dams was to create shallow pools that would provide recreational opportunities and increase aesthetic values along the river within the city's corporate limits.

Section 1135 of the Water Resources Development Act of 1986 authorizes the USACE to participate in the development and implementation of projects that restore terrestrial and wetland habitats that were lost or significantly altered as a result of previous USACE civil works programs. The proposed project would help restore those habitats lost as a result of construction of the flood control channel and would be cost-shared by the city of Oklahoma City as an integral part of their planned improvements for the river.

The purpose of this project is to prepare an Ecosystem Restoration Report (ERR) containing an integrated Environmental Assessment (EA) for restoration of riverine and riparian communities along the North Canadian River between May and Meridian Avenues. The ERR shall be prepared to identify each area/habitat to be restored and the plan for the restoration activities including structural and non-structural measures that would have to be accomplished. An EA will be integrated into the ERR which addresses the impacts associated with acquisition, construction and maintenance of the restoration sites. Currently, about 90 acres of open water riverine habitat, 36 acres of emergent wetlands and 20 acres of riparian and bottomland hardwoods are proposed for restoration. Some reshaping and grading work and water control structures may be required to ensure sites are capable of supporting wetland and bottomland communities. The attached map depicts the proposed location of the restoration activities.

The Tulsa District USACE will prepare the ERR and integrated EA. The ERR/EA will assess the environmental and socioeconomic impacts, adverse and beneficial, of the proposed program, particularly in regards to cumulative effects.

The public scoping meeting is being conducted so that the Tulsa District can publicly describe the various types of activities that may be implemented and to discuss the requirements that must be met during the preparation of an EA. More importantly, the meetings provide a forum that allows the public to make comments to the Tulsa District relative to the restoration activities and EA in accordance with the National Environmental Policy Act.

The public is invited to attend the informal meeting and ask questions or provide comments regarding the proposed restoration project. A comment form is provided to record specific concerns that the general public wishes to have addressed in the EA. Written comments will be accepted through 16 September 1999 and can be sent to the address shown at the bottom of this page.

For more information, contact:

Mr. David Combs, Chief
Environmental Analysis and Compliance Branch
U.S. Army Corps of Engineers
918-669-7660
e-mail: david.l.combs@usace.army.mil

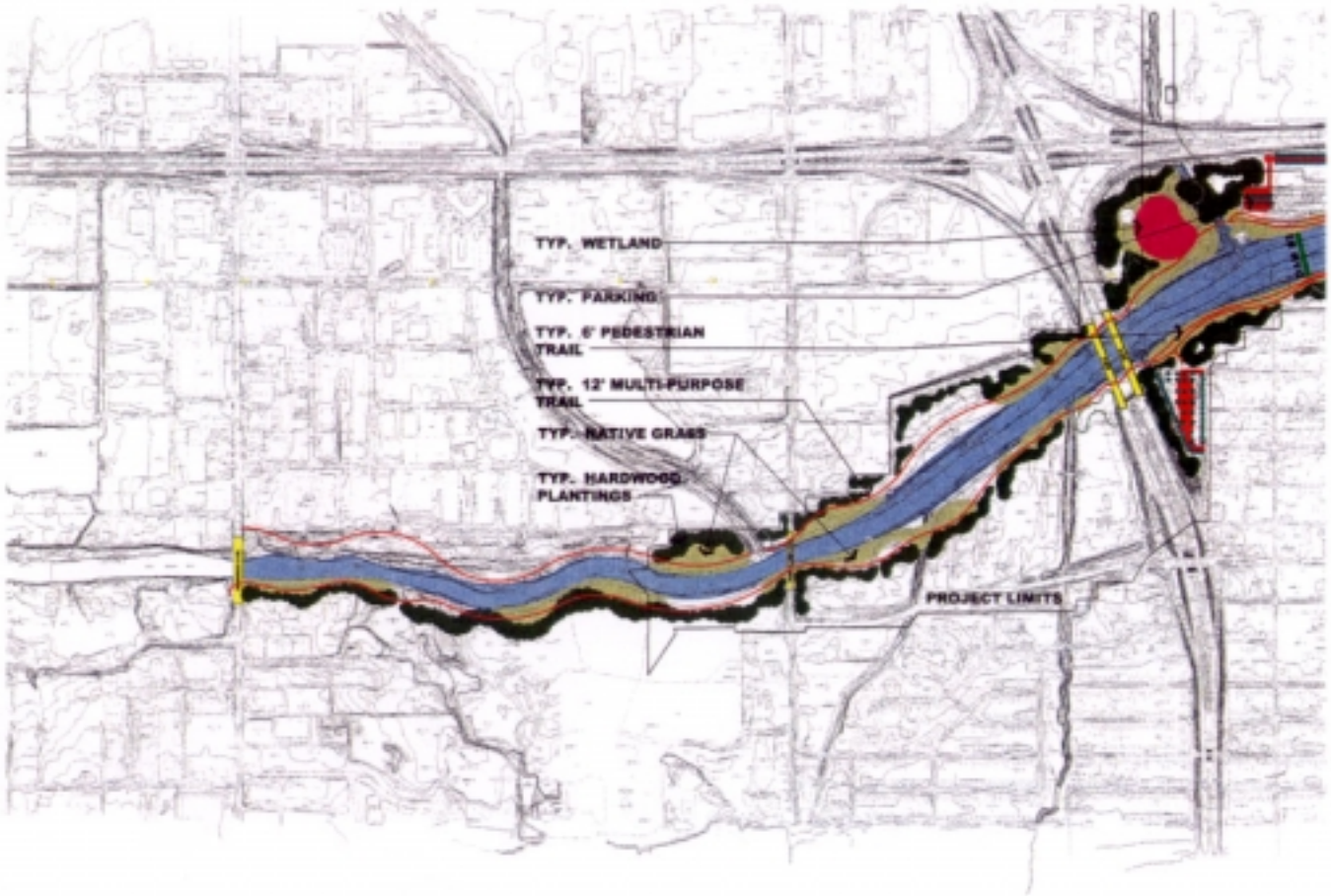
Or write to:

USAED, Tulsa
Attention: David Combs
CESWT-PE-E
1645 S. 101 E. Ave
Tulsa, Oklahoma 74128-4609

LEGEND

12' WIDE TRAIL SYSTEM

6' WIDE PEDESTRIAN TRAIL SYSTEM



North Canadian River Riverfront
Design Concept - C.O.E./OKC Funded

TRIAD DESIGN GROUP

BASIN 3

AGENCY LETTERS

WILDLIFE CONSERVATION COMMISSION

WILLIAM CRAWFORD, CHAIRMAN
HARLAND STONECIPHER, VICE CHAIRMAN
MARK PATTON, SECRETARY
DON RITTER, MEMBER
ED ABEL, MEMBER
JOHN S. "JACK" ZINK, MEMBER
JOHN D. GROENDYKE, MEMBER
VYRL KEETER, MEMBER

OKLAHOMA

FRANK KEATING, GOVERNOR
GREG D. DUFFY, DIRECTOR

DEPARTMENT OF WILDLIFE CONSERVATION

1801 N. Lincoln P.O. Box 53465 Oklahoma City, OK 73152 PH. 521-3851

September 16, 1999

David L. Combs
U.S. Army Corps of Engineers, Tulsa District
CESWT-PE-E
1645 S. 101 E. Ave
Tulsa OK 74128-4609

Subject: Comments Regarding the Aquatic Ecosystem Restoration Project, North Canadian River Floodway, Oklahoma City

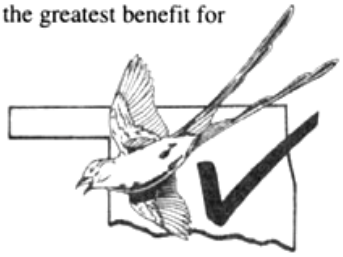
Dear Mr. Combs,

This responds to the Public Information Workshop held on September 2, 1999 to solicit public and agency comments regarding the Aquatic Ecosystem Restoration Project on the North Canadian River Floodway in Oklahoma City. Our comments and questions regarding wildlife resources relative to this project are listed below. In general, this project appears to have the potential for significant restoration of wetland and riparian habitats for the benefit of fish and wildlife resources.

1) We do not anticipate that this project will present any adverse impacts to species which are listed by the State of Oklahoma as endangered or threatened.

2) During the summer months, there exists a normal period of low flow conditions in the North Canadian River. There is some concern that the impoundment of the river, coupled with the high evaporation rates which exist in the summer, will diminish overall flow rates in the river downstream from the project area. What provisions exist to ensure that a continual flow of water will occur through the project to provide for year-round flow below the Eastern Avenue dam? At a minimum, some level of flow should be maintained below the Eastern Avenue dam for the benefit of aquatic wildlife resources and to maintain water quality.

3) Adequate bank stabilization should be in place prior to the construction of these impoundments in order to ensure that wave action will not erode the banks of the new lakes. The establishment and maintenance of riparian vegetation along the new shoreline would provide the greatest benefit for both bank stabilization and fish and wildlife resources.



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4) The handouts provided at the public meeting state that riparian and bottomland forests will be re-established in the project area. These areas have tremendous potential to benefit terrestrial wildlife resources and should be planted with a diversity of native tree species. The native riparian and bottomland hardwood trees commonly found in central Oklahoma are listed below. Seedlings or saplings of nearly all of these species are commercially available and should used as the dominant woody species in habitat restoration.

Bur Oak (*Quercus macrocarpa*)
Shumard Oak (*Quercus shumardii*)
Chinkapin Oak (*Quercus muehlenbergii*)
Pecan (*Carya illinoensis*)
Black Walnut (*Juglans nigra*)
Eastern Cottonwood (*Populus deltoides*)
Black Willow (*Salix nigra*)
American Plum (*Prunus americana*)
Green Ash (*Fraxinus pennsylvanica*)
Sugarberry (*Celtis laevigata*)
Hackberry (*Celtis occidentalis*)
American Elm (*Ulmus americana*)
Slippery Elm (*Ulmus rubra*)
Red Mulberry (*Morus rubra*)
Sycamore (*Platanus occidentalis*)
Redbud (*Cercis canadensis*)
Kentucky Coffeetree (*Gymnocladus dioicus*)

5) The proposed new wetlands and lakes will receive and store a great quantity of urban storm water runoff. An analysis of water quality should be performed for storm water runoff entering the project, particularly that runoff which will enter the restored wetlands areas. Urban storm water runoff has the potential to carry many pollutants including pesticides, sediment, and hydrocarbons which may impact aquatic life in these wetlands. Any potential problems should be identified now, so that they can be addressed and resolved prior to wetland restoration.

6) All existing riparian areas which will be flooded or destroyed during the construction of these three reservoirs and the siltation basin should be identified, and mitigation for this acreage should be provided as part of the project.

7) The project plans identify several areas which will be planted to ornamental plantings. Again, wildlife resources will benefit most from the planting of a diversity of native trees and shrubs in these ornamental planting areas and many native plants with ornamental value are available in the commercial nursery trade. Ornamental plantings which provide minimal wildlife value should be avoided (e.g. Bradford Pear, Austrian Pine). The Bradford Pear in particular has several negative attributes. In addition to providing minimal food resources, it is a preferred nesting tree for Great-tailed Grackles and is commonly used for evening roosting by European Starlings and grackles. Starlings and grackles are viewed by many people to be a substantial nuisance in urban Oklahoma City and should not be encouraged.

We appreciate the efforts of the Corps and the City of Oklahoma City to seek public input into this project. If you have any questions or would like additional information, please contact our Natural Resources Section at (405) 521-4616.

Sincerely,

Ron Suttles
Natural Resources Coordinator

DEPARTMENT OF THE ARMY
TULSA DISTRICT, CORPS OF ENGINEERS
P.O. BOX 61
TULSA, OKLAHOMA 74121-0061

SEP 2 7 1999

Planning, Environmental, and Regulatory Division
Environmental Analysis and Compliance Branch

Mr. Greg Duffy
Director
Oklahoma Department of Wildlife Conservation
P.O. Box 53456
Oklahoma City, OK 73152

Dear Mr. Duffy:

The Tulsa District, U.S. Army Corps of Engineers (District) completed the Oklahoma City Local Flood Protection Project on the North Canadian River in 1958. The project was constructed to reduce urban flooding in Oklahoma City and consists of a 13.6 mile-long channel with bottom widths varying from 200 to 800 feet. In 1993, the city of Oklahoma City was successful in passing a bond issue to finance the construction and operation of three low-head dams on the North Canadian River within the limits of the Corps project. The purpose of these dams was to create shallow pools that would provide recreational opportunities and increase aesthetic values along the river within the city's corporate limits.

Under Section 1135 of the Water Resources Development Act of 1986 and Section 206 of the Water Resources Development Act of 1996, the District and city of Oklahoma City are proposing construction of three separate environmental restoration projects along the North Canadian River in conjunction with the city project. The proposed projects would help restore those habitats lost as a result of construction of the flood control channel and would be cost-shared by the city of Oklahoma City as an integral part of their planned improvements for the river.

Enclosed is a summary and map of each proposed environmental restoration plan for your review and comment. Your continued

support for this project is appreciated. If you have any comments or questions, please contact Mr. Jim Randolph at 918-669-4396.

Sincerely,

G. David Steele

G. David Steele, P.E.
Chief, Planning, Environmental,
and Regulatory Division

Enclosures

DEPARTMENT OF THE ARMY
TULSA DISTRICT, CORPS OF ENGINEERS
P.O. BOX 61
TULSA, OKLAHOMA 74121-0061

SEP 27 1999

Planning, Environmental, and Regulatory Division
Environmental Analysis and Compliance Branch

Mr. Jerry Brabander
U.S. Fish and Wildlife Service
222 South Houston, Suite A
Tulsa, OK 74127

Dear Mr. Brabander:

The Tulsa District, U.S. Army Corps of Engineers (District) completed the Oklahoma City Local Flood Protection Project on the North Canadian River in 1958. The project was constructed to reduce urban flooding in Oklahoma City and consists of a 13.6 mile-long channel with bottom widths varying from 200 to 800 feet. In 1993, the city of Oklahoma City was successful in passing a bond issue to finance the construction and operation of three low-head dams on the North Canadian River within the limits of the Corps project. The purpose of these dams was to create shallow pools that would provide recreational opportunities and increase aesthetic values along the river within the city's corporate limits.

Under Section 1135 of the Water Resources Development Act of 1986 and Section 206 of the Water Resources Development Act of 1996, the District and city of Oklahoma City are proposing construction of three separate environmental restoration projects along the North Canadian River in conjunction with the city project. The proposed projects would help restore those habitats lost as a result of construction of the flood control channel and would be cost-shared by the city of Oklahoma City as an integral part of their planned improvements for the river.

Enclosed is a summary and map of each proposed environmental restoration plan for your review and comment. Your continued

support for this project is appreciated. If you have any comments or questions, please contact Mr. Jim Randolph at 918-669-4396.

Sincerely,

G. David Steele

G. David Steele, P.E.
Chief, Planning, Environmental,
and Regulatory Division

Enclosures

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
222 S. Houston, Suite A
Tulsa, Oklahoma 74127

October 4, 1999

Mr. G. David Steele, P.E.
Chief, Planning, Environmental, and Regulatory Division
Environmental Analysis and Compliance Branch
Tulsa District Corps of Engineers
P.O. Box 61
Tulsa, Oklahoma 74121-0061

#2-14-00-I-018

Dear Mr. Steele:

This letter responds to the three proposed environmental restoration projects along the North Canadian River in Oklahoma City. These projects are in conjunction with the construction and operation of three low-head dams by the city of Oklahoma City on the North Canadian River within the limits of the Oklahoma City Local Flood Protection Project completed in 1958 that was constructed to reduce urban flooding, and consists of a 13.6 mile-long channel. The purpose of these dams was to create shallow pools that would serve to increase recreational opportunities and aesthetic values along the river. The environmental restoration projects will help restore riverine and riparian habitat lost due to the construction of the flood control channel.

No federally-listed endangered and threatened species would be affected by the projects; therefore, no further endangered species consultation is needed.

The Service recommends using only native plant species to restore the emergent wetlands, and riparian and bottomland hardwoods. For more information on native plant species, contact the Oklahoma Department of Wildlife Conservation, Natural Resources Section at (405)-512-4616.

We appreciate the opportunity to comment on the projects. If we can be of further assistance, please contact Richard Stark of this office at 918-581-7458, extension 238.

Sincerely,

Jerry J. Brabander
Field Supervisor

cc: Director, Oklahoma Department of Wildlife Conservation, Oklahoma City, OK
(Attn: Natural Resources Section)

RCS:ag:FA/NCenvrst.COE

WILDLIFE CONSERVATION COMMISSION

WILLIAM CRAWFORD	ED ABEL
CHAIRMAN	MEMBER
HARLAND STONECIPHER	JOHN S. "JACK" ZINK
VICE CHAIRMAN	MEMBER
MARK PATTON	JOHN D. GROENDYKE
SECRETARY	MEMBER
LEWIS STILES	VYRL KEETER
MEMBER	MEMBER

OKLAHOMA

FRANK KEATING, GOVERNOR

GREG D. DUFFY, DIRECTOR

DEPARTMENT OF WILDLIFE CONSERVATION

1801 N. Lincoln P.O. Box 53465 Oklahoma City, OK 73152 PH. 521-3851

October 20, 1999

Jim Randolph
U.S. Army Corps of Engineers, Tulsa District
Planning, Environmental and Regulatory Division
P. O. Box 61
Tulsa, OK 74121-0061

Subject: Aquatic Ecosystem Restoration Project, North Canadian River Floodway, Oklahoma City

Dear Jim,

This responds to your letter of September 27, 1999 requesting comments related to the proposed Aquatic Ecosystem Restoration Project on the North Canadian River Floodway in Oklahoma City. Our comments and questions regarding wildlife resources relative to this project are listed below. In general, this project has the potential for significant restoration of wetland and riparian habitats which would benefit fish and wildlife resources.

1) We do not anticipate that this project will present any adverse impacts to species which are listed by the State of Oklahoma as endangered or threatened.

2) During the summer months, there exists a normal period of low flow conditions in the North Canadian River. There is some concern that the impoundment of the river, coupled with the high evaporation rates which exist in the summer, will diminish overall flow rates in the river downstream from the project area. What provisions exist to ensure that a continual flow of water will occur through the project to provide for year-round flow below the Eastern Avenue dam? At a minimum, some level of flow should be maintained below the Eastern Avenue dam for the benefit of aquatic wildlife resources and to maintain water quality.

3) Adequate bank stabilization should be in place prior to the construction of these impoundments in order to ensure that wave action will not erode the banks of the new lakes. The establishment and maintenance of riparian vegetation along the new shoreline would provide the greatest benefit for both bank stabilization and fish and wildlife resources.

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4) The diagrams enclosed with your letter indicate the areas where riparian and bottomland forests will be re-established within the project. These areas have tremendous potential to benefit terrestrial wildlife resources and should be planted with a diversity of native tree species. The native riparian and bottomland hardwood trees commonly found in central Oklahoma are listed below. Seedlings or saplings of nearly all of these species are commercially available and should used as the dominant woody species in habitat restoration. Attached with this letter is a list of commercial nurseries from which native tree seedlings can be purchased.

Bur Oak (*Quercus macrocarpa*)
Shumard Oak (*Quercus shumardii*)
Chinkapin Oak (*Quercus muehlenbergii*)
Pecan (*Carya illinoensis*)
Black Walnut (*Juglans nigra*)
Eastern Cottonwood (*Populus deltoides*)
Black Willow (*Salix nigra*)
American Plum (*Prunus americana*)
Green Ash (*Fraxinus pennsylvanica*)
Sugarberry (*Celtis laevigata*)
Hackberry (*Celtis occidentalis*)
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Slippery Elm (*Ulmus rubra*)
Red Mulberry (*Morus rubra*)
Sycamore (*Platanus occidentalis*)
Redbud (*Cercis canadensis*)
Kentucky Coffeetree (*Gymnocladus dioicus*)

5) The proposed new wetlands and lakes will receive and store a great quantity of urban storm water runoff. During the planning stages of this project, water quality analyses should be performed for samples of storm water runoff which would enter the project, particularly that runoff which will enter the restored wetlands areas. Urban storm water runoff has the potential to carry many pollutants including pesticides, sediment, and hydrocarbons which may impact aquatic life in these wetlands. Any potential problems should be identified now, so that they can be addressed and resolved prior to wetland restoration.

6) Any existing riparian areas and wetlands, which will be flooded and destroyed during the construction of these three reservoirs and the siltation basin, should be identified, and a mitigation plan should be prepared for this acreage and included as part of the project.

7) The project area diagrams identify several areas which will be planted to ornamental plantings. Again, wildlife resources will benefit most from the planting of a diversity of native trees and shrubs in these ornamental planting areas and many native plants with ornamental value are available in the commercial nursery trade (e.g. bur oak, deciduous holly, yaupon holly, redbud). Ornamental plantings which provide minimal wildlife value should be avoided (e.g. Bradford pear, Austrian pine). The Bradford pear in particular has several negative attributes which are relevant to this project. In addition to providing minimal food resources, it is a preferred nesting tree for Great-tailed Grackles and is commonly used for evening roosting by European Starlings and grackles. Starlings and grackles are abundant in the project area and are viewed by many people to be a substantial nuisance. The city of Oklahoma City expends considerable resources addressing nuisance starling and grackle concerns, therefore this project should not be encouraging these birds with certain ornamental plantings.

We appreciate your effort to solicit reviews of and input into this project. If you have any questions or would like additional information, please contact our Natural Resources Section at (405) 521-4616.

Sincerely,

Ron Suttles
Natural Resources Coordinator

attachment

Wetland Plants

Pinelands Nursery
323 Island Road
Columbus, NJ 08022
(609) 291-9486

CRM Ecosystems, Inc.
9738 Overland Road
Mt. Horeb, WI 53572-2832

Taylor Creek Restoration Nurseries
Applied Ecological Services, Inc.
Rt. 3, Smith Road
P.O. Box 256
Broadhead, WI 53520
(608) 897-8641

Heartland Restoration Services, Inc.
349 Airport North Office Park
Fort Wayne, IN 46825
(219) 489-8511

Ion Exchange Nursery
1878 Old Mission Drive
Harpers Ferry, IA 52146
(800) 291-2143, (319) 535-7231

J&J Tranzplant Aquatic Nursery, Inc.
P.O. Box 227-LW
Wild Rose, WI 54984-0227
(800) 622-5055, (414) 622-3552

Wildlife Nurseries, Inc.
P.O. Box 2724-LW
Oshkosh, WI 54903
(414) 231-3780

S & S Seeds
P.O. Box 1275
Carpinteria, CA 93014-1275
(805) 684-0436

Genesis Nursery
23200 Hurd Road
Tampico, IL 61283
(815) 438-2220

Marshland Transplant Aquatic Nursery
P.O. Box 1
Berlin, WI 54923
(414) 361-4200

Ernst Conservation Seeds
9006 Mercer Pike
Meadville, PA 16335
(800) 873-3321

Prairie Restorations, Ins.
P.O. Box 327
Princeton, MN 55371
(612) 389-4342

Aquatic & Wetland Construction Nursery
9999 WCR 25
Fort Lupton, CO 80621
(303) 442-4766

Freshwater Farms
5851 Myrtle Ave.
Eureka, CA 95503
(707) 444-8261

Octorara Wetland Nurseries, Inc.
P.O. Box 24
Oxford, PA 19363
(610) 932-2072

Wetland Construction Supply Co.
1633 Gilmar Road
Apollo, PA 15613
(412) 327-1830

Kester's Wild Game Food Nursery, Inc.
P.O. Box 516
Omro, WI 54963
(414) 685-2929

Applied Ecological Services, Inc.
Route 3, Smith Road
P.O. Box 256
Brodhead, WI 53520
(608) 897-8641

Spence Nursery, Inc.
P.O. Box 546
Muncie, IN 47308
(765) 286-7154

Hild and Associates
326 South Glover Road
River Falls, WI 54022
(715) 426-5131

Van Ness Water Gardens
2460 N. Euclid Ave. Dept 953
Upland, CA 91784 1-800-205-2425

Woodland Plant Species

Oikos Tree Crops
P.O. Box 19425-LW
Kalamazoo, MI 49019
(616) 624-6233

Ernst Conservation Seeds
9006 Mercer Pike
Meadville, PA 16335
(800) 873-3321

Hamilton Seeds and Wildflowers
16786 Brown Road
Elk Creek, MO 65464
(417) 967-2190

Arrowwood Nursery, Inc.
870 W. Malaga Road
Williamstown, NJ 08094
(609) 697-6045

Bitterroot Restoration, Inc.
445 Quast Lane
Corvallis, MT 59828
(406) 961-4991

Cascade Forestry Service
22033 Fillmore Road
Cascade, IA 52033
(319) 852-3042

Musser Forests Inc.
P.O. Box 340, Dept. 52
Indiana, PA 15701
(412) 465-5685

Sylva Native Nursery & Seed Co., Inc.
RD#2, Box 1033
New Freedom, PA 17349

The Natural Garden & Eco Logic
38 W 443 Highway 64
St. Charles, IL 60175
(630) 584-0150

Tree Pro
3180 W. 250 North
West Lafayette, IN 47906
(800) 875-8071

Treessentials Company
Riverview Station, P.O. Box 7097
St. Paul, MN 55107
(800) 248-8239, (612) 228-0535

Hills Nursery, Inc.
Rt. 2, Box 142
McMinnville, TN 37110
(615) 668-4364

Forrest Keeling Nursery
Elsberry, Missouri 63343
(800) 356-2401, (314) 898-5571

Granite Seed (western species)
1697 West 2100 North
Lehi, UT 84043
(801) 768-4422

Plant-A-Plug Systems, Inc.
P.O. Box 1953
Pine Bluff, AR 71613
(501) 536-4968

Forestry Division
Oklahoma Department of Agriculture
2800 N. Lincoln Blvd.
Oklahoma City, OK 73105-4298
(405) 288-2385

TramTex Nursery, Inc.
P O Box 4008
Tyler, TX 75712
(wholesaler)
1-800-657-1831

Skinner Wholesale Nursery
6800 Southpoint Parkway, Suite 400
Jacksonville, FL 32216
1-800-741-2020

Sunshine Nursery
Rt. 1, Box 4030
Clinton, OK 73601
(405) 323-6259

Pine Grove Nursery
R.D. 3, Box 146
Clearfield, PA 16830
1-800-647-1727
(814) 765-2363

Arborville Farm Nursery
15604 County Road "CC"
P. O. Box 227
Holt, MO 64048

Wildlife Landscape
P. O. Box 846
Wagoner, OK 74467

Lee's Nursery
P.O. Box 489-B
McMinnville, TN 37111

Clear Creek Farms
P.O. Box 89
Peggs, OK 74452
(918) 598-3782