

**Unimpounded River
Reaches 9 -10
Middle Mississippi River**

In April 2010 the RRAT Tech forwarded to the RRAT Exec, a list of jointly developed projects, which over the next four year period provided the best opportunities to work towards restoring natural processes and meeting the collectively defined objectives for the unimpounded river below St. Louis to the confluence with the Ohio River (MMR). That list contained 40 potential ecosystem restoration projects (Table 2). From that list, eighteen projects in the MMR were recommended by the RRAT Exec (4/19/10) as Tier 1 projects. Tier 1 projects were categorized as the projects the RRAT Exec collectively felt represented a higher priority for earlier implementation in the 4 year cycle. Those projects were:

- *Harlow Island – potential EMP*
- *Maple Island Complex*
- *Salt Lake Reach*
- *Salt Lake Chute*
- *Kidd Lake Marsh Complex*
- *Fort Chartres Reach*
- *Ft. Chartres Chute*
- *Crain's Island*
- *Grand Tower Floodplain Res*
- *Hamburg Riparian Corridor*
- *Schenimann/Picayune Reach*
- *Picayune Chute*
- *Devils Island*
- *East Cape Floodplain Res*
- *North Alexander Floodplain Res*
- *Thompson Reach*
- *Boston Bar Chute*
- *Cairo Reach*

In addition the RRAT Exec identified two projects that were presently in planning in other programs, that, if construction funds became available under NESP (or the existing program) should be considered Tier 1 priority for construction. Those projects were:

- *Elm Slough*
- *Horseshoe Lake*

Both the larger list and the Tier 1 list were developed to be program neutral, meaning they could be planned under various programs and authorities, including both the NESP and EMP Programs. Initially, Harlow Island was identified as potential EMP project, pending concurrence with the SET and/or EMPCC. The remaining projects remain program neutral at this point. Brief project descriptions follow.

Harlow Island RM 142-144 (potential EMP)

Location: The Middle Mississippi River National Wildlife Refuge (MMRNWR) is dispersed along 195 miles of the river between St. Louis, Missouri and the Mississippi River's confluence with the Ohio River; it includes approximately 7,000 acres of river islands and bottomland forest. The portion of the MMRNWR included in this EMP project (1,225 acres) is located at Harlow Island on the right descending bank of the Middle Mississippi River (MMR) between River Miles 140.5 and 144, approximately 5 miles south of Crystal City, in Jefferson County, Missouri. This sub area is in parts of Township 40 N, Range 6E; T40N, R7E; T39N, R7E. The U.S. Fish and Wildlife Service (USFWS) manage the MMRNWR.

Existing Resources: The U.S. Fish and Wildlife Service purchased the 1,225-acre Harlow Island tract in 1996. Nearly 800 acres had been cropland protected by a private levee that was breached during the 1993 flood. Following Service acquisition, the levee breaks were not repaired, which allows the Mississippi River into the floodplain during high water events. The former cropland has been allowed to naturally revegetate and is now comprised of young silver maple, cottonwood, and willow as well as some non-native grasses primarily Johnson's Grass. The remaining acreage is primarily bottomland forest with a small remnant side channel and a mile-long slough.

Problem Identification: The existing habitat conditions, future habitat needs and proposed general actions required for habitat restoration on the Upper Mississippi River (UMR) are addressed in the Upper Mississippi River System (UMRS) Habitat Needs Assessment (HNA) Report (COE, 2000). That report estimates that there is a need to create or restore 7,000 acres of isolated backwater habitat along the unimpounded reach of the Upper Mississippi River. The report also recommends secondary channel or contiguous backwaters at least every 5-7 miles on the MMR. Over 80% of the floodplain in the MMR is disconnected from the river by levees. In addition, EMP projects have been traditionally limited on the 200 miles of the Middle Mississippi River due to factors like a lack of public land or partners.

On a more site-specific level, Harlow Island has been affected by the operation and maintenance of the 9 foot navigation channel. Primary problems to be addressed by this project include: accretion of the island to the mainland so that it no longer provides historic island and side

channel habitat or braided channel complexes that are an important component of the open river ecosystem, existing fragmented forest habitat with low diversity, and non-native grasses such as Johnson's Grass that have invaded some of the former farm fields and contribute to habitat loss.

Project Goals: The project, if implemented, would begin to meet the goals set forth in the HNA report. The restoration and rehabilitation of these wetland and aquatic habitats would provide resting, feeding, nesting, breeding, and predator-escape cover for many forms of migrating water birds and resident wetland wildlife. It will improve aquatic habitat for fishes and reptiles/amphibians, improve woody and herbaceous plant diversity, and improve water management capabilities.

The project will create side channel/island habitat and improve quality of existing secondary channel habitat, thus providing depth diversity, connectivity, and improved water quality. It will also increase floodplain forest and grassland diversity, improve and increase seasonal wetland habitat, and control exotic species.

Proposed Project: The proposed restoration features will be based on input from the existing literature, an optimized hydraulic configuration (using environmental floodplain modeling) and best scientific judgment. Tentatively, the project includes the following general features:

- Dredging of 2 miles of secondary channel/slough habitat to improve depth diversity, water quality, and connectivity of valuable fish and wildlife habitat.
- Notching of main channel stone dikes to create additional side channel and island habitat.
- Planting trees or allowing natural regeneration on up to 800 acres to increase species diversity. Dredge material disposal sites may be used as tree planting locations.
- Installation of water control structures, levee notches and/or spillways at several locations to create ephemeral wetlands. These structures could be used manage wetland cells or to restore natural sheet flow across the site during high water conditions.

Implementation Considerations: The project has been endorsed by the River Resource Action Team as a potential EMP project. A transition plan has been developed for EMP and the Navigation and Ecosystem Sustainability Program (NESP). Ecosystem Restoration projects are being formulated for compatibility between the two programs. It is anticipated that this project could easily transition between the two programs if directed by Congress to do so.

Financial Data: The total estimated cost for this project is \$4.5 million. All project features are located on federally owned lands managed as a National Wildlife Refuge. Accordingly, under

the provisions of Section 906(e) of the Water Resources Development Act 1986, as amended, the projects first costs are 100% Federal. The project sponsor, U.S. Fish and Wildlife Service, is responsible for operations, maintenance, repair, rehabilitation, and replacement costs. The estimated annual operations and maintenance cost is \$10,000.

Maple Island Complex RM 200 – 198 R

This complex is located just downstream of Mel Price Locks and Dam. The chute is 150-900 feet wide, with an average width of approximately 325 feet. A secondary channel is located immediately upstream of the chute (90 ft average width), a second secondary channel (75 ft average width) is located within the chute. There is a public boat launch ramp at the upper end of the project area. Bathymetry is not available. A deeply notched off bank-line stone revetment is located at the upper end of the main side channel. Three stone filled dikes (Dike Nos. 198.7 R, 198.2 R and 197.7 R) are located at the downstream end of the chute. There are approximately 650 acres of unvegetated floodplain habitat (mostly forested) located within and adjacent to the project area. Approximately 517 acres are in public ownership.

The Maple Island subarea has the following resource problems (MMRRC 2009):

- Regulated river has halted river's natural process for the creation/extinction of side channels
- Much bed load entering the chute, and flows are reduced
- Diminished depth diversity in chute
- Reduced substrate diversity
- Swales formation has been impeded by the existing dike structures
- Reduced connectivity between side channel and river due to sedimentation in the side channels
- Little woody structure present within side channel
- Reduced water quality (especially low DO levels)
- Invasive species
- Silting in upper chute

The project could potentially involve rehabilitation of the side channel, through river training structures, the addition of woody structure, and selective dredging to remove large sand deposits, among other measures will also be beneficial. Dredge material could be placed at the downstream end of the island to increase sandbar habitat. Secondary channels, as well as wetland areas on the interior of Maple Island should be addressed to provide additional off channel habitats. Wetland, floodplain, and topographic diversity restoration measures are also potential project features.

Salt Lake Reach RM 143 – 134

Although Salt Lake Chute occurs within the reach, there is a general lack of aquatic diversity in the area, due to the relatively high number of dikes within the reach, with very few of them having environmental modifications. There are no dredging problems therefore many possible modifications exist. Salt Lake Reach was included in the 2002 stone dike alteration report. Opportunities for secondary channel development, sandbar, and island creation exist throughout the reach.

Salt Lake Chute RM 139 – 137 L

Salt Lake Chute side channel lies adjacent to the Salt Lake Reach. The entrance and exit points of the side channel are at a high elevation, near >9feet LWRP, leaving the chute cutoff from the river for most of the late summer, fall, and winter months. The mid portion of the channel becomes cut off before the entrance or exit of the chute due to sedimentation. The upper end of the chute has two entrances; the upper entrance becomes cutoff earlier in the summer than the lower entrance channel. In the center of the chute, just upstream of the sand plug, a deep scour hole (>30 ft deep LWRP) occurs behind a rock closure structure (Dike No. 138.1 L). Another hole also exists behind a wooden pile structure that lies in the lower ¼ of the channel. This hole is connected to the river during some times in the July timeframe via a very narrow and shallow channel that forms along the upstream edge of the rock dike that exists at the exit point of the chute. This side channel is 350 to 1000 feet wide, with an average width of approximately 650 feet. Bathymetry indicates the average bottom elevation of the chute is approximately +12 feet LWRP, ranging from about -35 to +24 feet LWRP. Fair to poor depth diversity exists within the side channel; most of bottom is relatively featureless. Substrate is mostly sand and mud; little woody structure is present within the chute. There are closing structures at the upstream and downstream ends of the chute, and there are two wooden pile dikes and three stone closure dikes located within the chute. Approximately 2500 acres of floodplain habitat, most of which is forested, is located within and adjacent to the project area. Maeystown Creek enters the chute at its upper end (RM 139.5) through Beagle Island side channel. Old Maeystown creek also enters the chute. The bottom of this section of the chute is considerably higher in elevation than in the remainder of the chute.

Rehabilitation of the side channel may be accomplished by reducing the amount of bed load entering the chute and increasing the amount of flow. Encouraging the development of an asymmetric sinusoidal flow pattern in the chute through the use of alternating hard points (stone or wood or both), or by modifying existing rock closing structures will increase depth diversity within the chute. Selective dredging to remove large sand deposits will be beneficial. Pile dikes in the chute will be retained. Material resulting from side channel dredging could be used to extend sandbar habitat at downstream end of island. Allow natural hydraulic processes, where

possible, to create swales. The secondary channels immediately upstream of the chute could be enhanced to provide additional off channel areas and/or high quality wetlands. An EMP fact sheet, combined with Ft. Chartres Chute, was previously several years ago. An HSR model was completed in 2001, but would need to be revisited.

Kidd Lake Marsh Complex RM 138.5.

Project area is centered around Kidd Lake Marsh an historic marsh area owned and managed by IDNR. The presence of public ownership and numerous adjacent WRP sites makes the area an excellent area to create a larger floodplain complex, composed of diverse habitats. The Kidd Lake area is one of the few examples of remaining remnant bottomland lake and abandoned channel habitat within the MMR. The area traditionally contained slope forest and floodplain forest. Wetland and marsh restoration, aquatic restoration, and restoration of a more normal hydrology to the area would be examined as project features.

Fort Chartres Reach RM 134 – 128

The reach consists of three consecutive river bends, and presents multiple opportunities for restoration. Alterations might include: dike removal, notches, rootless, raising, lowering, chevrons, multiple round points, W-dikes, dredging, etc. Fort Chartres was included in the 2002 stone dike alteration report. Opportunities for secondary channel development, sandbar, and island creation also exist with the reach. Establishment Chute and Fort Chartres Chute are adjacent to the reach. In concert with the Salt Lake Chute and Reach, and the Harlow island habitat improvements; this entire area has the potential for high habitat diversity and a mosaic of habitats.

Fort. Chartres Chute RM 134 – 132 L

The Fort Chartres side channel is relatively shallow with a few deep holes. There are two holes, both associated with rock dikes, one has depth equivalent to 0 LWRP, while the other has depth to about -10. The area is unique because of public ownership (Illinois Historic Preservation Agency owns approximately half of the adjacent island). Dredging will be required to obtain a reconnection of the side channel to the main channel during moderate to low river stages. Specific Fort Chartres Chute related measures to consider in the MMR Side Channels Report (1999) included selective placement of hard points (wood, rock, or both), modification of existing structures at high energy areas to create scour holes, selective dredging within the chute, pile dikes retained and where possible improved, dredge material disposal to form sandbar habitat, dredge material placement to form ridges for trees planting, and reforestation of riparian corridor. This side channel along with Establishment Island/Side Channel just downstream of

Fort Chartres and Kidd Lake Marsh, which is inside the levee, offer the opportunity for management of this reach of river and associated habitat as a diverse complex.

Crain's Island RM 104-107

A large part of this island is currently owned by the USFWS and is part of the Middle Mississippi River Fish and Wildlife Refuge. The area is largely riverward of the existing levee and includes the Crain's Chute side channel. The area has seen historic filling and draining of wetlands, clearing of floodplain forest, has reduced connectivity within the side channel due to sedimentation, and contains isolated and degraded backwaters. Opportunities for floodplain restoration, wetland and moist soil restorations, dike alteration, and side channel and backwater restoration are all possible at this site.

Grand Tower Floodplain Restoration RM 82-75

This area includes approximately 23,450 acres of protected floodplain mostly in Illinois in Jackson County. The area in 2000 was 36% agriculture (8,360 acres), 45% forest (10,610 acres), 3% grasses/forbs (727 acres), and 14% wetlands and open water (3,186 acres). The area includes most of the Oakwood Bottoms Greentree Reservoir and the Oakwood Bottoms Natural Area (USFS). This area includes the largest contiguous blocks of remnant bottomland within the entire MMR. Most of the area is within the Middle Mississippi River Purchase Unit for the Shawnee National Forest. The area includes one levee and drainage district and there is continued need for drainage of private farmlands in this subarea. Approximately 50% (11,760 acres) is in public ownership (Shawnee National Forest) and 50% is in private ownership. All of the public ownership in this area is within the USFS Shawnee National Forest. The area presents great opportunity to work with the USFS, NRCS, local levee districts, interested landowners, and other groups. Potential projects include wetland restorations, greentree reservoir development, additional WRP enrollment, private landowner cooperative easements, riparian and other buffer creation, partnerships with L&DD for levee and ditch management, backwater restoration, floodplain restoration, potential reconnection of floodplain to the river, and floodplain topographic diversity projects.

Hamburg Riparian Corridor RM 60-75

This area includes approximately 2,700 acres of unprotected floodplain around Union County, Illinois. The area in 2000 was only 19% agriculture (509 acres), 55% forest (1,483 acres), and 18% wetlands and open water. The area includes over 290 acres of open water and over 195 acres of wetlands. Presettlement vegetation was riverfront forest (72%), floodplain forest ridge (12%), and floodplain forest swale (8%). Approximately 23% of the area is in public ownership. The area is adjacent to the Crawford Chute side channel. Project would

look at the potential for backwater restoration and reconnection, increasing topographic diversity, wetland restoration, and floodplain restoration. The area presents great opportunity to work with the USFS, NRCS, local levee districts, interested landowners, and other groups.

Schenimann/Picayune Reach RM 63 – 54

This area includes approximately 2,280 acres of the Mississippi River and its immediate borders in Cape Girardeau County, Missouri and Union County, Illinois. The river corridor is primarily forested. There is one dredging site at RM 58.0, 46 dikes and 18 weirs in the river. Nine percent of the dikes are notched. The reach is adjacent to Windy Bar, a Conservation Area owned by MDC and Devil's Island, a fish and wildlife area for IDNR. River banks on the Illinois side of this area are within the Middle Mississippi River purchase unit for the Shawnee National Forest. This subarea is foraging habitat for least terns and probable habitat for pallid sturgeon.

This reach was included in the 2002 stone dike alteration report. Opportunities for secondary channel development, sandbar, and island creation also exist with the reach. Two side channels currently exist in the reach. Restoration of this reach is concert with restoration of Schenimann Chute and Picayune Chute provides the opportunity to create a complex mix of habitats.

Picayune Chute RM 61 – 55 L

Picayune channel has a wing dike above the inlet and a notched closing structure across the outlet. There are three remnant wooden pile dikes, a low water road spanning the side channel connecting the Illinois bank to the island, a rock closing structure, and a rock spur dike. Picayune Chute has a good chute on outside bend of river, and is open most of the year for river fish, but maybe somewhat perched. Objectives would likely include better flow and connectivity with river to ensure adequate water quality (i.e. late summer hypoxia issues). The inlet becomes isolated from the main river by a large sand plug (an extension of the island) at river stages below +7 LWRP. The side channel contains deep water throughout its length with moderately good depth diversity, a few small sandbars, and a small amount of woody structure. The low water road and stone closing structure begin to dissect the side channel at river stages of +17 LWRP and below.

Rehabilitation of this side channel could include notching of the upper closing structure to improve flow at lower river stages while preventing bed load from entering the side channel. Additional woody structure will be beneficial. The area adjacent to the side channel includes a large amount of public land, approximately 2,650 acres owned by IDNR.

The 20009 MMRRC report indicated the following problems within the side channel:

- Isolated and degraded backwaters and wetlands

- Reduced flows in the side channel
- Diminished depth diversity in the side channel
- Reduced connectivity between side channel and the river due to sedimentation in the side channel
- Sedimentation problems in the Chute
- Perched water in the Chute
- Bank/shoreline erosion problems along the Chute
- Late summer hypoxia issues in the Chute
- Concern that the lower closing structure on the Chute might be removed and dewater the Chute
- Concern for future problems with off-channel dredging too close to the upper end of the Chute
- Shoreline erosion problems on the river-side of Devil's Island

Devils Island RM 60-55 L

Devils Island is owned by IDNR. Existing management of Devil's Island includes wetland, forest and crop management for wildlife. There is great opportunity on the island to increase forest and topographic diversity through ridge and swale development, potentially in concert with dredging, and material placement from the adjacent Picayune Chute. Interior wetland restoration and development are also possibilities.

East Cape Floodplain Restoration RM 51-46L

North Alexander Floodplain Restoration RM 51-46L

These areas include approximately 13,375 acres of protected floodplain entirely in Alexander County, Illinois. The areas in 2000 were 65% agriculture (8,733 acres), 8% forest (1,033 acres), 3% grasses/forbs (409 acres), and over 20% wetlands and open water (2,712 acres). It includes approximately 70 acres of open water and over 2,700 acres of wetlands. These areas have the highest acreage of marsh/wetland of any areas in the reach. Presettlement vegetation was floodplain forest swale (73%) and floodplain forest ridge (20%). There was a significant loss of forest vegetation from the 1800s as much of the land was converted to agricultural use. Agricultural land decreased by about 3,900 acres and forest land increased by 550 acres from 1989 to 2000. Marsh/wetland increased by over 2,700 acres during that same time period.

The areas are within the Middle Mississippi River Purchase Unit for the Shawnee National Forest and there is currently National Forest ownership in this subarea. IDNR and SIUC also share a large area of ownership/management in this subarea including the SIU field station and Cape Bend Fish and Wildlife Area. There is a National Forest natural area and Clear Creek Swamp (cypress swamp) Ecological Area. There are a number of cultural resource sites and there is potential for landowner wetlands and recreational development. The area includes at least two levee and drainage districts and there is continued need for drainage of private

farmlands. This subarea includes the southern part of the town of McClure and an active Railroad line and grade running through it (Burlington Northern). It also includes a large, underground, petroleum products pipeline and easement corridor through both public and private lands.

Approximately 20% (2727 acres) is in public ownership (Shawnee National Forest and IDNR) and 80% is in private ownership. Both areas present opportunities to work with the USFS, NRCS, IDNR, local levee districts, interested landowners, and other groups. Their proximity to Cape Girardeau also provides opportunity for extensive recreation and public use. The mix of potential partners and opportunities lends itself to a multifaceted approach in these reaches. Potential projects include wetland restoration especially near existing and remnant bald cypress swamp, additional WRP enrollment, private landowner cooperative easements, riparian and other buffer creation, management partnerships with L&DD for levee and ditch management, backwater restoration, floodplain restoration, borrow ditch/pond restoration (dredging), reforestation, reconnection of floodplain to the river, floodplain topographic diversity projects, and small private lands and recreation management programs.

Thompson Reach RM 20-12

Two side channels currently exist in this reach and 20% of the dikes are notched. Opportunities for environmental enhancements exist in all dike fields. A secondary benefit of environmental alterations may be a reduction of repetitive dredging along the LDB throughout much of the reach, especially between Miles 16 and 15. The area includes two largely disconnected side channels, Thompson Chute and Sister Chute. This reach was included in the 2002 stone dike alteration report. Opportunities for secondary channel development, sandbar, and island creation also exist with the reach. An HSR model likely will be prepared for this reach.

Boston Bar Chute RM 10.2-7.6 L

The chute has an average width of approximately 250 feet, ranging from about 125 to 550 feet. There are two secondary channels located just upstream of the island. Bathymetry is not available but field observations indicate that the average bottom elevation is about +5 feet LWRP, ranging from about -5 to +10 LWRP. Substrate is sand and mud. There is a rock dike (Dike No. 10.1L) located at the upstream end of the chute and a rock closing structure (Dike No. 7.9L) near the lower end of the chute. Approximately 2000 acres of levee free floodplain habitat, most of which is agricultural, is located within and adjacent to the project area.

Rehabilitation of the side channel may be accomplished by reducing the amount of bed load entering the chute and increasing the amount of flow. Selective placement of hard points (wood,

rock, or both) or modification of existing structures at "high energy" areas to create scour holes will increase depth diversity. Additional woody structure and selective dredging to remove large sediment deposits will also be beneficial. Material resulting from dredging may be used to extend sandbar habitat on the downstream end of the island. The secondary channels could be enhanced to provide additional off channel areas and/or high quality wetlands.

Cairo Reach RM 12 – 0

This area is located along RM 0.0 to 12.0 on both sides of the Mississippi River. The area includes a number of dike fields, with only about 3% notched. The area had traditionally contained large amounts of gravel. The area includes two side channels, Boston Bar and Angelo Chute. This reach was included in the 2002 stone dike alteration report. Opportunities for secondary channel development, sandbar, and island creation also exist with the reach. Restoration of gravel substrate would likely be a focus area.

Elm Slough RM 182-186

This project is presently planned under the East St. Louis and Vicinity Interior Flood Control Project. The Elm Slough project area consists of features to restore and enhance aquatic, wetland and terrestrial habitats in the floodplain near Horseshoe Lake, one of the few remaining floodplain lakes in the MMR. Project features involve expansion of existing forested wetlands by creating new forested wetlands, enhancement of existing wetlands, modification of existing patterns of drainage into Elm Slough to approximate historic flooding conditions, creation of vegetative buffers within the modified drainage ways to intercept sediment carried by flows from Long Lake and Mitchell Ditch, and construction of earthen berms to utilize storm water within the project area.

Horseshoe Lake RM 38-33

This project is presently being planned under the authority of Section 206 of the Water Resources Development Act (WRDA) of 1996, as amended, in response to a request for Federal assistance from the Illinois Department of Natural Resources for an ecosystem restoration project. The project is located in the floodplain of the Mississippi River in Alexander County, Illinois. It is 15 miles northwest of Cairo and 2 miles south of Olive Branch, Illinois. The Horseshoe Lake State Conservation Area is managed by the Illinois Department of Natural Resources (IDNR) as a multipurpose conservation/recreation area. The lake area consists of an ancient river cutoff meander and 2 separate nature preserve tracts. The shallow oxbow covers 2007 acres and was formed by the Mississippi River about 6,000 years ago (Bogner et al. 1985). This lake is a bottomland cypress swamp and its vegetation (bald cypress, tupelo gum and swamp cottonwood) is reminiscent of what is found in the Louisiana bayou country.

This area has contained an abundance of aquatic resources for more than one thousand years. These resources have been severely impacted as the result the introduction of a large population of exotic invasive and rough fish (bighead carp, silver carp, black carp, grass carp, common carp, buffalo, and gar) during the floods of 1993 and 1995. Effects of these fish introduced through flood events have hindered aquatic plant growth and degraded fisheries habitat. The foraging activity of bottom feeding fish creates turbidity, which prevents sunlight from reaching far enough into the water column to support plant growth. In addition, the turbidity makes it difficult for the targeted species (bass and crappie) to see their prey and to spawn. The turbidity also increases the potential for higher water temperature. Warmer water retains less oxygen and thereby provides a reduced dissolved oxygen level for the target species. Since the Flood of 1993 there has been a noticeable decline of habitat for invertebrates, hydrophytic vegetation, amphibians, reptiles, birds, fish, and mammals of which some species are listed as state or federally threatened and endangered. Present conditions in and around the proposed project areas only provides limited habitat value for most species associated with marsh habitat. Proposed features of the restoration project include drawdown of the lake to control the exotic invasive and rough fish population, consolidate the lake bottom, and a dewatering pump to facilitate management of two of the lake's compartments for moist soil and cypress/tupelo regeneration, along with other features.

**Table 2. UMR Reach Planning: Middle Mississippi River (Reaches 9-10) Priority Projects
2011-2015 planning cycle**

Project Name or Description	Project Area	Project Type	River Mile	Partner	RRAT Exec Tier 1 recommendations
Dogtooth Reach	MMR-5		40-0		
Cairo Subarea					
Boston Bar Chute	MMR-5	side channel/backwater restoration	11-8L	NA	X
Angelo Chute	MMR-5	side channel restoration	5-2L	NA	
Cairo Reach	MMR-5	dike alteration, island/sandbar creation	12-0	NA	X
Powers Island Subarea					
Price's Reach	MMR-5	dike alteration, island/sandbar creation	29-20	NA	
Billings Chute	MMR-5	side channel/backwater restoration	35-31R	NA	
Commerce Point Backwater	MMR-5	backwater restoration	32		
Horseshoe Lake	MMR-5	floodplain restoration	38-33	IDNR	X
Thompson Subarea					
Thompson Reach	MMR-5	dike alteration, island/sandbar creation	20-12	NA	X
Thompson Chute	MMR-5	backwater restoration	19-16	NA	
Other - Future/ Incomplete					
Preston & Clear Creek D&LD - Backwater res	MMR-4	backwater restoration through borrow pit enhancements	75-60	TBD	
Jones Towhead Floodplain Res	MMR-3		97-95R	TBD	
entire MMR	MMR	island building, BiOp efforts should provide some sites, will leave placeholder and will append reach plan when complete	200-0	NA	
Fisheries mitigation	MMR	floodplain reconnection, gravel bars, other, location TBD	200-0	NA	

Open River Reach 9 Tier 1 Projects (1 of 3)



Legend

- River Mile
- Elm Slough
- Maple Island Complex

Location Map

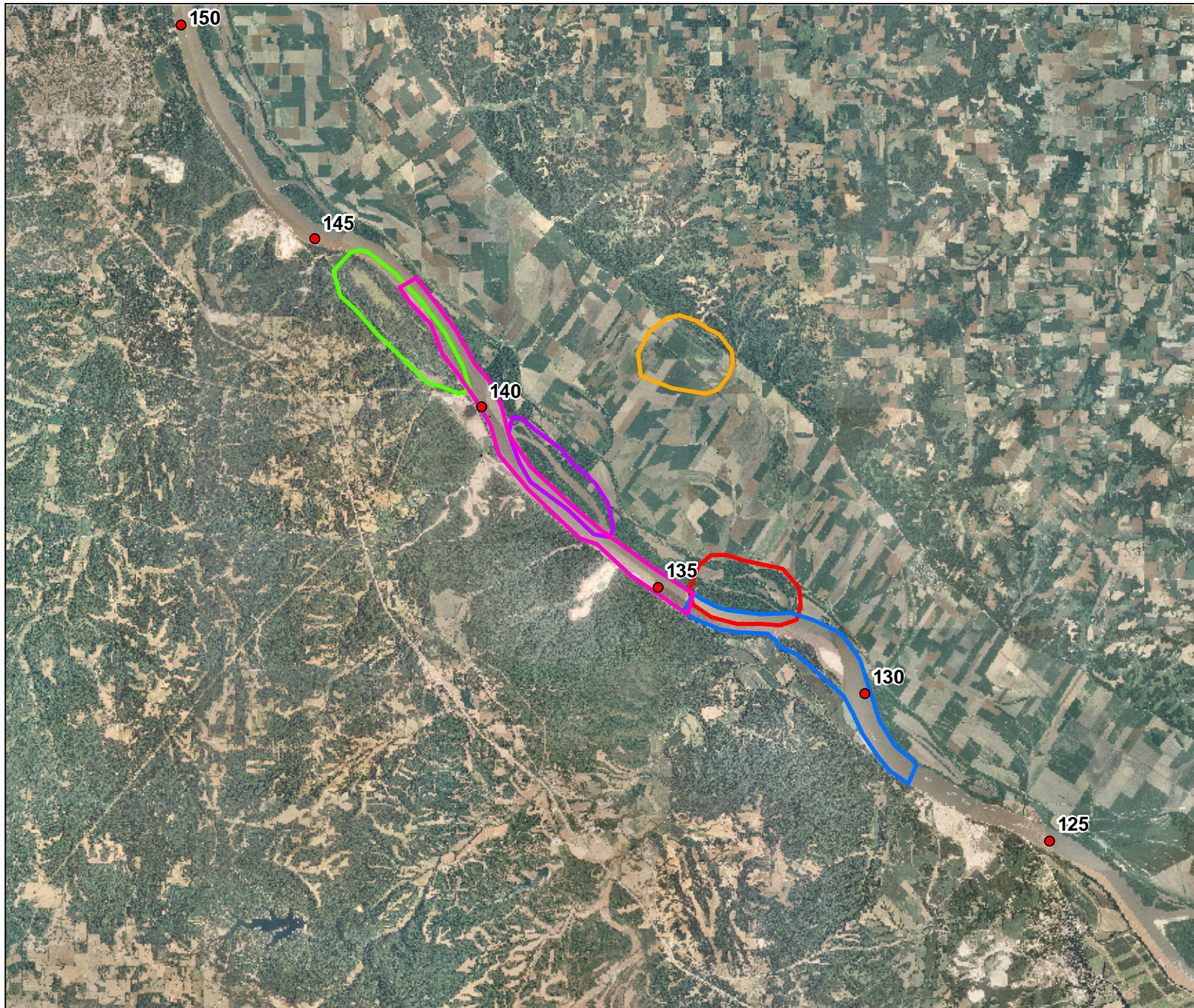


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Miles

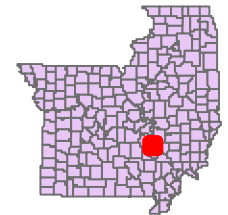
Open River Reach 9 Tier 1 Projects (2 of 3)



Legend

- River Mile
- ▭ Ft. Chartres Chute
- ▭ Ft. Chartres Reach
- ▭ Harlow Island
- ▭ Kidd Lake Marsh
- ▭ Salt Lake Chute
- ▭ Salt Lake Reach

Location Map



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Miles

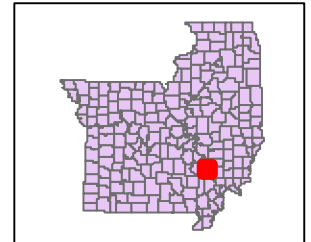
Open River Reach 9 Tier 1 Projects (3 of 3)



Legend

- River Mile
- Crains Island

Location Map

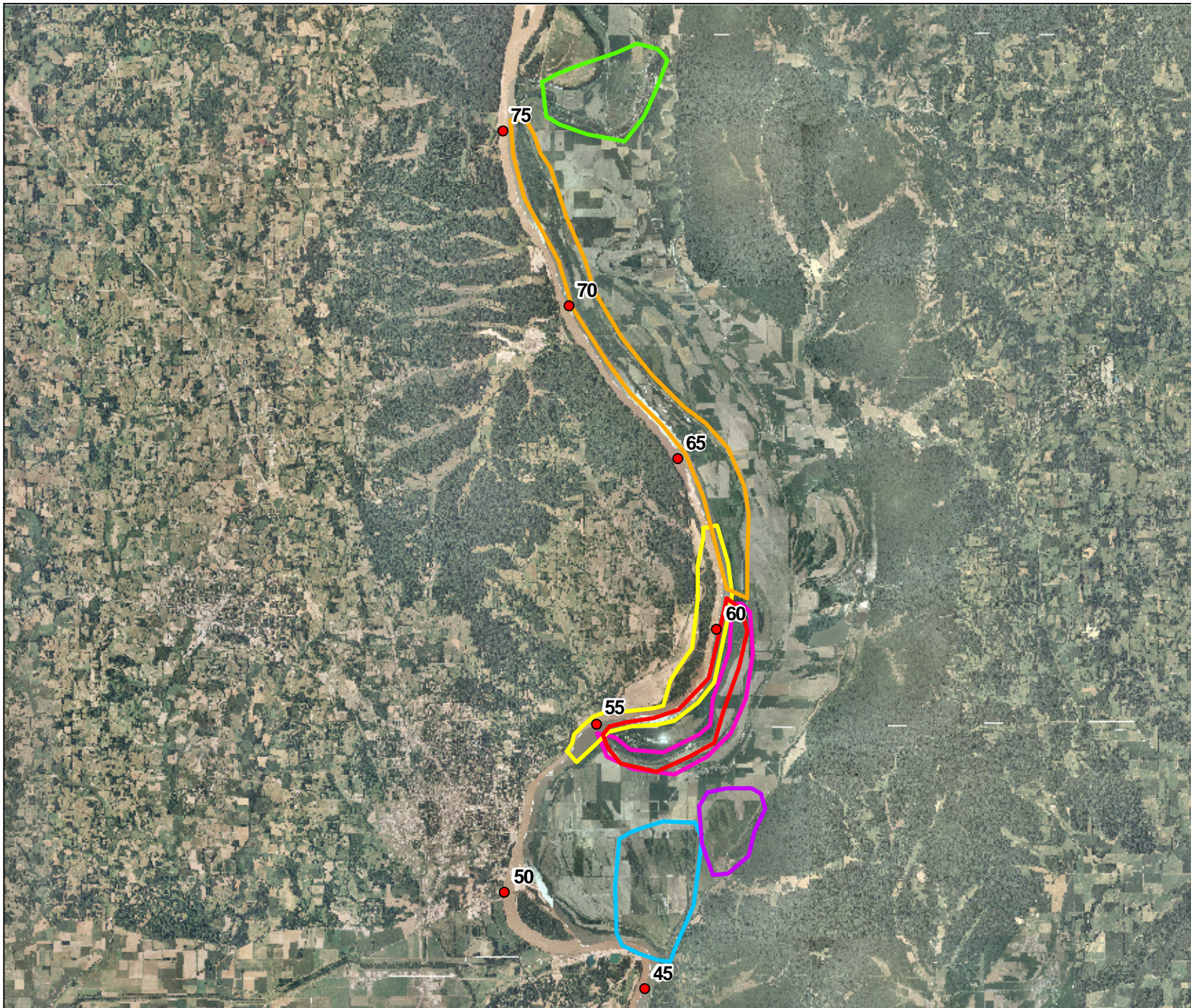


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0.8 0.4 0 0.8 1.6 2.4
Miles

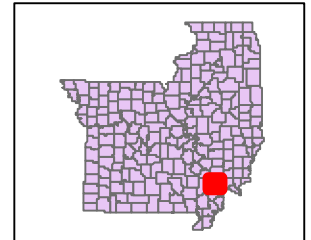
Open River Reach 10 Tier 1 Projects (1 of 2)



Legend

- River Mile
- ▭ Devils Island
- ▭ East Cape Floodplain
- ▭ Grand Tower Floodplain
- ▭ Hamburg Riparian Corridor
- ▭ North Alexander Floodplain
- ▭ Picayune Chute
- ▭ Schenimann/Picayune Reach

Location Map

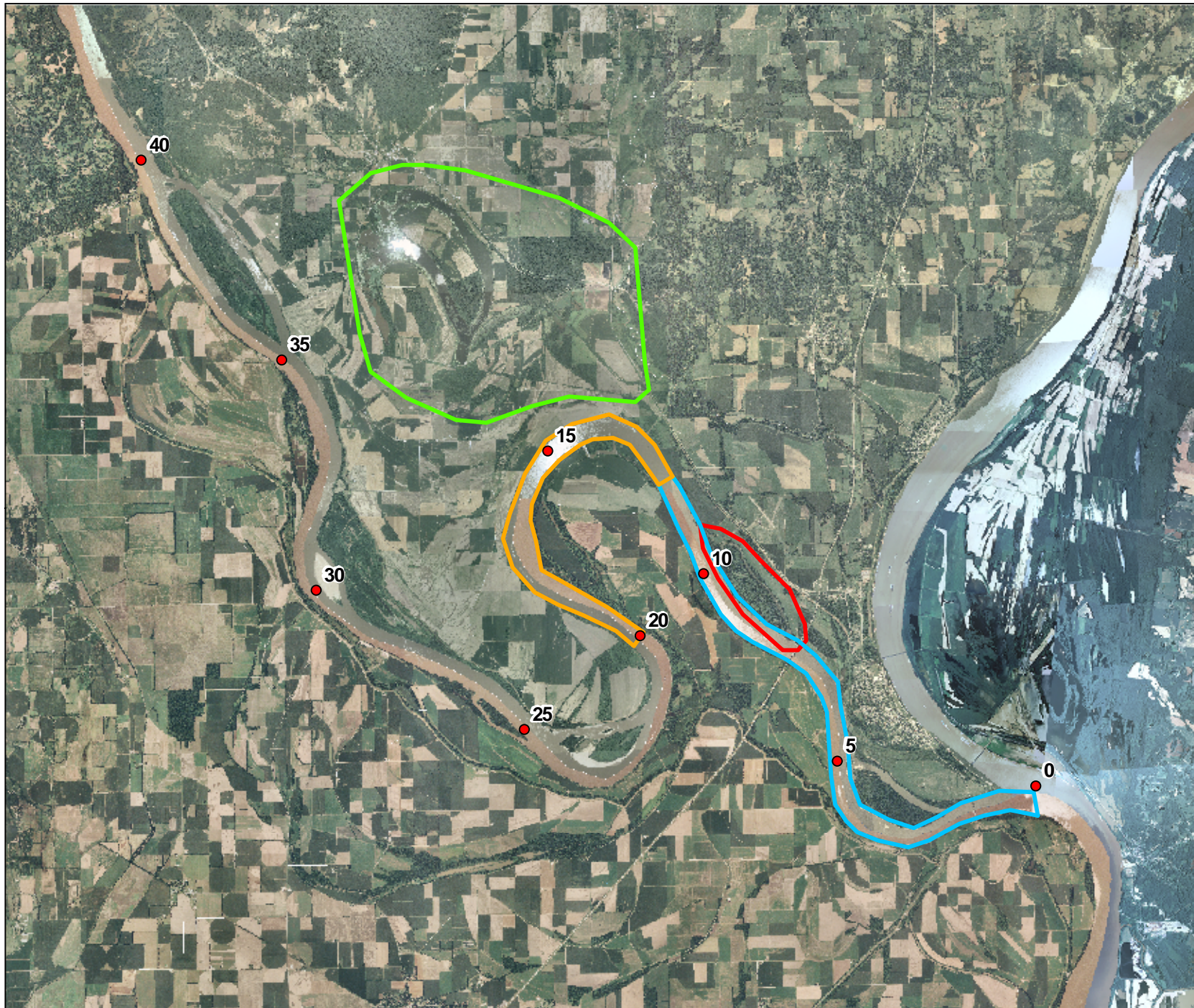


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1 0.5 0 1 2 3
Miles

Open River Reach 10 Tier 1 Projects (2 of 2)



Legend

- River Mile
- Boston Bar Chute
- Cairo Reach
- Horseshoe Lake
- Thompson Reach

Location Map



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1 0.5 0 1 2 3 Miles