



**US Army Corps
of Engineers®
Memphis District**

SECTION IV

Northwest Tennessee Regional Harbor

HABITAT IMPACT ANALYSIS

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HABITAT IMPACT ANALYSIS

Northwest Tennessee Regional Harbor, Lake County, Tennessee

The study area was defined as the Mississippi River within the dike field, Old Slough Landing, Cates Landing, potential disposal area, and site development areas. The total study area encompasses approximately 2,863 acres. Land cover and wetlands areas were calculated utilizing a Geographic Information System (GIS) database.

Model Development

The Habitat Evaluation System (HES) was used to quantify existing habitat values and make predictions of future habitat values over the 50-year project life (USACE, 1980). The general assumption in the HES model states that the presence or absence, and abundance and diversity of animal populations in a habitat or community are determined by basic biotic and abiotic factors that can be quantified. The HES assumes that if necessary habitat requirements for a species are present then a viable population of the species will be, or potentially could be, supported by the habitat. General characteristics are used that indicate quality for fish and wildlife populations as a whole. Therefore, detailed data on specific species and life history are not required, although they were considered in developing the model.

The HES procedures consist of determining the quality of habitat type by using functional curves relating habitat quality to quantitative biotic and abiotic characteristics of the habitat. The HES procedures involve six steps for evaluating benefits/impacts to the environment. These steps include:

1. Obtaining habitat type or land use acreages.
2. Deriving Habitat Quality Index (HQI) Scores.
3. Deriving Habitat Unit Values (HUV).
4. Projecting HUV for future with and without project conditions.
5. Using HUV to assess benefits/impacts of project alternatives.
6. Determining mitigation requirements, if any.

Existing Conditions

Existing habitat conditions were determined by utilizing existing GIS data derived from the Mississippi River Mainline Levees Enlargement and Seepage Control (MRL) Project Report completed in 1998, viewing aerial photography, and making site visits to the area. Figure 1 provides existing habitat conditions.

Land Cover Classifications

Land cover data was based on data obtained from the MRL study and new data obtained from viewing aerial photography and conducting site visits. All data was ground-truthed. Table 1 provides a summary of classifications.

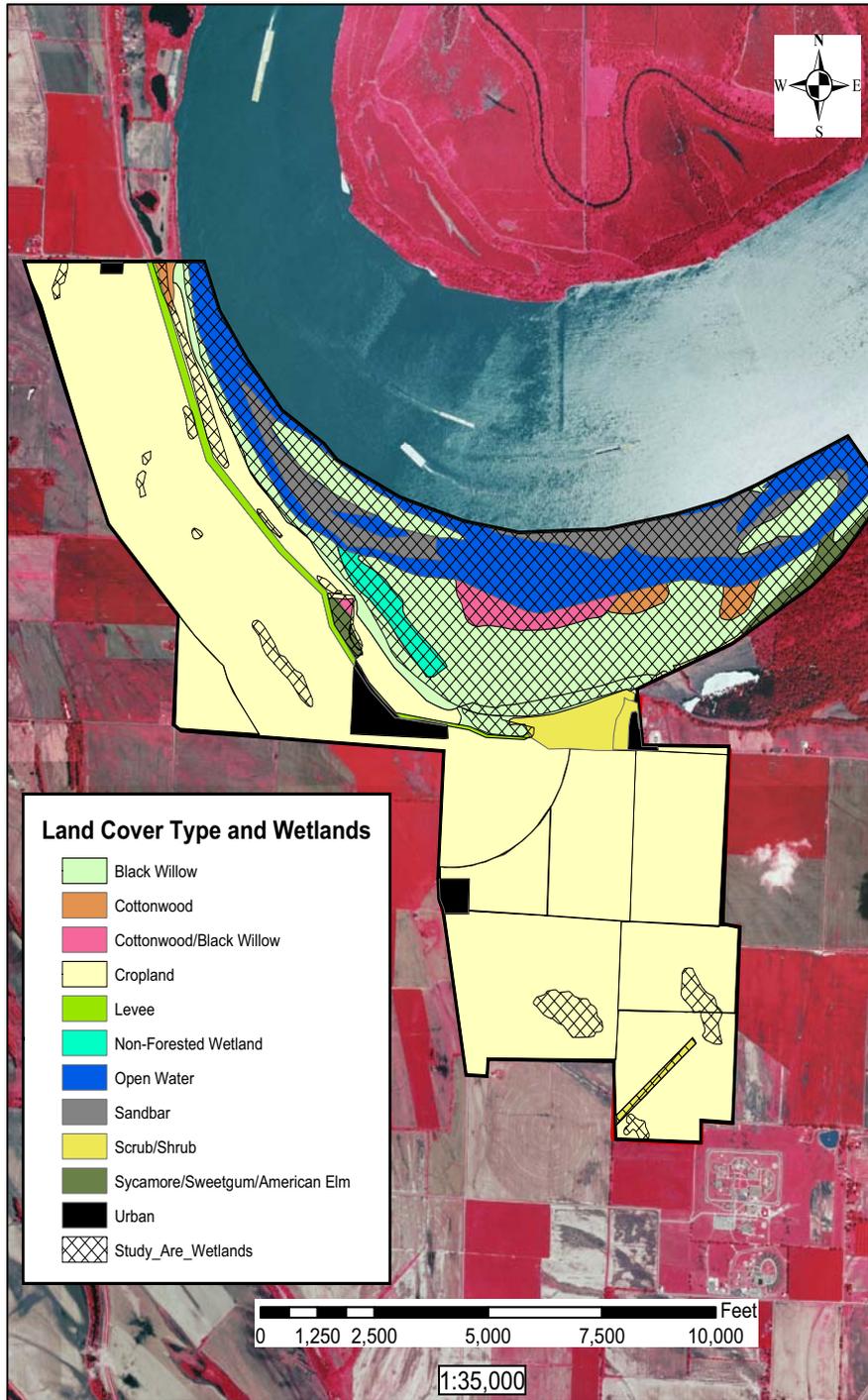


Figure 1. Study area land cover type and wetland overlay, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee

Table 1. Existing land cover classification, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee

Land Cover Type	Acres
Black Willow	434
Cottonwood	26
Cotton Wood/Black Willow	35
Cropland	1695
Levee	37
Non-Forested Wetland	31
Open Water	350
Sandbar	130
Scrub/Shrub	52
Mixed Forest	28
Urban	45
Total	2863

Cropland makes up 59% of the land cover in the project area. Major crops grown in the area include soybeans, cotton, and wheat. Black willow makes up the majority of the land cover in all vegetated areas. Black willow is very common along the Lower Mississippi riverfront. The non-forested wetland cover type consists of an area in which black willow is young (only found in groundcover and understorey layers). Total vegetated areas encompass 606 acres.

Wetlands

Wetland coverage was based on MRL data. The jurisdictional wetland determination in the MRL study includes all lands riverside of the landside toe of the mainline Mississippi River (on both sides) from near Cape Girardeau, Missouri, to Head of Passes, Louisiana, and an area 3,000 feet landside of the levee toe (on both sides). The 1987 Corps of Engineers Wetland Delineation Manual with supplemental guidance was the basis for determining the extent of jurisdictional wetland for vegetated areas. Wetlands on agricultural lands were identified using procedures in the National Food Security Act Manual (3rd Edition). Because of the project's regional scale, offsite procedures were used to establish the approximate extent of jurisdiction. The Natural Resource Conservation Service (NRCS) was consulted for the offsite jurisdiction determination on agricultural lands. Offsite information was entered into a GIS and used to produce preliminary jurisdictional wetland maps which were ground-truthed by an interagency team represented by U.S. Army Corps of Engineers; NRCS, Environmental Protection Agency, U.S. Fish and Wildlife Service; state Departments of Environmental Quality; Game and Fish; private landowners; levee boards; and the Sierra Club. Because of the extensive project area, assumptions were made about vegetation, soils, and hydrology based upon preliminary field investigations and available statistical data. Detailed information on the assumptions and process used in the delineation can be found in Attachment 1, Appendix 13, Volume III, MRL (1998).

Areas within the project area of the current study were ground-truthed to ensure accuracy. Changes were made based on existing conditions. The changes included the expansion of wetland acreages within the proposed disposal areas. Additional data concerning farmed wetlands were obtained from the Lake County NRCS office and added to the wetland coverage.

All of the vegetated areas in the study area are jurisdictional wetlands. There are additional farm wetlands throughout the study area that could be impacted by harbor construction.

Habitat Quality Index and Habitat Unit Value

HQI scores were measured at twelve vegetated locations throughout the study area. The areas included the harbor footprint (4 sites), Old Slough Landing (5 sites), and the batture area/disposal sites (3 sites). HQI were not measured in agricultural, open water, levee, or sandbar locations. However, acreages of farm wetland impacts were calculated.

Key variables are measured at the study sites and are assigned a value based on specific functional curves for that key variable and habitat type. The HQI value is based on a scale of 0 to 1.0. Each HQI score for a given habitat type is assigned a weight between 0 and 100 which reflects the importance of the key measured variable in describing overall habitat quality. The bottomland hardwood model was used.

HQI scores were measured from the following variables:

1. Species Association. The species association was recorded on a 1/5 acre plot.
2. Number of Mast Bearing Trees. The number of species of hard mast bearing trees ≥ 12 inches DBH was recorded in the 1/5 acre plot.
3. Percent Understory. The percent understory was estimated on a 1/25 acre plot from 2 feet and 12 feet above the ground level. A proper functional curve was selected based on the desirability of plant species for browse and whether it is within reach of deer.
4. Percent Groundcover. The percent ground cover was estimated on a 0.01 acre plot. A proper functional curve was selected based on browse desirability.
5. Number of trees ≥ 18 inches DBH. The number of trees that were ≥ 18 inches on a 1/5 acre plot was recorded. The number of trees ≥ 24 inches was also recorded. The proper functional curve was selected.
6. Tract Size. The acreage of woodland was measured and a proper functional curve was selected based on the amount of openings within the circumscribed boundary.

7. Number of Snags. The number of snags ≥ 6 inches on a 1/5 acre plot was recorded that were at least 8 feet tall.

Specific HQI scores and functional curves are found as an Attachment to this section. HQI scores ranged from a high of 50.72 in an area on Old Slough Landing to a low of 34.1 in another area on Old Slough Landing. The average weighted HQI score was 37.2 ± 5.1 . The average weighted HQI score was divided by 100 to yield an aggregate HQI score.

The Habitat Unit Value was calculated by multiplying the aggregate HQI score by the acreage of given habitat. Both the size or quantity and quality of a given habitat are considered important in evaluating the overall habitat value. Thus,

$$\text{Habitat Unit Value (HUV)} = 0.37 (\text{aggregate HQI}) \times 606 (\text{acres of BLH in study area})$$

$$\text{HUV} = 224.2$$

Future Conditions

HUV values were projected in the project areas over the life of the project (50 years) for each alternative and the future without a project conditions. Predictions were made at year 10, 20, 30, and 50. An annualized habitat unit value (AHUV) was calculated for each alternative over the life of the project.

AHUV was calculated by:

$$\text{Total HUV} = [0.5(\text{HUV}_0 + \text{HUV}_{10})10] + [0.5(\text{HUV}_{10} + \text{HUV}_{20})10] + [0.5(\text{HUV}_{20} + \text{HUV}_{30})10] + [0.5(\text{HUV}_{30} + \text{HUV}_{50})20]$$

$$\text{AHUV} = \text{Total HUV}/50$$

Future Without Project (Alternative 6)

Several assumptions were made concerning land use over the life of the project. The assumptions made are:

1. The area of Old Slough Landing would continue silting in over time, and thus rise in elevation.
2. Small willow trees would change to large (14-inch DBH) within 10-15 years.
3. Cottonwood associations are expected over time with the increase in elevation. This can presently be seen in some of the higher elevated areas on Old Slough Landing.
4. Cottonwood associations will exist for 55 to 60 years once established.
5. Flooding frequency would remain the same.
6. No timber harvest. Therefore, acreages of existing forest would remain the same.

7. No change in agricultural practices. Therefore, the existing cropland is expected to remain the same.
8. No change in urban areas.

Table 2 provides the expected value of habitat without a project. HQI is expected to increase approximately by a factor of 0.3 every 10 years due to expected plant succession.

Table 2. Future without project habitat value, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee.

<u>Habitat Type</u>	<u>Year</u>	<u>Without Project Acres</u>	<u>HQI</u>	<u>HUV</u>
Bottomland	0	606	0.37	224.22
Hardwoods	10	606	0.40	242.40
	20	606	0.43	260.58
	30	606	0.46	278.76
	50	606	0.52	315.12
Total HUV Annualized HUV				13,483.50 269.67

Alternative 1

The proposed design would consist of dredging a channel approximately 14,000 feet long and 225 feet wide (bottom width) with a 300-foot turning basin. The harbor would cover an area of approximately 116 acres. Approximately 3,100,000 cubic yards of sediment would be excavated to create a nine-foot navigation channel (bottom elevation of 250.0 NGVD). Dredged material would be placed seven feet high in the 315 acres landside of the levee, and the 110 acres located in the batture land. The batture land disposal site would also be utilized for future maintenance dredging operations over the project life.

Alternative 1 would impact approximately 151 acres of vegetated wetland habitat (Figure 2). The loss of 151 acres to harbor construction would result in a loss of 67 AHUV over the life of the project. Table 3 provides results of the HES analysis. Alternative 1 would also impact an additional 16 acres of farmed wetlands.

Table 3. Impacts of Alternative 1, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee.

<u>Year</u>	Without Project			With Project			
	<u>Acres</u>	<u>HQI</u>	<u>HUV</u>	<u>Acres</u>	<u>HQI</u>	<u>HUV</u>	
0	606	0.37	224.22	455	0.37	168.35	
10	606	0.40	242.40	455	0.40	182.00	
20	606	0.43	260.58	455	0.43	195.65	
30	606	0.46	278.76	455	0.46	209.30	
50	606	0.52	315.12	455	0.52	236.60	
			Total HUV Annualized HUV				Total HUV Annualized HUV
			13,483.50				10,123.75
			269.67				202.48

Alternative 2

The proposed design would consist of dredging a channel approximately 14,000 feet long, 130 feet wide (bottom width), with a 300-foot turning basin. This design would cover an area of approximately 95 acres and would require approximately 2,480,000 cubic yards of excavation. Dredged material would be placed seven feet high in the 166 acres landside of the levee, and the 110 acres located in the batture land. The batture land disposal site would also be utilized for future maintenance dredging operations over the project life.

Alternative 2 would impact approximately 127 acres of vegetated wetland habitat (Figure 3). The loss of 127 acres to harbor construction would result in a loss of 57 AHUV over the life of the project. Table 4 provides results of the HES analysis. Alternative 2 would impact an additional six acres of farm wetlands.

Table 4. Impacts of Alternative 2, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee.

<u>Year</u>	Without Project			With Project			
	<u>Acres</u>	<u>HQI</u>	<u>HUV</u>	<u>Acres</u>	<u>HQI</u>	<u>HUV</u>	
0	606	0.37	224.22	479	0.37	177.23	
10	606	0.40	242.40	479	0.40	191.60	
20	606	0.43	260.58	479	0.43	205.97	
30	606	0.46	278.76	479	0.46	220.34	
50	606	0.52	315.12	479	0.52	249.08	
			Total HUV Annualized HUV				Total HUV Annualized HUV
			13,483.50				10,657.75
			269.67				213.16

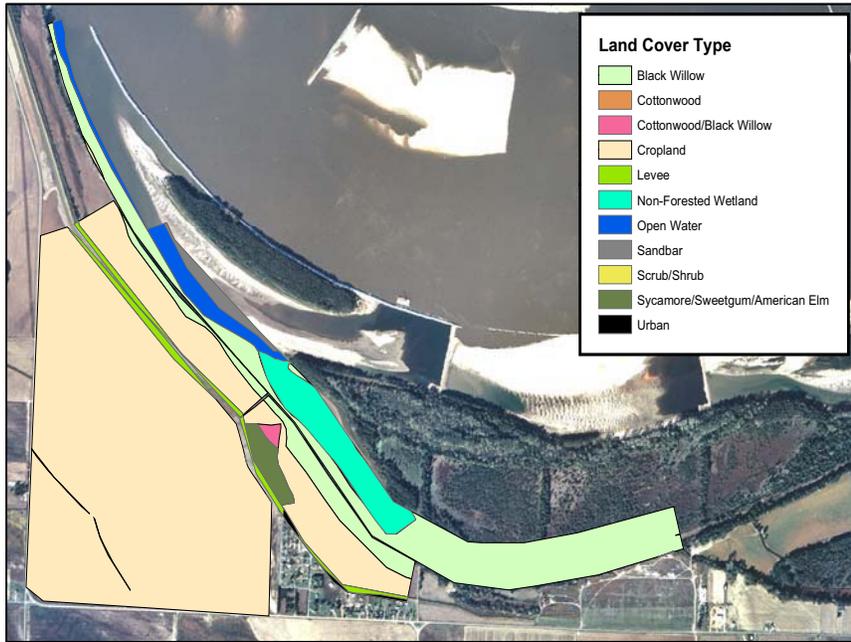


 Figure 2. Impacts of Alternative 1, Northwest Tennessee Harbor, Lake County, Tennessee

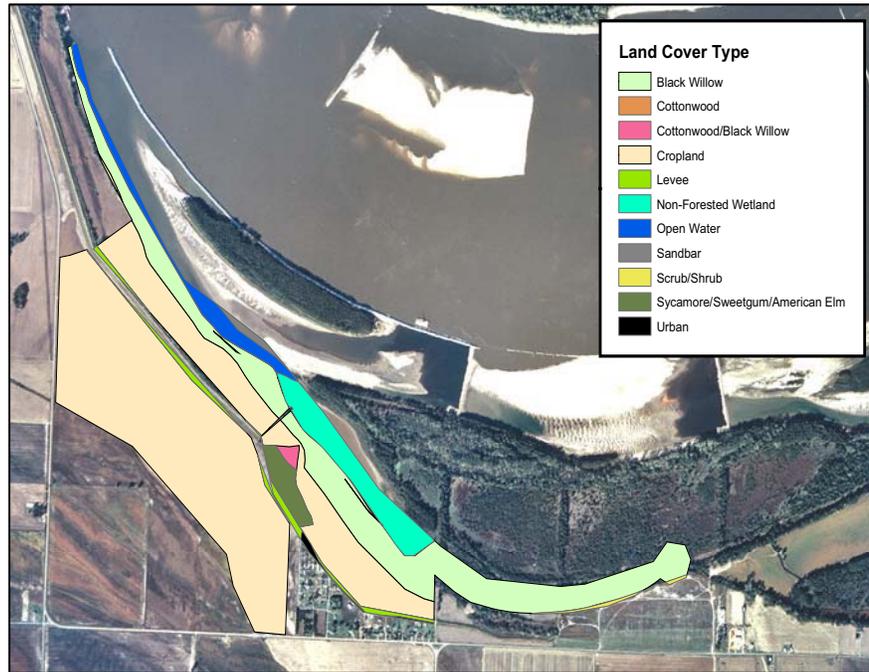


 Figure 3. Impacts of Alternative 2, Northwest Tennessee Harbor, Lake County, Tennessee

Alternative 3

The proposed design consists of dredging a channel 225 feet wide (bottom width) extending 8,500 feet upstream from Cates Landing with a 300-foot turning basin. The design would cover an area of approximately 113 acres and would require approximately 4,100,000 cubic yards of excavation. Approximately, 142,000 tons of riprap would be used to stabilize the banks. No disposal sites were identified.

Alternative 3 would impact approximately 100 acres of vegetated wetland habitat (Figure 4). The loss of 100 acres to harbor construction would result in a loss of 45 AHUV over the life of the project. Table 5 provides results of the HES analysis. Additional impacts to wetlands and farm wetlands would be expected from disposal areas.

Table 5. Impacts of Alternative 3, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee.

<u>Year</u>	<u>Without Project Acres</u>	<u>HQI</u>	<u>HUV</u>	<u>With Project Acres</u>	<u>HQI</u>	<u>HUV</u>	
0	606	0.37	224.22	506	0.37	187.22	
10	606	0.40	242.40	506	0.40	202.40	
20	606	0.43	260.58	506	0.43	217.58	
30	606	0.46	278.76	506	0.46	232.76	
50	606	0.52	315.12	506	0.52	263.12	
			Total HUV				Total HUV
			Annualized				Annualized
			HUV				HUV
			13,483.50				11,258.50
			269.67				225.17

Alternative 4

Alternative 4 would consist of dredging a channel approximately 5,000 feet long, bottom width of 130 feet transitioning to 225 feet, and a 300-foot turning basin. The design would cover an area of approximately 33 acres and would require approximately 118,000 cubic yards of sediment removal. Dredged material would be placed in a 48-acre site located in the batture land. This area would also be utilized for maintenance dredging.

Alternative 4 would impact approximately 20 acres of vegetated wetland habitat (Figure 5). The loss of 20 acres to harbor construction would result in a loss of 9 AHUV over the life of the project. Table 6 provides results of the HES analysis. Alternative 4 would impact an additional 2 acres of farm wetlands.

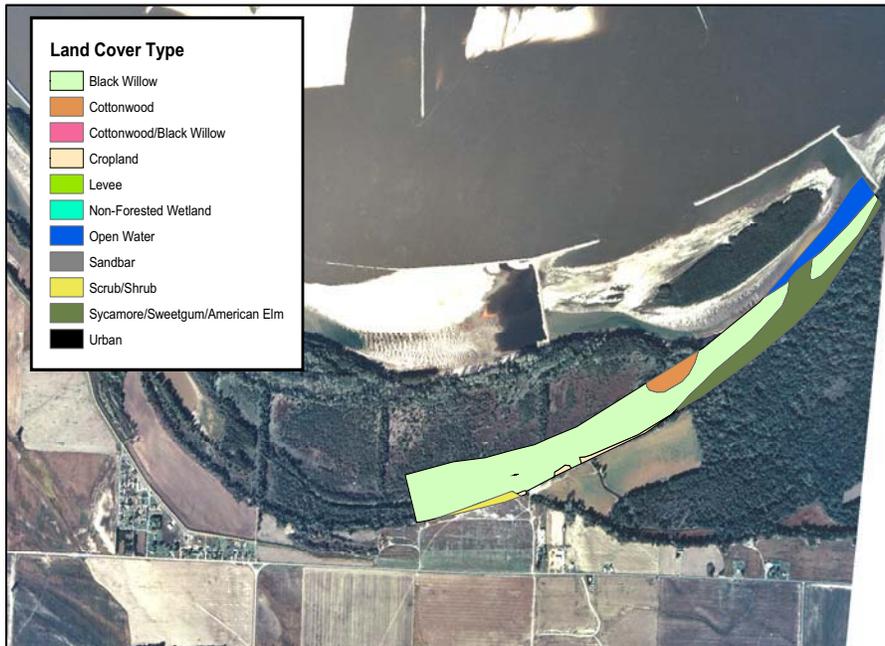


 Figure 4. Impacts of Alternative 3, Northwest Tennessee Harbor, Lake County, Tennessee

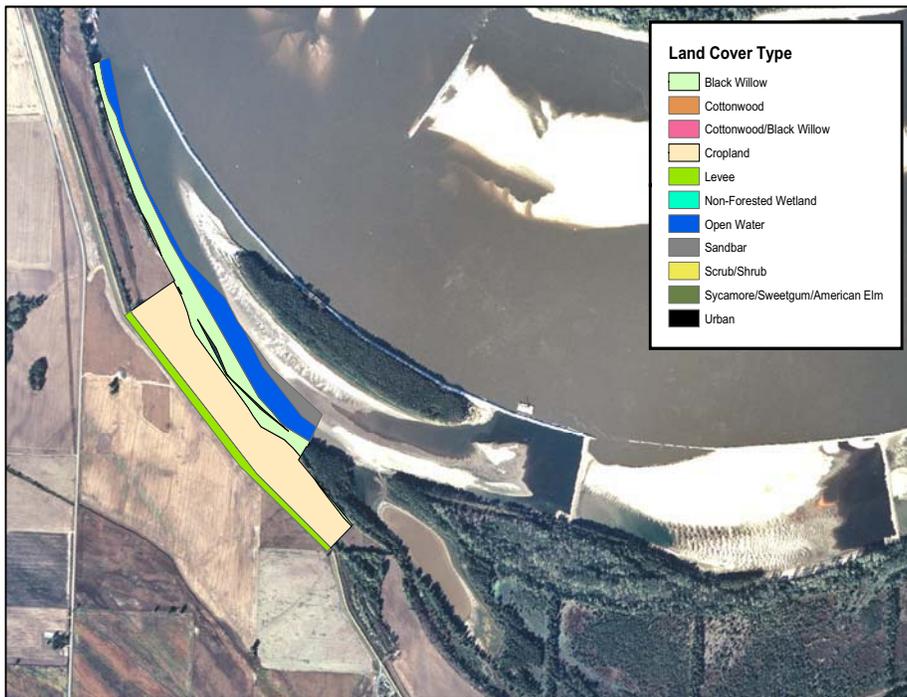


 Figure 5. Impacts of Alternative 4, Northwest Tennessee Harbor, Lake County, Tennessee

Table 6. Impacts of Alternative 4, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee.

<u>Year</u>	<u>Without Project Acres</u>	<u>HQI</u>	<u>HUV</u>	<u>With Project Acres</u>	<u>HQI</u>	<u>HUV</u>	
0	606	0.37	224.22	586	0.37	216.82	
10	606	0.40	242.40	586	0.40	234.40	
20	606	0.43	260.58	586	0.43	251.98	
30	606	0.46	278.76	586	0.46	269.56	
50	606	0.52	315.12	586	0.52	304.72	
			Total HUV Annualized HUV				Total HUV Annualized HUV
			13,483.50				13,038.50
			269.67				260.77

Alternative 5 (Recommended Plan)

Alternative 5 would consist of dredging a channel approximately 9,000 feet long, bottom width of 130 feet transitioning to 225 feet, and a 300-foot turning basin. The design would cover an area of approximately 67 acres and would require approximately 1.02 million cubic yards of dredging. Dredged material would be placed in two different areas. The first site is a 39-acre site located landside of the levee. The second area is a 66-acre site located in the batture land. This area would also be used for maintenance dredging.

Alternative 5 would impact approximately 60 acres of vegetated wetland habitat (Figure 6). The loss of 60 acres to harbor construction would result in a loss of 27 AHUV over the life of the project. Table 7 provides results of the HES analysis. Alternative 5 would impact an additional 14 acres of farm wetlands.

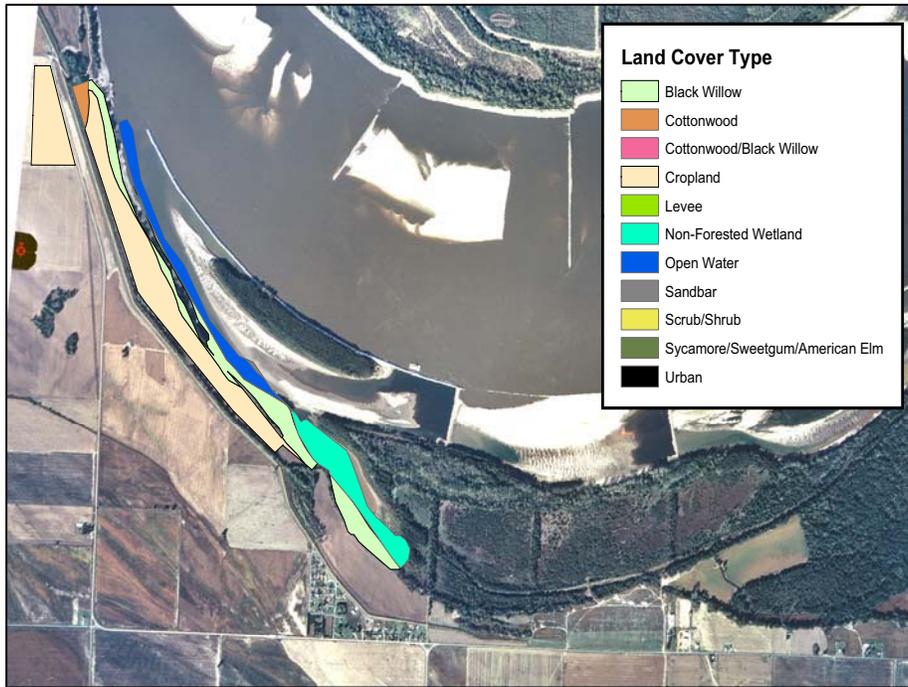


 Figure 6. Impacts of Alternative 5, Northwest Tennessee Harbor, Lake County, Tennessee

Table 7. Impacts of Alternative 5, Northwest Tennessee Harbor Feasibility Study, Lake County, Tennessee.

<u>Year</u>	<u>Without Project Acres</u>	<u>HQI</u>	<u>HUV</u>	<u>With Project Acres</u>	<u>HQI</u>	<u>HUV</u>	
0	606	0.37	224.22	546	0.37	202.02	
10	606	0.40	242.40	546	0.40	218.40	
20	606	0.43	260.58	546	0.43	234.78	
30	606	0.46	278.76	546	0.46	251.16	
50	606	0.52	315.12	546	0.52	283.92	
			Total HUV Annualized				Total HUV Annualized
			HUV				HUV
			13,483.50				12,148.50
			269.67				242.97

Literature Cited

U.S. Army Corps of Engineers. 1980. A Habitat evaluation system for water Resources planning. U.S. Army Corps of Engineers, Lower Mississippi Valley Division, Vicksburg. 89 pp.

U.S. Army Corps of Engineer. 1998. Flood Control, Mississippi River and Tributaries, Mississippi River Mainline Levee Enlargement and Seepage Control, Cape Girardeau, Missouri to Head of Passes, Louisiana, Project Report and Final Environmental Impact Statement. U.S. Army Corps of Engineers Memphis District, Memphis, TN.

Attachment

HQI Values

Project NW TN Harbor
Site No. 1A
Location Harbor Area

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.36	14	5.04
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			34.96

Project NW TN Harbor
Site No. 1B
Location Harbor Area

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.36	14	5.04
Percent Cover groundcover	0.84	14	11.76
No. >18" trees	0.46	14	6.44
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			40.56

Project NW TN Harbor
 Site No. 1C
 Location Harbor Area

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.36	14	5.04
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			34.96

Project NW TN Harbor
 Site No. 1D
 Location Harbor Area

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.36	14	5.04
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			34.96

Project NW TN Harbor
 Site No. 2A
 Location Old Slough Landing

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.40	14	5.60
Percent Cover groundcover	0.80	14	11.20
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			34.12

Project NW TN Harbor
 Site No. 2B
 Location Old Slough Landing

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.40	14	5.60
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			35.52

Site No. 2C
 Location Old Slough Landing

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.70	14	9.80
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	1.00	11	11.00
Total			50.72

Project NW TN Harbor
 Site No 2D
 Location Old Slough Landing

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.36	14	5.04
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			34.96

Project NW TN Harbor
 Site No. 2E
 Location Old Slough Landing

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.40	14	5.60
Percent Cover groundcover	0.80	14	11.20
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			34.12

Project NW TN Harbor
 Site No. 3A
 Location Batture Land

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.44	17	7.48
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.50	14	7.00
Percent Cover groundcover	0.90	14	12.60
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			38.28

Project NW TN Harbor
 Site No. 3B
 Location Batture Land

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.36	17	6.12
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.40	14	5.60
Percent Cover groundcover	0.53	14	7.42
No. >18" trees	0.80	14	11.20
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			41.54

Project NW TN Harbor
 Site No. 3B
 Location Batture Land

Key Variable	HQI Score	Key Variable Weight	Weighted HQI Score
Species Association	0.44	17	7.48
Number Mast Trees	0.00	16	0.00
Percent Cover Understory	0.40	14	5.60
Percent Cover groundcover	0.53	14	7.42
No. >18" trees	0.00	14	0.00
Tract size	0.80	14	11.20
Number Snags	0.00	11	0.00
Total			31.70

Average Weighted HQI	37.20
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