U.S. Army Corps
Of Engineers
St. Louis District

June 2018

FINAL SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT WITH FINDING OF NO SIGNIFICANT IMPACT

Mosenthein-Ivory Landing Phase 4
Eliza Point-Greenfield Bend Phase 3
Dogtooth Bend Phase 5
Mosenthein-Ivory Landing Phase 5
Grand Tower Phase 5

Regulating Works Project

U.S. Army Corps of Engineers, St. Louis District
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Chapter 1. Introduction

1.1 Overview

The St. Louis District (District) of the U.S. Army Corps of Engineers (Corps) recently completed a Supplemental Environmental Impact Statement (SEIS) entitled: *Final Supplement I to the Final Environmental Statement, Mississippi River between the Ohio and Missouri Rivers (Regulating Works)* (USACE 2017). The purpose of that document was to provide an update to the Project's 1976 Environmental Impact Statement by analyzing the impacts of the Project in the context of new circumstances and information that currently exist, in order to remain in compliance with the National Environmental Policy Act of 1969. Based on the new information uncovered through the process, the Project's Congressional authority, and the continued benefit of the remaining construction to be completed, the selected alternative was to continue with new construction of the Project with the future potential addition of compensatory mitigation for unavoidable adverse effects to main channel border (MCB) habitat.

When the District began the process to consider supplementing the 1976 EIS in 2013, a decision was made to complete site specific Environmental Assessments (SSEAs) for all new Regulating Works Project construction prior to completion of the SEIS. These SSEAs made a commitment that should the analyses undertaken as part of the SEIS process reveal any new impacts on the resources, ecosystem, and human environment not accounted for in the SSEAs, measures would be taken within the Corps' authority to avoid, minimize, and/or compensate for the impacts during the SEIS process as appropriate.

Ultimately, analyses completed as part of the SEIS process revealed that the continue construction alternative would likely have a significant adverse effect on shallow to moderate-depth, moderate-to high-velocity habitat along the main channel border, considering the Project as whole. As indicated in the SEIS, a habitat model has been developed and certified to further evaluate the quantity and quality of this particular habitat impacted by new construction. Therefore, the District has re-evaluated the recent construction activities of the Regulating Works Project outlined in the SSEAs for impacts to main channel border habitat using the certified habitat model, given that the significant adverse impact to this habitat type was not known at the time the SSEAs were completed.

The purpose of this document is to supplement the completed SSEAs with site specific quantification of impacts to main channel border habitat, for the purposes of assessing whether compensatory mitigation should be considered, as well as provide the details of development, implementation, and monitoring of potential mitigation actions going forward. Further, there is no new information or analyses that would suggest impacts to other resources would be different than those discussed in the SSEAs. As such, the other resources and impacts assessed in the SSEAs have not been re-evaluated and are not discussed in this report. The Final SEIS, the SSEAs, and all other applicable background information and documentation can be found here and are all incorporated by reference:

http://www.mvs.usace.army.mil/Missions/Navigation/SEIS/Library.aspx

1.2 Authorization

The St. Louis District of the U.S. Army Corps of Engineers is charged with obtaining and maintaining a navigation channel on the Middle Mississippi River (MMR) that is nine feet deep, 300 feet wide with additional width in bends as necessary[1]. The MMR is defined as that portion of the Mississippi River that lies between its confluence with the Ohio and the Missouri Rivers (Figure 1). This ongoing Project is also commonly referred to as the Regulating Works Project. As authorized by Congress, the Regulating Works Project utilizes bank stabilization, rock removal, and sediment management to maintain bank stability and ensure adequate navigation depth and width. Bank stabilization is achieved by revetment and river training structures, while sediment management is achieved by river training structures. The Regulating Works Project is maintained through dredging and any needed maintenance to already constructed features. The long-term goal of the Project, as authorized by Congress, is to obtain and maintain a navigation channel and reduce federal expenditures by alleviating the amount of annual maintenance dredging through the construction of regulating works. Therefore, pursuant to the Congressionally authorized purpose of the Project, the District continually identifies and monitors areas of the MMR that require frequent and costly dredging to determine if a long-term sustainable solution through regulating works is reasonable. The District also monitors bank stabilization areas to determine if additional work or re-enforcement of existing work is needed to ensure the dependability of the navigation channel.

1.3 Loss of Main Channel Border Habitat

In the Water Resources Development Act of 1986 (WRDA 1986), Section 906(b), Congress gave the Corps the discretionary authority to mitigate for fish and wildlife damages for any water

[1] Congress originally authorized the project of improving navigation of the Mississippi River from the mouth of the Missouri to New Orleans in the Rivers and Harbors Act dated May 24, 1824, by the removal of trees that were endangering the safety of navigating the river. In the Rivers and Harbors Act dated Jun 10, 1872, Section 2, Congress mandated that an examination and/or survey be completed of the Mississippi River between the mouth of the Missouri River and the mouth of the Ohio River, providing the first Congressional action to define this portion of the Mississippi River as distinct from the rest of the Mississippi River. Congress authorized the specific improvement of the Mississippi River between the mouth of the Missouri River and the mouth of the Ohio River in the Rivers and Harbors Act dated March 3, 1873. Between 1874-1892, Congress expanded this section of the Mississippi River to include that portion between the mouth of the Missouri River and the mouth of the Illinois, but in the Rivers and Harbors Act dated July 13, 1892, Congress removed this additional section of the river and once again referred to it as the Mississippi River between the mouth of the Ohio River and the mouth of the Missouri River. In the Rivers and Harbors Act dated June 25, 1910, Congress provided exactly how this Project was to be carried out by authorizing the construction, completion, repair, and preservation of "[i]mproving [the] Mississippi River from the mouth of the Ohio River to and including the mouth of the Missouri River: Continuing improvement in accordance with the plan adopted in [1881], which has for its object to eventually obtain by regularization works and by dredging a minimum depth." The 1881 plan called for the removal of rock hindering navigation, the contraction of the river to compel the river to scour its bed (now known as regulating works), and to be aided by dredging, if necessary. The 1881 plan also provided for bank protection improvements (now known as revetment) wherever the river is causing any serious caving of its banks. (Letter from the Secretary of War, dated November 25, 1881, 47th Congress, 1st Session, Ex. Doc. No. 10). The Project's current dimensions of the navigation channel were established in the Rivers and Harbors Act dated January 21, 1927 and July 3, 1930. The Rivers and Harbors Act dated January 21, 1927 modified the Project pursuant to the Chief of Engineers recommendations, which further detailed the purpose of the Project to construct the channel through regulating works and augment this by dredging, stating that dredging should be reduced to a minimum. The Project was also later modified to provide for the Chain of Rocks Canal and Lock 27 in Rivers and Harbors Acts dated March 2, 1945 to address the rock formation hindering navigation in this area, and the rock filled low water dam at the Chain of Rocks was authorized in the Rivers and Harbors Act dated July 3, 1958 to assure adequate depth over the lower gate sills at Lock and Dam 26.

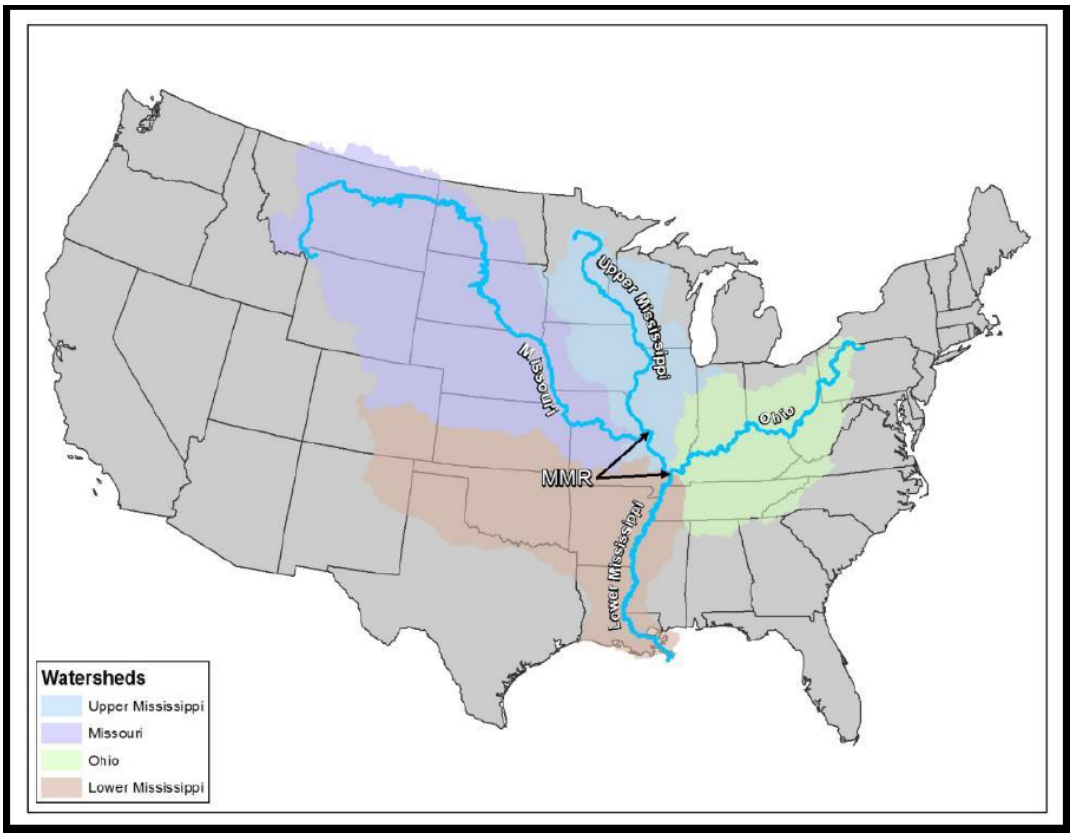


Figure 1. Location of the MMR within the Upper Mississippi River watershed.

resources project that was completed or under construction at the time of the passing of WRDA 1986. This authority is in contrast to Section 906(a) of WRDA 1986, which made mitigation mandatory for any newly authorized projects or those where construction had not started. Because the Regulating Works Project was already under construction at the time WRDA 1986 passed, it fell under 906(b). Therefore, since 1986, efforts have been made to avoid and minimize project impacts by modifying designs of river training structures. This has included various designs such as chevron dikes, notched dikes, offset dikes, W-dikes, L-dikes, multiple roundpoint structures, and bendway weirs. Compared to only using traditional dikes, these designs generally create more diverse main channel border habitat for the benefit of aquatic biota.

However, even with these alternative designs, recent analyses described in the SEIS suggest that river training structures would still result in the loss of main channel border habitat with certain depth, velocity, slope, and other functional characteristics. While the avoid and minimize mitigation measures implemented to date have been effective, the new information and circumstances further studied and analyzed as part of this SEIS reveal that the continued construction of river training structures would be expected to have a significant impact on main channel border habitat due to the potential loss of approximately 1,100 acres (8%) of the remaining unstructured main channel border habitat for the entire MMR. While the severity of these effects to biota is difficult to pinpoint, the losses are concerning given the cumulative

condition of main channel border habitat and the lack of specific habitat areas that meet these various conditions throughout the MMR. For these reasons, the Corps decided that mitigation will be considered to offset losses within the MMR to the greatest extent practicable in accordance with Section 906(b) of WRDA 1986, subject to the availability of future funding.

More specifically, the results of the 3-D numerical model developed as part of the SEIS effort revealed that placement of river training structures is likely to reduce shallow to moderate-depth, moderate-to high-velocity habitat along the main channel border, which is important for some MMR fish guilds that have seen declines in abundance since the mid-1900s. Although construction of river training structures does benefit some MMR fish species by providing low-velocity habitats, this does not offset or compensate for the anticipated adverse effects to shallow to moderate-depth, moderate- to high-velocity habitat. The adverse effects impact a different habitat type with a different function for a different group of fish than do the benefits. Due to these potential unavoidable adverse effects to main channel border habitat associated with future construction of river training structures, the District anticipated these impacts would result in the consideration of compensatory mitigation, and developed a Habitat Suitability Index (HSI) model in order to quantify changes to this specific MCB habitat type and ultimately guide the quantification of potential compensatory mitigation for the Project.

1.4 MMR Sturgeon Chub Model

To better understand the quality of MCB habitat impacted, and evaluate potential effectiveness and ultimately the practicability of different mitigation actions, the District developed the MMR Sturgeon Chub Model (Chub Model). The Chub Model is intended to help quantify the effects of river training structure construction or modification on the quality of sturgeon chub (*Macrhybopsis gelida*) habitat. Similarly, it would be used to evaluate the effectiveness of potential mitigation actions to improve or restore this specific type of MCB habitat. The Chub Model could also be used to evaluate other actions that impact key variables in main channel border habitat of the MMR.

Sturgeon chub are small-bodied minnows (family Cyprinidae) often associated with large rivers such as the Mississippi or Missouri rivers. They appear to favor moderate to higher flow velocities, course substrates and shallow to moderate depths (Herzog 2004; Rahel and Thel 2004). They are relatively rare, and are currently being considered for listing under the Endangered Species Act. They were selected for modeling because their habitat requirements generally align with the shallow to moderate-depth, moderate- to high-velocity habitat that is anticipated to be lost through continued construction of river training structures under the Regulating Works Project.

The Chub Model consists of Habitat Suitability Index (HSI) parameters for the habitat variables depth, velocity, substrate, and structured/unstructured habitat (Figure 2). These represent key variables in determining sturgeon chub habitat that also are most directly influenced by the construction or modification of river training structures. HSI curve equations and categories are

used in conjunction with corresponding data to compute an HSI score for each parameter that ranges between 0.0 (poor quality) to 1.0 (high quality or "perfect" condition). An overall HSI score is then calculated by taking the average of the parameter HSI scores:

($DEPTH_{HSI}$ + $VELOCITY_{HSI}$ + $SUBSTRATE_{HSI}$ + $STRUCTURE_{HSI}$)/ 4 = OVERALL HSI Score

This simplistic approach applies equal weight to all variables. Discussion was held with agency partners on whether or not any variable should be weighted more heavily. However, no clear data or evidence suggests any variable more important than another under normal circumstances. However, in situations where the velocity is over 2.2 m/s, the overall HSI defaults to 0.0. This is done to account for the fact that high-velocity habitat is unusable, regardless of the values of the other variables.

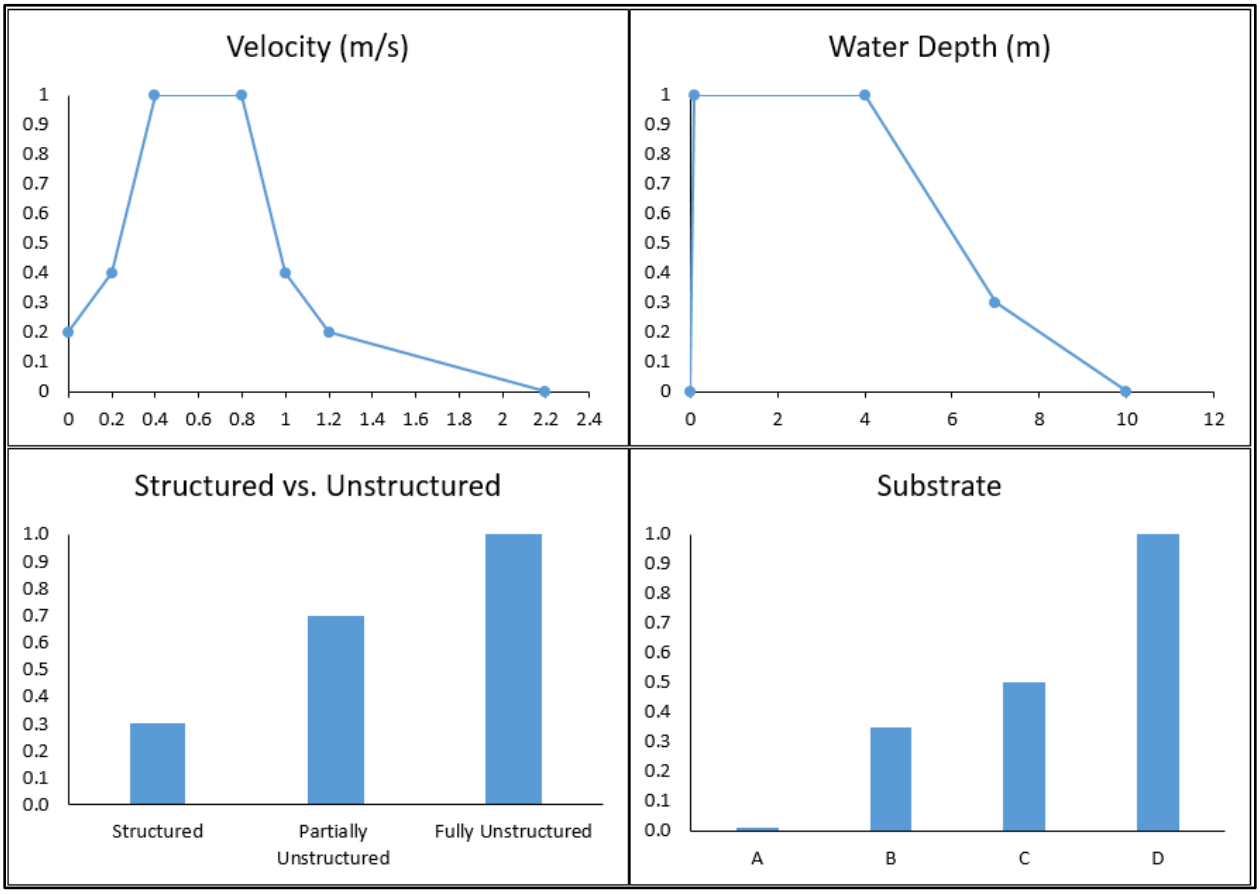


Figure 2. Habitat suitability index parameters developed for the MMR Sturgeon Chub Model. The y-axis represents the HSI score for the associated measurement (x-axis) of each parameter. Substrate parameter categories are (A) Silt, (B) Silt/Clay/Little Sand, (C) Sand/Mostly Sand, and (D) Gravel/Cobble/Hard Clay.

Model Development and Certification

Development of the chub model began with an interagency workshop in April 2016. This included participation from representatives of the U.S. Fish and Wildlife Service (USFWS), the Missouri Department of Conservation (MDC), and the Illinois Department of Natural Resources

(IDNR), as well as the U.S Army Corps of Engineers. Areas of expertise included fisheries biology, river ecology, river hydraulics, and maintenance activities for the river navigation channel. The agency workshop included facilitation and guidance by experts in model development, including representatives from the USACE Engineering Research and Development Center (ERDC) and the Ecosystem Restoration Planning Center of Expertise (EcoPCX). The agency workshop was conducted over three days with the focus of first building a conceptual model to describe key habitat factors for MCB riverine habitat affected by regulating works activities. Once key habitat variables were collaboratively identified, discussion was held on what fish species are most responsive to the variables of concern. After lengthy discussion the group selected chub species (e.g., sturgeon chub and sicklefin chub (*Macrhybopsis meeki*)) as possible representative species for the aspects of MCB habitat most directly affected by river training structures.

A draft of the conceptual model was developed at the conclusion of the agency workshop. This was refined over the next couple months and included additional resource agency review and input. During completion of the conceptual model, focus for development of specific habitat curves included both sturgeon chub and sicklefin chub. However, data review of the sicklefin chub suggested that habitat variables for this species did not align as well with the habitat conditions of concern identified during conceptual model development. For that reason, quantitative model development shifted focus to the sturgeon chub to represent key habitat conditions. Further, in order to better evaluate the effects of construction activities, selection of model variables focused on habitat parameters likely to be affected by construction. Therefore, only the four aforementioned model variables were retained for further development.

Primary literature and available field data were reviewed to verify key habitat requirements of sturgeon chub. Although limited, detailed habitat characteristics of sturgeon chub were available to facilitate development of a quantitative model. Trends in sturgeon chub Catch Per Unit Effort (CPUE) data were used to develop the equations and categories of the model parameters. Key references for model development include the following that are specific to sturgeon chub habitat in the MMR:

- Herzog, D. 2004. Capture efficiency and habitat use of sturgeon chub (*Macrhybopsis gelida*) and sicklefin chub (*Macrhybopsis meeki*) in the Mississippi River. Thesis. Department of Biology, School of Graduate Studies and Research, Southeast Missouri State University. Cape Girardeau, MO. March 2004.

- Missouri Department of Conservation routine trawl sampling data for the Middle Mississippi River.

The Herzog dataset is from trawling conducted on the Middle Mississippi River and just outside the Middle Mississippi River on the Lower Missouri River and the Lower Mississippi River from 2000 to 2001. The Missouri Department of Conservation dataset is from trawling conducted on the Middle Mississippi River from 2002 to 2014. Sampling was conducted with modified two-seam slingshot balloon trawls (i.e. Missouri trawls) in main channel, main channel border, side

channel, and tributary habitats. Depth, velocity, substrate, and macrohabitat stratum information were collected at each sample location. Sturgeon chub collected were recorded, with select habitat conditions noted for the area trawled.

One of the limitations with this approach is that it collects fish over a protracted area (e.g., 100 yards or more per trawl run). The habitat notes that accompany the trawling observations are generalized over the duration of the trawl. It is impossible to know when or where a fish was collected within a trawling run and, thus, impossible to know the precise habitat conditions where the fish was collected within the trawl. However, the datasets represent the best available data to link sturgeon chub observations to habitat conditions, particularly on the MMR. As such, it represents the best source of information to describe habitat preferences of sturgeon chub on the MMR and, thus, prescribe a habitat model for the area. Moreover, where possible, trawling observations from Herzog (2004) and MDC were compared to other data sources to confirm reasonableness of the data.

In addition to the above, the following also served as a point of information and reference for sturgeon chub habitat:

- Rahel, F.J. and L.A. Thel. 2004. Sturgeon Chub (*Macrhybopsis gelida*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/sturgeonchub.pdf

- U.S. Fish and Wildlife Service. 2001. Updated Status Review of Sicklefin and Sturgeon Chub in the United States. U.S. Dept. of Interior. USFWS, Region 6. Denver Colorado. March 2001.

- Young, B.A., T.L. Welker, M.L. Wildhaber, C.R. Berry and D. Scarnecchia, editors. 1997. Population structure and habitat use of benthic fishes along the Missouri and Lower Yellowstone Rivers. 1997 Annual Report of Missouri River Benthic Fish Study PD-95-5832 to the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation.

Once the model parameters were developed and refined using the aforementioned data, the model review process began March 2017. Led by the ECO-PCX, a review team with extensive experience and knowledge of USACE planning policy, alternative evaluation and comparison, large riverine ecology, and sturgeon chub life history and habitat, thoroughly reviewed the model for technical quality, system quality, usability, and compliance with USACE policy. Model reviewers and developers worked through comments and resolved key issues based on reviewer recommendations, leading to finalized model documentation and ultimately a recommendation from the EcoPCX to the Office of Water Project Review (OWPR) for the Model Certification Panel to consider. The model was certified by the panel in October, 2017. The model documentation and certification documentation is hereby incorporated by reference, and is available on the SEIS Library:

http://www.mvs.usace.army.mil/Missions/Navigation/SEIS/Library.aspx

Chapter 2. Impact Assessment

2.1 Site Specific Environmental Assessments

When the District began the process to consider supplementing the 1976 EIS in 2013, a decision was made to complete site specific Environmental Assessments (SSEAs) for all new Regulating Works Project construction prior to completion of the SEIS (Figure 3), including work associated with the District's Endangered Species Act obligations, in order to evaluate the new information and circumstances on a site-specific basis. These SSEAs made a commitment that should the analyses undertaken as part of the SEIS process reveal any new impacts on the resources, ecosystem, and human environment not accounted for in the SSEAs, measures would be taken within the Corps' authority to avoid, minimize, and/or compensate for the impacts during the SEIS process as appropriate. Therefore, the District has reevaluated the recent construction activities of the Regulating Works Project outlined in the SSEAs for impacts to shallow to moderate-depth, moderate- to high-velocity habitat using the Chub Model, given that the significant adverse impact to this habitat type was not known at the time the SSEAs were completed. The SSEAs finalized to date include the following:

- Mosenthein-Ivory Landing Phase 4 (April 2014)
- Eliza Point-Greenfield Bend Phase 3 (April 2014)
- Dogtooth Bend Phase 5 (April 2014)
- Mosenthein-Ivory Landing Phase 5 (June 2015)
- Boston Bar Side Channel Restoration and Island Creation Project (April 2016)
- Grand Tower Phase 5 (June 2016)
- Dogtooth Bend Phase 6 (July 2016)
- Burnham Island Sandbar Creation Project (June 2017)

The potential adverse impact to MCB habitat identified in the SEIS is a product of the continued construction of river training structures for the purpose of obtaining and maintaining the authorized navigation channel throughout the MMR. As such, the SSEA's for new construction of river training structures for other purposes under the Project were deemed not to have a significant adverse impact on this habitat, so these SSEA's were not reevaluated with the habitat model. This includes work constructed in accordance with the Project's Biological Opinion and in coordination with the U.S. Fish and Wildlife Service for the District's Endangered Species Act obligations (i.e., Boston Bar Side Channel Restoration, Burnham Island Sandbar Creation). As well as the work completed under Dogtooth Bend Phase 6, which was completed to prevent the formation of a channel cut-off, and did not include any work on MCB habitat. The five remaining work areas were assessed for impacts to shallow to moderate-depth, moderate- to high-velocity habitat.

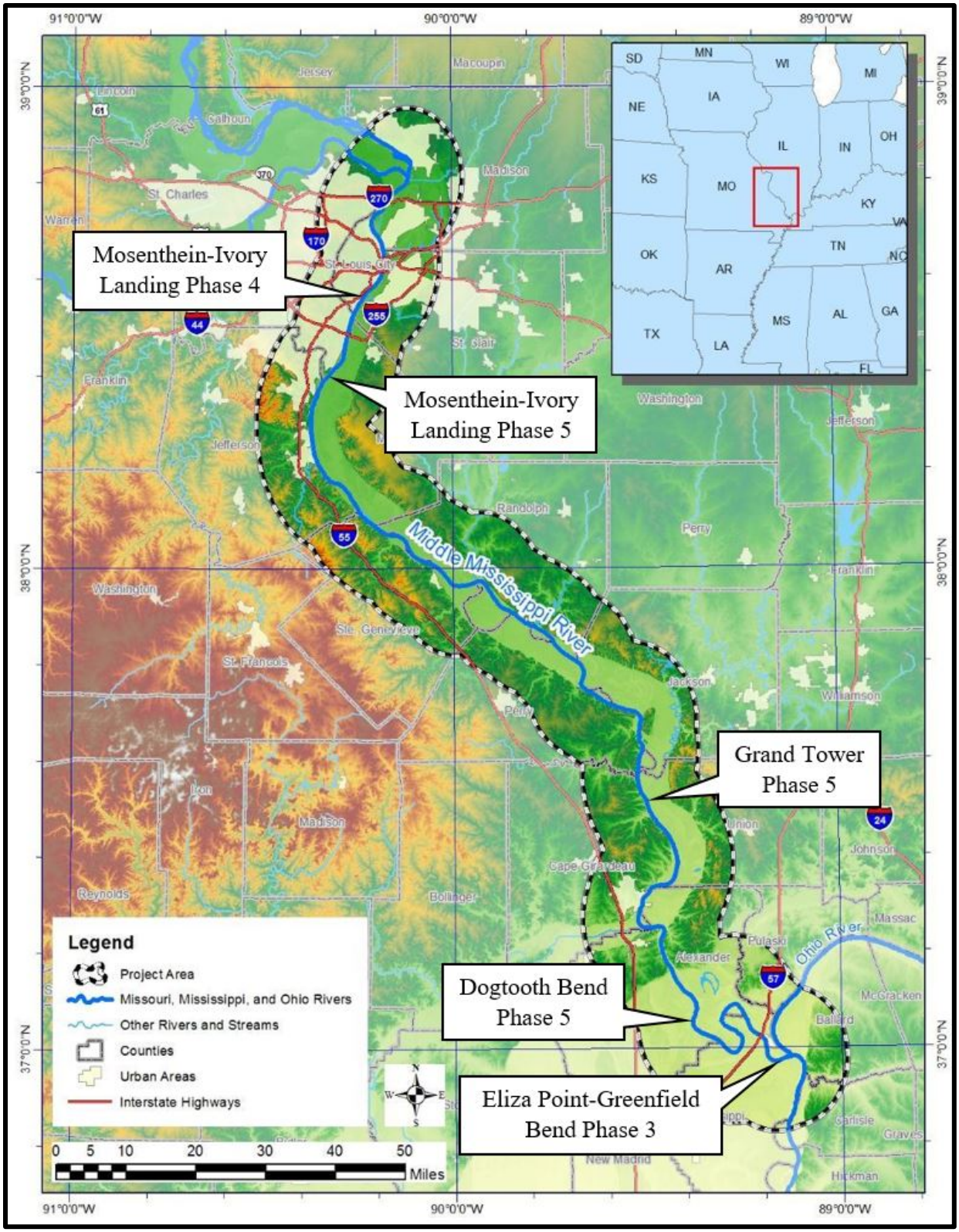


Figure 3. General location of recent work areas completed under the Regulating Works Project.

2.2 Chub Model Application

This section summarizes the general approach the District took in applying the Chub Model and calculating the impact to MCB habitat for the work areas assessed in the SSEAs. Using the Habitat Evaluation Procedures (HEP) developed by the U.S. Fish and Wildlife Service (USFWS 1976), habitat quality generated from the Chub Model was used in conjunction with the total area of influence (acres) to derive Average Annual Habitat Units (AAHUs), the metric by which Project construction and mitigation actions will be assessed. Pre-project HSI scores were used to calculate AAHUs for the Future Without Project (FWOP) condition, with the assumption that conditions will remain the same into the future. Post-construction HSI scores were used to calculate AAHUs for the Future With Project (FWP) condition, with the assumption that post-construction conditions are reached three years after construction completion. Both the FWOP and the FWP were assessed using a fifty year period of analysis, after which the net difference in AAHUs between these scenarios was derived.

Data Sources and Collection

The District is committed to using the best available data during all mitigation assessments. As such, multiple sources were relied upon to develop the pre- and post-construction inputs for various model parameters. Data sources included 2-D numerical models developed by the District during the design phase of each work site, field data from work sites, the results of Hydraulic Sediment Response (HSR) models, and/or the previously mentioned 3-D model developed as part of the SEIS effort.

As part of its monitoring and adaptive management plan, the District will make a reasonable effort to collect post-construction field data from work sites during periods of moderate discharge, replacing some of the input data discussed herein, and updating this mitigation assessment as needed (see Chapter 3). Further, recognizing these data requirements moving forward, the District will attempt to collect depth and velocity data for both pre- and post-construction conditions for all future work completed under the Project, such that reliance on multiple data sources will be reduced during future mitigation calculations. However, there are multiple issues associated with collecting these field data. These include common resource and budgetary constraints, perfectly timing the collection of ADCP data during the site-specific hydrologic window in which it must be collected (i.e., median discharge), and physical accessibility to sections of the total area of influence. Therefore, it is anticipated that multiple data sources will frequently be required. Specifically, the District anticipates that 2-D hydraulic modeling will be required to produce pre- and post-construction velocity data that can be applied to the chub model, because this method will allow for modeling during the exact discharge required by the chub model.

Furthermore, prior to collecting post-construction field data, each work area will be given the opportunity to undergo the physical changes that result from implementation. Collection of post-construction field data will not be finalized until work sites reach a state of dynamic equilibrium, in which ongoing significant changes to bathymetry are no longer occurring. Allowing enough time for these changes to occur will ensure that post-construction field data best reflects the

physical changes that would result from construction activities, and that mitigation assessments accurately capture the net gain/loss in AAHUs. The immediate changes that result from construction or modification of river training structures typically occur within three years of completed construction to a work area, during which different seasonal hydrologic events can act upon the site (e.g., high-flow events, droughts, etc.), progressing it toward a state of dynamic equilibrium. A state of dynamic equilibrium will be noted simply by a lack of ongoing significant changes to bathymetry in a work area, meaning multiple post-construction bathymetric surveys will need to be analyzed to determine whether dynamic equilibrium has been reached.

Total Area of Influence

The first step in calculating the net change in habit units was delineation of the total area of influence for each of the work areas. Ideally, the area of influence would be drawn large enough to capture all the potential changes that occur due to construction or modification of river training structures, but small enough to focus the analysis on the effects of the structure(s) in question. In general, the area of influence encompasses a stretch of main channel border, starting from an existing upstream structure and ending at an existing downstream structure, extending riverward from the bankline to a location approximately 250 feet riverward of the most riverward located structures. If an existing structure was not present upstream or downstream of the newly constructed river training structures, the length of the area of influence was extended by 1,200 ft upstream and downstream of the newly constructed features. This length represents the average distance between river training structures in the MMR. Because this general approach relies heavily on best professional judgment, some degree of subjectivity is required to ensure all potential changes to the aquatic habitat fall within the analyzed area of influence. Specifically, if changes to depth and velocity characteristics were anticipated further upstream or downstream, either due to the results of modeling efforts, post-construction data collection, or simply best professional judgment, the area of influence was extended to encompass such changes.

Figure 4. Delineation of the total area of influence (left) as well as pre- (center) and post-construction (right) delineation of the structured/unstructured parameter categories for the Mosenthein Ivory Landing Phase 4 work area. Construction of the rootless dike (red) reduces the score immediately downstream of the dike to 0.3, and the remainder of the area to 0.7, because a dike is now present within the total area of influence.

Structured vs Unstructured Area of Influence

The model includes a categorical parameter for the presence/absence of river training structures, which is intended to gauge the degree to which an area provides habitat that is not influenced by river training structures, provides longitudinal connectivity for fish movement, and provides large patches of contiguous habitat of the same type. The structure parameter is also intended to capture the impact of changes to habitat not specifically included in the other model parameters, such as sandbar slope and channel crossovers. While the model documentation and instructions provide a general definition for each of the three categorical options, some degree of best professional judgment is required during the process of categorizing areas based on the definitions. The low quality category (HSI = 0.3) is defined as main channel or main channel border habitat that is influenced by either an unmodified existing river training structure or newly constructed river training structure. The moderate quality category (HSI = 0.7) is defined as main channel border habitat that is influenced by the notch or modification of an existing river training structure to provide improved longitudinal connectivity or patch size; or the area is unstructured main channel border habitat that is influenced by existing river training structures. The high quality category (HSI = 1.0) is defined as contiguous main channel border habitat created by complete removal of existing structures; or the habitat is a large contiguous main channel border habitat that is devoid of river training structures. This "influence" and how to delineate area of influence for this model parameter is based upon professional judgment to ensure the model is applied in the most biologically sound and appropriate manner, tailored to site-specific characteristics of a work area.

When applying the model to the construction documented in the completed SSEAs, the District addressed the structure parameter in the following manner. Regarding the pre-construction condition, the areas immediately downstream of any existing structures were assigned the low quality score (0.3). These areas were delineated by connecting dike tips, thereby capturing the complete area encompassed by a traditional dike field, and the lack of longitudinal connectivity they provide. In the case of a single existing structure, the same approach taken to delineate the total area of influence was used; the low quality area was drawn 1,200 ft downstream roughly parallel with the thalweg. After the low quality area was delineated at a given site, the remaining area was assigned the moderate quality score (0.7). While the longitudinal connectivity of these areas is not reduced in the same manner as the area within the dike fields, it was determined these areas are still "influenced" by the existing structures within the work area. The high quality score (1.0) was applied only when the total area of influence was located at MCB habitat that was completely void of river training structures. In that case, the entire area of influence was given the high quality structure score.

The same approach was used for the post construction condition, which generally involved delineating new areas of influence and modifying the structure score of some areas. The most commonly encountered scenario was new structures built in moderate score areas, resulting in a reduced structure score (0.7 to 0.3) for the area immediately downstream of the new structure. Further, if a structure was built in a high quality unstructured area, the drop in structure score was more severe (1.0 to 0.3) for the area immediately downstream of the structure, while the

remaining area also dropped (1.0 to 0.7) because this area is now "influenced" by the structure (Figure 4). Lastly, a slightly different approach was taken to address the removal of structures. Given the definition of each category in the structured/unstructured parameter, the removal of any structure should result in a high quality structure score (1.0). Therefore, dike removal boosts the structure score (0.3 to 1.0) for the immediate downstream area, even if river training structures still exist within the total area of influence, that would otherwise be deemed as an "influence" on the newly opened area. This would result in a less substantial boost (0.3 to 0.7) to the structure score if the same approach to adding structures was used. Preliminary hydraulic modeling of potential mitigation sites revealed that structure removal would often fail to affect the depth and velocity parameters. Meaning these parameters would not capture any benefit of structure removal. Therefore, this alternate approach was necessary in order to fully quantify the benefit of complete structure removal when implementing future mitigation actions. The same habitat analysis and approach will be applied to mitigation actions in order to quantify the resulting net gain in AAHUs.

Substrate

Similar to the structure parameter, substrate was also developed as a categorical model parameter, with categories representing the varying degrees of coarseness in substrate constituents. However, given the fact that little predictive capability exists regarding changes to substrate composition resulting from the Project, and the fact that substrate data were not available, it was assumed that the substrate in the work areas was mostly sand (HSI = 0.5) for both the pre- and post-construction conditions. This assumption was further supported by empirical evidence from previously constructed dike fields throughout the MMR. Thus the substrate parameter had no influence on the net change to AAHUs in this initial assessment. However, new pre- and post-construction substrate data may become available as data are collected and visual observations are made at planned and completed work sites. Therefore, this

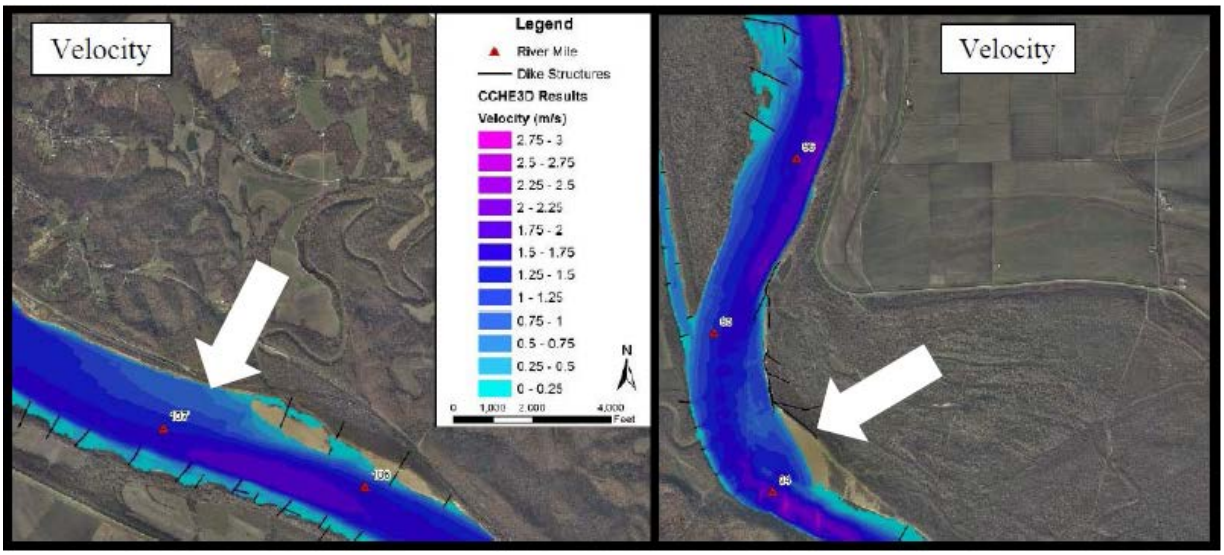


Figure 5. Example of sites from the 3-D model used to supplement pre-construction velocity HSI scores. HSI scores of 0.75 (left) and 0.51 (right) were developed from the unstructured MCB sandbar and point bar habitat indicated by the arrows.

assumption may be revisited during future Project planning and mitigation assessments, at which time the pre- and post-construction substrate category could be updated for any of the work sites assessed herein, potentially altering the change in AAHUs for the entire Project.

Depth and Velocity

Unlike the substrate and structured/unstructured categorical parameters, the depth and velocity parameters were developed as traditional HSI curves, comprised of multiple linear equations with varying slopes for different depth and velocity ranges. In cases where bathymetry data and Acoustic Doppler Current Profiler (ADCP) data collected at moderate flows were available for specific work areas, these data were converted to a raster format (50ft x 50ft cells) within the total area of influence, each cell was then converted to the appropriate HSI score using the model parameters presented in Figure 2. As previously discussed, site-specific bathymetry and ADCP data were often not available, meaning other sources were needed to supplement the data used in assessing the SSEA work areas. In particular, pre-construction velocity data were not readily available.

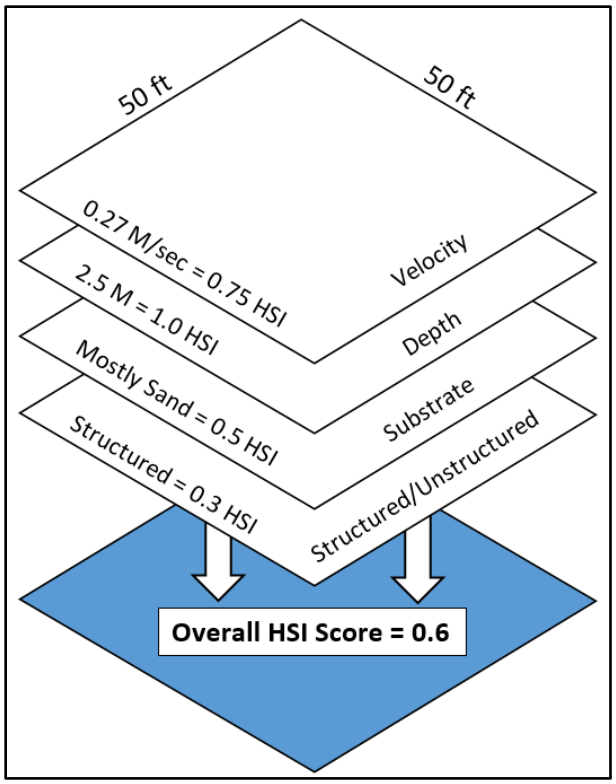


Figure 6. Conceptual model of HSI score calculation process for a 50ft x 50ft cell within a work area. Example data and resulting HSI scores are included for demonstration. Refer to model parameters (Figure 2) for explanation of specific score calculations.

The 3-D hydraulic model from the SEIS effort served as one of the primary sources of input data for the velocity parameter. Specific areas of the modeled reach were selected to provide velocity input data for the work sites discussed in the SSEAs (Figure 5). 3-D model sites were selected based on their physical characteristics and layout. Within the 3-D model, depth averaged velocity rates were analyzed at the selected locations at a moderate discharge (213,000 ft^3/sec), and a velocity HSI score was then developed from the average velocity at each site. These HSI scores were used as the input data for many of the work sites discussed in the SSEAs. Sites with similar physical characteristics and layout, or an average HSI score from multiple surrogate sites were used. Utilized sites from the 3-D model include traditional dike fields, an unstructured sandbar, an unstructured point bar, chevrons, islands, offset dikes, and notched dikes.

Raster Component

The assessment was carried out in the GIS platform of ArcMap. All input data were converted to a raster format with 50ft x 50ft cells (Figure 7). These data rasters were then converted to HSI score rasters using the model parameter equations outlined in the model documentation, resulting

in four separate rasters representing each of the four model parameters. The HSI rasters were then combined and averaged to calculate each 50 x 50 ft cell's overall HSI value using the raster calculator tool (Figure 6).

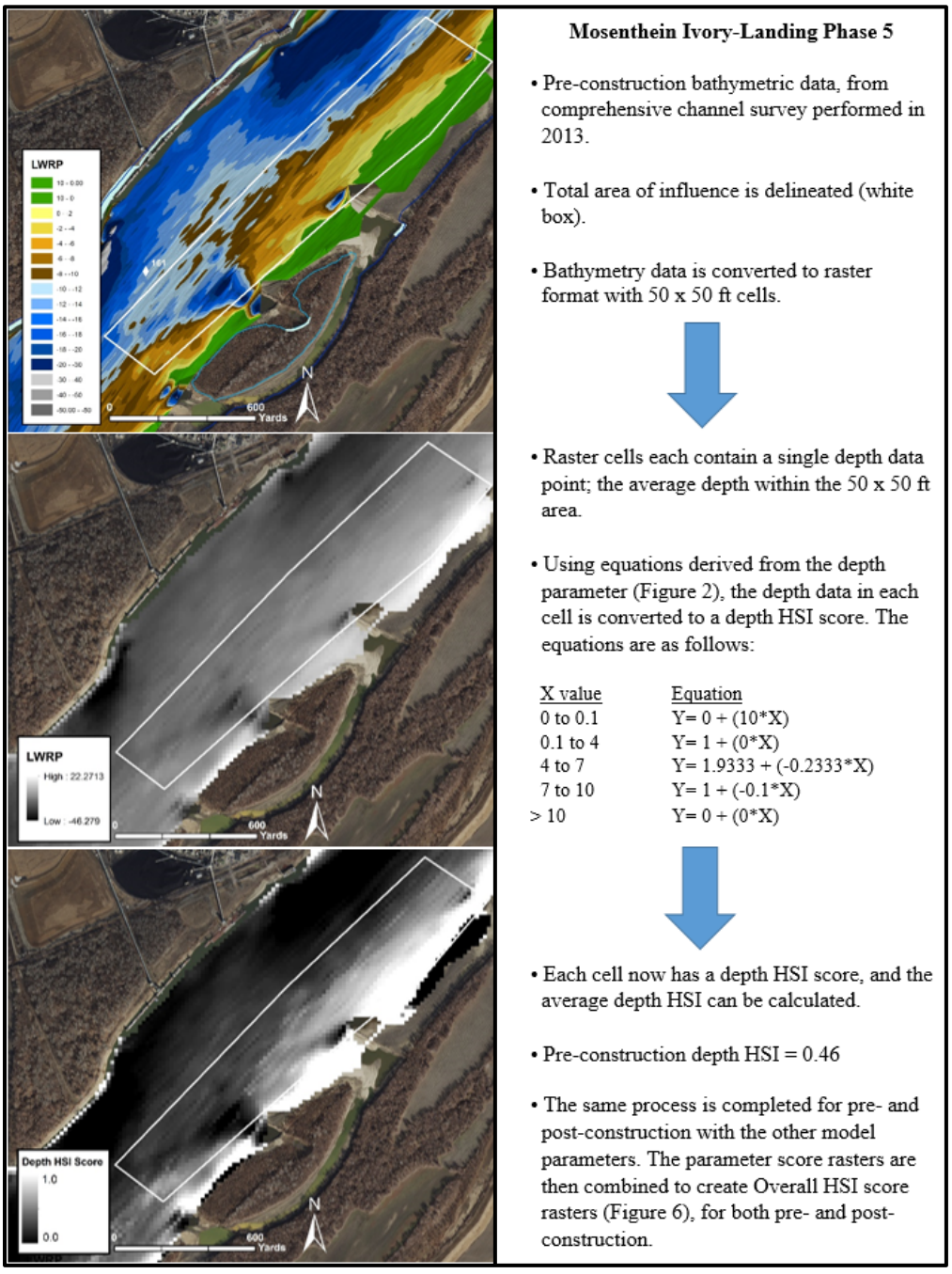


Figure 7. Example of raster development process.

2.3 Site Specific Quantification

The following section describes the assessment of impacts to shallow to moderate-depth, moderate-to high-velocity habitat for each of the five most recent work areas completed under the Regulating Works Project. Included are details on the area of influence delineations, structured/unstructured delineations, input data sources for the depth and velocity parameters, and pre- and post-construction HSI scores for each of the work areas. A brief description of each work area is provided herein; for more detailed descriptions, refer to the SSEAs found here, incorporated by reference:

http://www.mvs.usace.army.mil/Missions/Navigation/SEIS/Library.aspx

Mosenthein-Ivory Landing Phase 4

This work involved construction of a rootless dike near the left descending (left) bank at RM 173.4 (Figure 8) and placing bankline revetment at four locations on the left bank from RM 175 to RM 171. The only component considered in this assessment was the rootless dike, which was built 550 ft long, and to a design elevation of 389 ft NGVD (+ 15 ft LWRP).

Figure 8. Aerial imagery of the Mosenthein Ivory-Landing Phase 4 work area, including the new rootless dike (white) and total area of influence (blue).

The rootless dike was built in an area of unstructured MCB habitat downstream of the Cahokia Chute tributary. The area of influence completely lacked any existing river training structures, and was therefore assigned the high quality structure score (1.0) for its pre-construction condition. Construction of the dike produced a sharp drop to the low quality structure score (0.3) for the area downstream of the dike, and a drop to the moderate structure score (0.7) for the remainder of the area, resulting in a lower average structure score (0.63) for the total area of influence (Figure 4).

Regarding the depth parameter, both pre and post-construction HSI scores were based on bathymetric survey data collected before and after construction. Prior to construction, the site consisted of a heterogeneous mix of different depths, ranging from high quality to low quality HSI scores, and resulting in a moderate pre-construction depth HSI score (0.57). A post-construction bathymetric survey revealed the expected outcome had occurred. Reduced velocity downstream of the dike resulted in increased deposition and reduced depth, while areas surrounding this depositional area had deepened. The depth HSI score was slightly reduced due to construction (0.53).

The pre-construction velocity HSI score was derived from multiple sites in the 3-D model. Specifically, the velocity HSI scores from the RM 107 sandbar and the RM 94 point bar (Figure 5) were used to develop an average HSI score (0.63) that could be used for similar unstructured MCB areas, such as the Mosenthein Ivory Landing Phase 4 work area. The post-construction velocity HSI score (0.68) was developed from field data collected after construction. This slight increase to the velocity HSI score is far outweighed by the decreased depth and structure HSI scores, which ultimately results in a net loss in AAHUs within the work area (Table 1).

Eliza Point-Greenfield Bend Phase 3

This work consisted of building a rootless dike along the left bank near RM 3.0 (Figure 9) and four bendway weirs along the right descending (right) bank at RM 2.2 and RM 2.6. Under the Project, bendway weirs are built within the navigation channel, which is relatively deep and swift compared to MCB habitat. The physical conditions in the navigation channel effectively "zero out" the chub model (i.e., HSI = 0) prior to construction of bendway weirs, meaning these structures would not affect the HSI score, and therefore, do not need to be considered during mitigation assessments. The only work area component considered in this assessment is the rootless dike at RM 3.0 which was built 615 ft long, to a design elevation of 296 NGVD (+18 ft LWRP), and with two large notches.

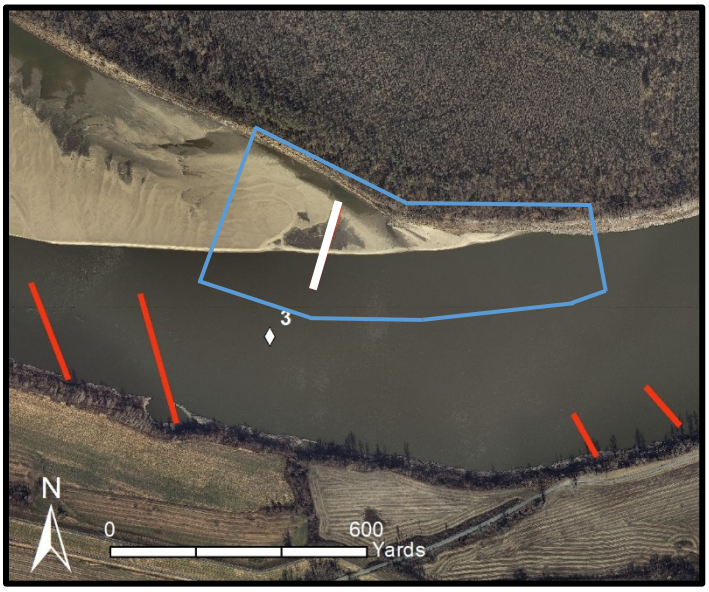


Figure 9. 2012 Aerial imagery of the Eliza Point-Greenfield Bend Phase 3 work area, including the new rootless dike structure (white), bendway weirs along the right bank (red), and total area of influence (blue).

The rootless dike was built in an area of unstructured MCB habitat near the lower end of Angelo Towhead. The area of influence completely lacked any existing river training structures, and was therefore assigned the high quality structure score (1.0) for its pre-construction condition. Construction of the dike produced a sharp drop to the low quality structure score (0.3) for the area downstream of the dike, resulting in a lower average structure score (0.61) for the total area of influence.

Regarding the depth parameter, both pre and post-construction HSI scores were based on bathymetric survey data. The area was relatively shallow prior to construction, as demonstrated by its pre-construction depth HSI score (0.72). Post-construction bathymetric surveys revealed a lower average bed elevation within the total area of influence, particularly due to deepening of the area between the dike and the navigation channel. Similar to the structure parameter, this resulted in a sharp decrease to the overall depth HSI score (0.34).

Both the pre- and post-construction velocity HSI scores were the same as those used in the Mosenthein-Ivory Landing Phase 4 assessment (above). These HSI scores were deemed appropriate to use given the similarities between the two work areas; the Mosenthein Ivory Phase 4 work area also consisted of building a rootless dike in unstructured MCB habitat. Using these input data results in a slight boost to the post-construction velocity HSI score, which is subject to change after post-construction data is collected from the Eliza Point work area. However, this slight increase to the velocity HSI score is far outweighed by the decreased depth and structure HSI scores, which ultimately produce a net loss in AAHUs within the work area (Table 1).

Dogtooth Bend Phase 5

This work area involved the construction of two bendway weirs along the left bank near RM 34, four bendway weirs along the left bank near RM 32, two bendway weirs along the right bank near RM 31, and a dike along the right bank at RM 31.6 (Figure 10). The conditions in the navigation channel effectively "zero out" the chub model (i.e., HSI = 0), the weirs were therefore not considered in the assessment. The only component considered in this assessment is the dike at RM 31.6, which was built 300 ft long and to a design elevation of 310.4 NGVD (+15 ft LWRP).

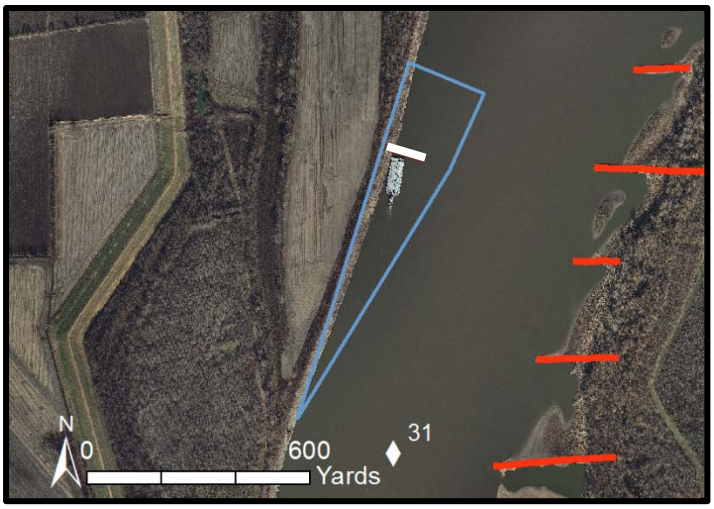


Figure 10. 2012 Aerial imagery of the Dogtooth Bend Phase 5 work area, including the new river training structure (white), existing river training structures, and total area of influence (blue).

The dike was built in a relatively deep, high-velocity area directly adjacent to the navigation channel. Even though no existing structures were present within the area of influence, the moderate quality structure score (0.7) was applied to the entire area of influence for the pre-construction condition. This was done because the area is more characteristic of the main channel, rather than the main channel border, and to remain consistent with the model parameters and their associated definitions. Construction of the dike changed the structure score from moderate (0.7) to the low quality (0.3) for a large portion of the area. This resulted in a lower average structure score (0.6) for the total area of influence. Regarding the depth parameter, both pre- and post-construction HSI scores were based on bathymetric surveys collected before and after construction. Differences between these surveys reveal an overall decrease in the average bed elevation within the area, resulting in a lower overall depth HSI score (0.25) for the area.

Pre- and post-construction velocity HSI scores were derived from sites in the 3-D model. Specifically, the pre-construction HSI score (0.37) was developed from an outside bend area near RM 99 within the 3-D model. This location was chosen to supplement the input data for the pre-

construction condition because of similarities shared by the sites - both are located on an outside bend, lack existing structures, are generally deep and swift, and are directly adjacent to the navigation channel. The post-construction velocity HSI score (0.52) was developed from the outside bend near RM 101 within the 3-D model. This site is similar to the aforementioned site at RM 99, except for the presence of relatively short dikes located along the outside bend, which is similar to the post-construction condition of the Dogtooth Bend Phase 5 work area. Using these 3-D model site HSI scores increases the overall velocity HSI score within the work area. This is due to reduced velocities occurring immediately downstream of the dikes along the otherwise swift outside bend. Ultimately, this increased post-construction velocity score results in a slight net gain in AAHUs within the total area of influence (Table 1). This net gain is subject to change, however, as the post-construction velocity HSI score is likely to be updated with a different score developed from field data collected during a period of moderate discharge.

Mosenthein-Ivory Landing Phase 5

This work consisted of building four bendway weirs on the right bank and three rootless dikes on the left bank between RM 160 and RM 162.5 (Figure 11). The conditions in the navigation channel effectively "zero out" the chub model (i.e., HSI = 0), the weirs were therefore not considered in the assessment. Only the three rootless dikes were considered in this assessment. The dikes were built between 300 - 600 ft long, and to a design elevation of 389 ft NGVD (+ 15 ft LWRP).

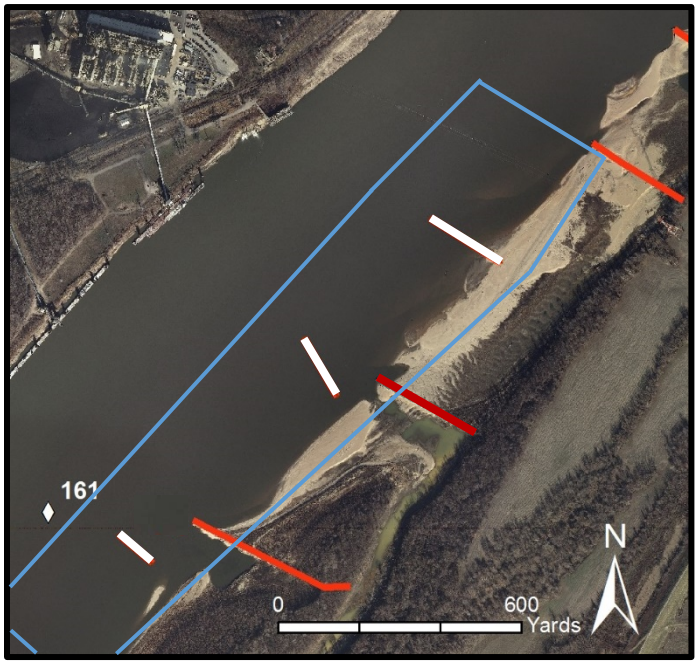


Figure 11. 2012 Aerial imagery of the Mosenthein-Ivory Landing Phase 5 work area, including the new rootless dike structures (white), existing river training structures (red), and total area of influence (blue).

Unlike the previous work areas, existing river training structures were present in this area prior to construction. The area of influence was delineated along MCB habitat just outside of an existing dike field. Therefore, a portion of the area was assigned the low quality HSI score (0.3) for the structure parameter, this portion lies within the existing dike field, and the remainder of the area was assigned the moderate quality structure score (0.7), given that this area is highly influenced by the existing dikes in the area. Construction of the new rootless dikes occurred outside of the existing dike field (riverward), lowering the post-construction structure score in this area, as well as the average structure parameter score for the entire area of influence (0.47).

Regarding the depth parameter, both pre- and post-construction HSI scores (0.46 and 0.55 respectively) were based on bathymetric survey data. While some scouring occurred around the

new rootless dikes, lowering the bed elevation and thereby decreasing the depth HSI score for much of the area, a substantial amount of deposition occurred immediately downstream of the new rootless dikes. These depositional areas raised the bed elevation and increased the depth HSI score, which outweighed the decrease due to scouring. The overall post-construction depth HSI score for the work area increased slightly due to these effects.

Similar to the aforementioned work areas, the pre-construction velocity HSI score was derived from multiple sites within the 3D model. Specifically, a velocity HSI score was calculated from a number of different areas characterized as being traditional dike fields. The average of these velocity HSI scores (0.50) was used as the pre-construction velocity HSI score for this work area, given that it is also characterized as a traditional dike field. Post-construction velocity field data (ADCP) has been collected for this work area, which reveals decreased velocities immediately downstream of the rootless dikes, resulting in an increased velocity HSI score (0.74). The increased velocity score gives a substantial boost to the overall HSI score for the work area, and ultimately results in a net gain in AAHUs (Table 1).

Grand Tower Phase 5 - Crawford Chevrons

Features of the Grand Tower Phase 5 work were constructed at two separate work locations and each location was assessed for mitigation separately. The Crawford Towhead portion is located near the left bank between RM 74 and RM 72, and consisted of building two 300 ft x 300 ft chevron dikes and extending an existing dike by 300 ft (Figure 12). All features were built to a design elevation of 339 ft NGVD (+18 LWRP). Existing river training structures were present in this area prior to construction of the new features.

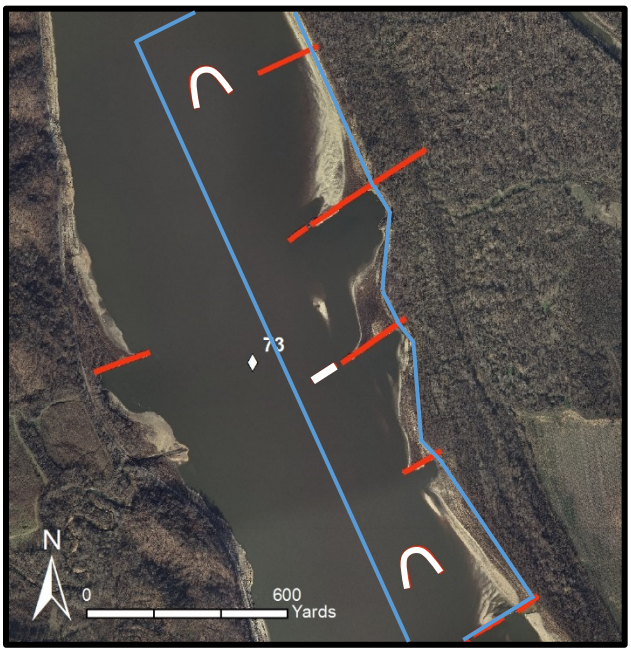


Figure 12. 2012 Aerial imagery of the Grand Tower Phase 5 - Crawford Chevrons work area, including new river training structures (white), existing river training structures (red) and total area of influence (blue).

The entire MCB habitat in the area was delineated as the total area of influence, including the preexisting dike field. The preexisting dike field was assigned the low quality HSI score (0.3) for the structure parameter, and the remainder of the area was assigned the moderate quality structure score (0.7), given that this area is highly influenced by the existing dike field. Construction of the new chevron dikes and extension of dike 72.9L occurred outside of the existing dike field (riverward), lowering the post-construction structure score in this area, as well as the average structure parameter score for the entire total area of influence (0.54 to 0.44).

Similar to all the previously discussed work areas, bathymetric survey data were used to develop the pre-construction depth HSI score (0.54). However, given that this work has only recently been completed, a post-construction bathymetric survey has not yet been performed. The depth HSI score for the RM 104 Chevron site from the 3-D model was used as the input data for the post-construction depth HSI score (0.46), resulting in a slightly reduced depth HSI score.

The pre-construction velocity HSI score was derived from a 2-D numerical model developed during the planning phase for the work. The modeling effort revealed swift current within the work area vicinity prior to construction, resulting in a relatively low velocity HSI score (0.41). The post-construction velocity HSI score (0.64) was also derived from the RM 104 Chevron site from the 3-D model, similar to the post-construction depth HSI score. These data suggest that construction activity in this work area would reduce flow velocity downstream of the structures. This increases the average velocity HSI score, and essentially cancels out the decrease to the depth and structure HSI scores, resulting in a slight gain in AAHUs (Table 1.)

Grand Tower Phase 5 - Vancill Dikes

The second portion of the Grand Tower Phase 5 work consisted of building multiple features along the left bank between RM 67 and RM 69 (Figure 13). This analysis only considered the features that could potentially impact the identified MCB habitat: the construction of three 750 ft long S-dikes, the repair of 350 ft of an existing traditional dike, and the shortening of two traditional dikes.

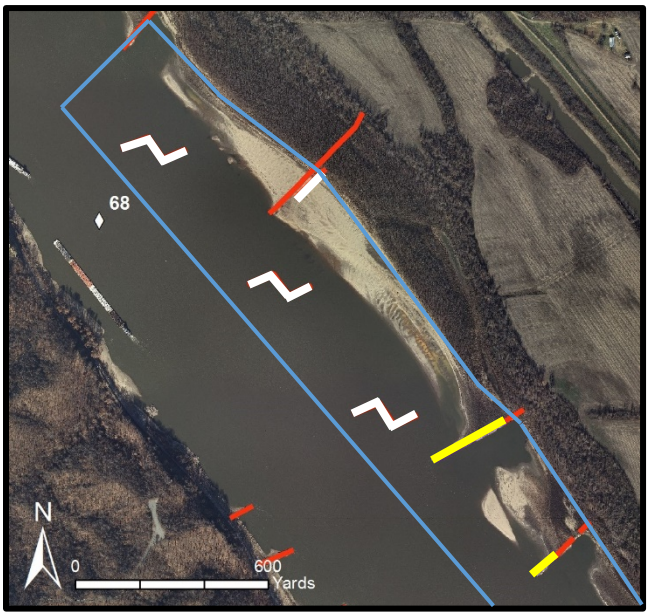


Figure 13. 2012 Aerial imagery of the Grand Tower Phase 5 - Vancill Dikes work area, including new river training structures (white) structure removal (yellow), existing river training structures (red), and total area of influence (blue).

Traditional dikes were already present along the left descending bank; the area between the dikes was assigned the low-quality structure HSI score (0.3), and the remaining area was assigned the moderate structure score (0.7). Construction of the S-dikes drops the structure score for the area immediately downstream of these structures (0.7 to 0.3). The shortening of dikes 67.3L and 67.1L enhances the structure score for the area downstream of the removed portion (0.3 to 1.0). Although construction of the S-dikes reduces the structure HSI for a large portion of the area, this effect is outweighed by the dike removal component, which boosts the overall structure HSI score (0.51 to 0.54).

Bathymetric survey data were used to develop the pre-construction depth HSI score (0.51), and unlike any of the previously mentioned work areas, the results of an HSR model developed for

this site were used as the input data source for the post-construction depth HSI score (0.57). The HSR model demonstrates that construction of the S-dikes would result in sediment deposition immediately downstream of the structures, increasing the average bed elevation within the area and boosting the depth HSI score within the work area.

The pre and post-construction velocity HSI scores were developed using a 2-D numerical model developed during the design phase of this work. The majority of the work area had relatively swift current before construction was implemented, producing a low pre-construction HSI score (0.38). Building the S-dikes reduced the velocity for a significant portion of the area, increasing the average velocity HSI score for the total area of influence (0.56). Ultimately, because the S-dikes were built relatively far from the bank and near the navigation channel, they reduce the velocity and increase the bed elevation in an area that would otherwise have an overall HSI score of 0.0 (i.e., too deep and swift). These effects boost the overall HSI score (0.48 to 0.55), producing a relatively large net gain in AAHUs (Table 1).

However, like the previously discussed Crawford Chevrons, this work has only recently been completed. Conditions at the site will be given the opportunity to change and eventually reach a state of dynamic equilibrium, after which field data can be collected, and the post-construction HSI scores for depth and velocity can be updated. Therefore, the current net gain in AAHUs from this work will likely increase or decrease after a future reevaluation.

2.4 Initial Assessment Results

While some of the construction has reduced the aforementioned habitat type in certain work area vicinities, the results demonstrate an overall net gain of this habitat type (i.e., increased AAHUs) within the MMR. This outcome is largely due to the construction activity completed at the Vancill Towhead work area - primarily the construction of the innovative S-dike structures. This work seemingly transforms a relatively large portion of low-quality MCB habitat into high-quality MCB habitat. The structures have achieved their desired effect of helping maintain the navigation channel and reducing the need for channel maintenance dredging, while simultaneously diverting flow bankward and creating a myriad of flow patterns and depositional areas. The S-dike structures created a large swath of the specific habitat type that was identified in the SEIS as potentially being significantly impacted from the continued construction of the overall Project. This is not completely surprising as the Vancill Towhead reach was extensively coordinated with the natural resource agencies and consisted of both dike shortening and the placement of what were modeled to be environmentally friendly structures. The design was implemented in this area to avoid and minimize known impacts at that time, but as the model results show, the design also avoided and minimized, and inadvertently enhanced, the MCB habitat identified in the SEIS as a potentially significant impact for the entire Project that could not be avoided and minimized and thus possibly result in the consideration of compensatory mitigation for the entire Project. This resulted in an overall net gain in AAHUs for the evaluated construction activities for the entire Project (Table 1).

The details and process described above represent the District's initial assessment of the impacts to shallow to moderate-depth, moderate-to high-velocity habitat within specific work areas completed for the Regulating Works Project described in the SEIS and as committed to in the work areas' SSEAs. Given the results of this initial assessment, compensatory mitigation for the Regulating Works Project is not currently warranted. However, post-construction AAHUs are subject to change in light of new information gathered through monitoring efforts, which may result in a reevaluation of compensatory mitigation resulting from the impacts of these work areas to the overall Project. Further, the District will continue to evaluate the impacts of future Project construction utilizing the Chub Model and the process discussed herein. Based upon the analyses completed as part of the SEIS and this initial assessment of the completed SSEAs, the District still anticipates that compensatory mitigation will need to be considered moving forward, and will thus proceed accordingly and plan feasible mitigation actions (described below), so they will be ready for execution if deemed appropriate for the circumstances moving forward.

Table 1. Results of the Project's initial mitigation assessment, and the tentative monitoring plan for each of the work areas discussed in the SSEAs.

Project Work Area	FWOP HSI	FWP HSI	Net Change	Latest Assessment
Mosenthein-Ivory Landing Phase 4 (71 acres)				
Velocity	0.63	0.68	+0.05	Nov-17
Depth	0.57	0.53	-0.04	Nov-17
Substrate	0.50	0.50	0.00	Nov-17
Structured/Unstructured	1.00	0.63	-0.37	Nov-17
Overall HSI Score	0.67	0.58	-0.09	Nov-17
AAHUs	**47.5**	**41.32**	**-6.19**	Nov-17
Monitoring Construction was completed in April 2015. Post-construction depth and velocity field data have already been collected once, and applied to the latest mitigation assessment. Progress to dynamic equilibrium (DE) will be determined after an additional bathymetric channel survey is performed (2018 or 2019). If the site has reached DE, velocity field data will be collected and all HSI scores and AAHUs will be deemed final. If the site has not reached DE, it will continue to be monitored and will be reassessed after periodic channel surveys are performed and provide updated bathymetry. Once the site has reached DE, post-construction velocity field data will be recollected and reassessed.				
Eliza Point-Greenfield Bend Phase 3 (52 acres)				
Velocity	0.63	0.68	+0.05	Nov-17
Depth	0.72	0.34	-0.38	Nov-17
Substrate	0.50	0.50	0.00	Nov-17
Structured/Unstructured	1.00	0.61	-0.39	Nov-17
Overall HSI Score	0.71	0.53	-0.19	Nov-17
AAHUs	**37.25**	**28.09**	**-9.16**	Nov-17

Monitoring

Construction was completed in March, 2017. Post-construction depth field data have already been collected once, and were applied to the latest mitigation assessment. Progress to dynamic equilibrium (DE) will be determined after an additional channel survey is collected (2018 or 2019). If the site has reached DE, velocity field data will be collected and all HSI scores and AAHUs will be deemed final. If the site has not reached DE, it will continue to be monitored and will be reassessed after periodic channel surveys are performed and provide updated bathymetry. Once the site has reached DE, post-construction velocity field data will be collected and assessed.

Dogtooth Bend Phase 5 (25 acres)				
Velocity	0.37	0.52	+0.14	Nov-17
Depth	0.31	0.25	-0.06	Nov-17
Substrate	0.50	0.50	0.00	Nov-17
Structured/Unstructured	0.70	0.60	-0.10	Nov-17
Overall HSI Score	0.45	0.46	+0.01	Nov-17
AAHUs	**11.21**	**11.45**	**+0.24**	Nov-17

Monitoring

Construction was completed in May, 2015. Post-construction depth field data have already been collected once, and applied to the latest mitigation assessment. Progress to dynamic equilibrium (DE) will be determined after an additional bathymetric channel survey is performed (2018 or 2019). If the site has reached DE, velocity field data will be collected and all HSI scores and AAHUs will be deemed final. If the site has not reached DE, it will continue to be monitored and will be reassessed after periodic channel surveys are performed and provide updated bathymetry. Once the site has reached DE, post-construction velocity field data will be collected and assessed.

Mosenthein-Ivory Landing Phase 5 (122 acres)				
Velocity	0.50	0.74	+0.24	Nov-17
Depth	0.46	0.55	+0.09	Nov-17
Substrate	0.50	0.50	0.00	Nov-17
Structured/Unstructured	0.60	0.47	-0.13	Nov-17
Overall HSI Score	0.52	0.56	+0.05	Nov-17
AAHUs	**63.38**	**68.11**	**+4.73**	Nov-17

Monitoring

Construction was completed in November 2016. Post-construction depth and velocity field data have already been collected once, and applied to the latest mitigation assessment. Progress to dynamic equilibrium (DE) will be determined after an additional bathymetric channel survey is performed (2018 or 2019). If the site has reached DE, velocity field data will be collected and all HSI scores and AAHUs will be deemed final. If the site has not reached DE, it will continue to be monitored and will be reassessed after periodic channel surveys are performed and provide updated bathymetry. Once the site has reached DE, post-construction velocity field data will be recollected and reassessed.

Grand Tower Phase 5 - Crawford Chevrons (175 acres)				
Velocity	0.41	0.64	+0.23	Nov-17
Depth	0.54	0.46	-0.07	Nov-17
Substrate	0.50	0.50	0.00	Nov-17
Structured/Unstructured	0.54	0.44	-0.10	Nov-17
Overall HSI Score	0.50	0.51	+0.01	Nov-17
AAHUs	**87.49**	**89.18**	**+1.70**	Nov-17

Monitoring

Construction was completed in December, 2016. Post-construction field data has not been collected for any of the parameters. This is a more recent construction activity, meaning it is unlikely the site has reached dynamic equilibrium (DE). The initial assessment of post-construction depth field data will occur after the next channel survey is performed (2018 or 2019). Status to DE will be assessed after an additional channel survey is performed (2020 or 2021). Once the site has reached DE, post-construction velocity field data will be collected and assessed.

Grand Tower Phase 5 - Vancill Dikes (257 acres)				
Velocity	0.38	0.56	+0.18	Nov-17
Depth	0.51	0.57	+0.06	Nov-17
Substrate	0.50	0.50	0.00	Nov-17
Structured/Unstructured	0.51	0.54	+0.03	Nov-17
Overall HSI Score	0.48	0.55	+0.07	Nov-17
AAHUs	**123.36**	**140.81**	**+17.45**	Nov-17

Monitoring

Construction was completed in March 2017. Post-construction field data has not been collected for any of the parameters. This is a more recent construction activity, meaning it is unlikely the site has reached dynamic equilibrium (DE). The initial assessment of post-construction depth field data will occur after the next channel survey is performed (2018 or 2019). Status to DE will be assessed after an additional channel survey is performed (2020 or 2021). Once the site has reached DE, post-construction velocity field data will be collected and assessed.

Overall AAHUs			**+8.77**	Nov-17

Chapter 3. Mitigation Plan

Corps regulations (Engineering Regulation 1105-2-100) guide the process for mitigation planning. Changes to habitat must be assessed as a function of improvement or degradation in habitat quality and quantity, as expressed quantitatively in physical units or indexes (but not monetary units). In the case of mitigation for significant environmental impacts, ecosystem restoration actions must be formulated and evaluated in terms of their net contributions to increases in ecosystem value, expressed in non-monetary units. Various mitigation actions also should be compared to each other through a Cost Effectiveness and Incremental Cost Analysis (CE/ICA) to ensure benefits are optimized relative to cost.

Accordingly, the District has assessed the impacts to shallow to moderate-depth, moderate-to high-velocity habitat for the work areas discussed in the SSEAs using a Habitat Suitability Index model (i.e., Chub Model), and will apply the model in the same manner to future river training structure construction and mitigation work carried out under the Project for the purpose of obtaining and maintaining the navigation channel. As previously discussed, applying the model generates a general habitat quality score between 0 and 1. The HEP analysis is then performed to derive a total number of AAHUs lost at each work area. Those AAHUs lost that are determined to be a "significant" impact as to the entire Project could result in compensatory mitigation. It should be noted that what level of loss is significant is a judgment determined by the Corps after collaboration with resource agencies and utilizing all information that is readily available. The simple loss of AAHUs does not in and of itself constitute a significant impact to consider mitigation to offset an equal amount of AAHUs. Further, as discussed in the SEIS the "significance" to this particular habitat is based upon the current conditions and expected impact to this habitat throughout the MMR for the continued construction of river training structures to reduce dredging in areas where the river does not naturally maintain a reliable and efficient nine-foot navigation channel. However, the Corps does anticipate pursuing compensatory mitigation for the types of habitat change forecasted within the SEIS. The levels of impact, impact significance, and compensatory mitigation (including the type and amount and a detailed mitigation plan) for the overall Project would be developed and documented in future Tier II site specific Environmental Assessments of the additional construction of river training structures for the purpose of obtaining and maintaining the navigation channel with the ultimate goal of reducing dredging.

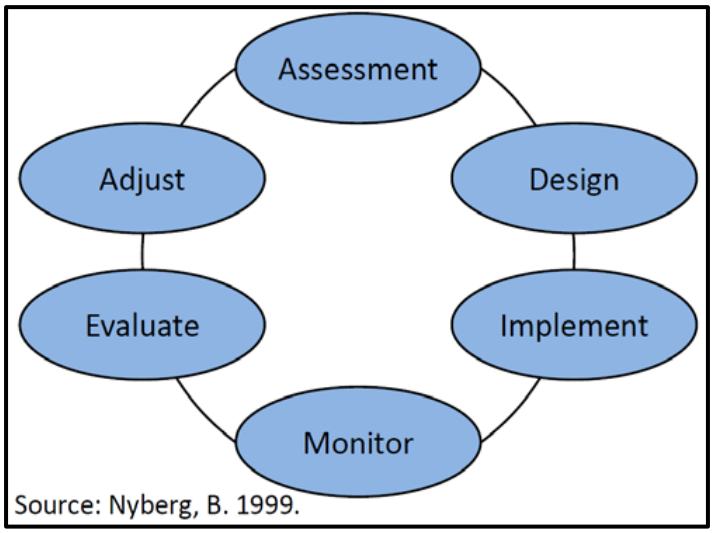
When mitigation is required by law, Corps regulations require an adaptive approach be taken to implementing, monitoring and modifying mitigation actions to ensure they are offsetting significant project impacts (USACE Implementation Guidance for Section 2036(a) of WRDA 2007, Aug 2009). This guidance requires mitigation plans include: 1) a description of the mitigation action; 2) a description of the type and amount of habitat to be restored; 3) ecological success criteria including specific metrics to quantify success; 4) a monitoring plan; 5) a contingency plan; and 6) a real estate plan. The mitigation plan also will establish a consultation process with appropriate Federal and state agencies to evaluate mitigation effectiveness, including monitoring and determining the success of mitigation. While this is not required by

law for the Regulating Works Project, it is anticipated that any compensatory mitigation done under the Project would follow this process (see below).

3.1 Monitoring and Adaptive Management

The impact to this specific habitat was deemed to be a significant impact for the overall Project within the SEIS; therefore, the compensatory mitigation will also be considered on an overall Project basis moving forward[2]. This will be achieved through a monitoring and adaptive management plan developed specifically for the Project.

The foundation of the adaptive management plan is provided in the SEIS, which outlines the basic steps of the adaptive management process; (1) Assess; (2) Design; (3) Implement; (4) Monitor; (5) Evaluate; and (6) Adjust. In practice, adaptive management is implemented in a non-linear sequence, in an iterative way, starting at various points in the process and repeating steps based on improved knowledge.



The Regulating Works Project is somewhat unique relative to other construction projects, given that it has been ongoing for many years and will likely continue until a minimal amount of dredging is required to maintain the navigation channel throughout the MMR. Further, construction activities carried out under the Project are implemented at various sites throughout the MMR, all with different timelines and completion dates. As such, the Project's adaptive management plan and the aforementioned steps of the process cannot be tailored to a single mitigation action implemented for a single completed construction activity, which would result in a relatively straightforward and simplified adaptive management process. Rather, the adaptive management process for the Regulating Works Project will have an added level of complexity; not only will it be an iterative process, but multiple steps will take place concurrently.

Specific construction activities and mitigation actions could fall under any of the six steps outlined above, and switch to a different step at any given time in light of new information or data collected through monitoring efforts. Further, since consideration of compensatory mitigation is based upon impacts from the overall Project, the step at which any given work area

[2] Note that in the SEIS, sometimes the word “programmatic” impact or mitigation was used. However, the Regulating Works Project is a single, on-going project rather than a “program” in the true sense. Based upon CEQ Guidance a programmatic approach to NEPA assessment was taken due to the on-going nature of this particular Project and the fact that future construction (i.e., “work areas”) is not known for the entire Project. Any confusion on this issue has attempted to be clarified herein and in the responses to public and agency comments.

falls under is dependent on all the other work areas. For example, an assessment of planned construction activity could reveal a loss in AAHUs would result from the work. The adaptive management team (see below) may then decide to implement a compensatory mitigation action that had been previously designed. However, a concurrent monitoring effort of a previously completed mitigation action could reveal a higher increase in AAHUs than what was initially anticipated through modeling efforts. The newly revealed increase in AAHUs essentially offsets the loss that triggered the implementation of the mitigation action, thereby moving the new mitigation action from the implementation step back to the design step.

That hypothetical situation is just one of many different scenarios that are likely to occur as the Project's adaptive management plan is implemented. Given the nature of the Project and the subsequent complexities of its monitoring and adaptive management plan, the District is committed to being fully transparent with every detail of the process, including data sources used, site-specific and overall Project updates to AAHUs due to monitoring efforts, mitigation site planning, decisions made at adaptive management team meetings, etc. Accordingly, all future SSEAs will include the site-specific information presented in Table 1, make note of the updated information, and provide discussion on how updated information has affected the overall adaptive management process for the entire Project.

3.2 Adaptive Management Team

An Adaptive Management Team (AMT) would provide essential support to meeting goals and objectives through the application of a systemic approach to evaluating Project impacts, mitigation and mitigation effectiveness. The AMT will consist of a multi-agency (state and Federal) staff from the appropriate disciplines, including engineering, planning, environmental science and resource management. As this is not a cost-shared Project, the Corps serves as the AMT leader.

The AMT for the Project is essentially already established, in the form of the current interagency coordination process the District uses, which was officially codified in a 2002 Memorandum of Understanding (MOU) between the District and the U.S. Fish and Wildlife Service, the Illinois Department of Natural Resources, and the Missouri Department of Conservation and described in the SEIS. The MOU created the River Resources Action Team (RRAT) as the official forum to be used for interagency coordination of the Regulating Works Project and other Mississippi River navigation channel actions within the District. The RRAT was created to:

- Enhance and formalize the interagency coordination process;
- Foster a cooperative interagency partnership;
- Ensure consistency of interagency coordination;
- Identify a collaborative mechanism for project coordination;
- Provide effective implementation of the 2000 Biological Opinion; and
- Use a team approach to restore and protect UMR watersheds and ecosystems.

Through the RRAT the District coordinates all Project activities with interagency coordination meetings at least twice per year and on an as-needed basis for specific work areas or activities.

All aspects of compensatory mitigation, monitoring, and adaptive management for the Regulating Works Project will be coordinated with the interagency partners that comprise the RRAT. Further, they will be intimately involved in the planning process for activities carried out under the adaptive management plan, including mitigation site selection, mitigation measures (e.g., dike notching, dike removal), collection of monitoring data, as well as the establishment of goals and objectives. Since the completion of the SEIS, AMT coordination and discussions have occurred at two separate RRAT meetings as follows:

- RRAT Executive meeting - 19 December 2017.
- RRAT Executive meeting - 23 January 2018.

These initial AMT discussions involved coordination and presentation of the information found in Chapter 2 of this report, including the development of the MMR Sturgeon Chub Model, the model application process, and the results of the initial mitigation assessment. Further, AMT members discussed the selection of proposed mitigation sites (see below), details of the AM process, due-outs of AMT members, and the next steps of the AM process.

3.3 Goals, Objectives and Performance Standards/Metrics

The SEIS discusses the incorporation of goals, objectives, and performance standards/metrics, within the adaptive management plan. The goals and objectives on the overall Project will be fully developed based on input from the AMT during future Tier II site specific Environmental Assessments, which will include detailed mitigation plans when applicable. Goals and objectives will be largely based on the existing conditions within the proposed mitigation area. Examples might be to increase longitudinal connectivity of aquatic habitat within a dike field, increase the overall area of a sandbar, etc. While the goals and objectives developed by the AMT might be somewhat subjective in nature, based largely on subject matter expertise, they must ultimately be captured by the performance standard/metric in order to successfully quantify the effectiveness of a specific mitigation action.

Performance standards/metrics include potential metrics for quantifying impacts following construction and measuring mitigation effectiveness. Because the general goal of mitigation will be to replace the habitat value lost through significant Project impacts, the performance metric will be the same metric used to assess the potential for compensatory mitigation (i.e., AAHUs). For planning purposes, the MMR Sturgeon Chub Model will be used to estimate the AAHUs that would result from a proposed mitigation action prior to implementation. This will be done to ensure that proposed mitigation actions compensate for the appropriate amount of habitat lost in the MMR due to new construction activities. The initial AAHU calculation will be achieved by using the best available existing data, as well as hydraulic modeling efforts. However, while the estimated AAHUs will officially be accounted for within the overall Project AAHU tally and, thus, impact the decision making and adaptive management processes, these numbers are subject to change at any given time as a result of post-construction monitoring. All updated AAHUs will be noted and discussed in all subsequent NEPA documentation.

3.4 Mitigation Site Planning

Once the specific amount of significant adverse future impact that warrants consideration of mitigation has been identified by the AMT, the Corps will consider multiple alternatives to mitigate these impacts. This includes consideration of the cost for different mitigation alternatives, and the amount of mitigation benefits generated by each alternative. Mitigation benefits will be estimated and quantified with a HEP analysis, which will produce potential AAHUs that could be achieved through each mitigation action. Then a Cost Effectiveness/Incremental Cost Analysis (CE/ICA) will be performed to compare the alternatives. This helps ensure the Corps is making an informed selection on the most cost-effective mitigation approach.

Potential mitigation actions may include, but are not limited to the following: wing dike notching, dike removal, wing dike creation using alternative designs (e.g., rootless dikes), use of rock piles, dredging or material placement of sand, and other possible activities. Mitigation will be tailored toward the goals and objectives identified by the AMT, but will generally be designed to compensate for the loss of shallow to moderate-depth, moderate-to high-velocity habitat along the main channel border habitat. Such habitat may be challenging to design and effectively implement. The ability to design for such habitat may need to be carefully considered within the context of the impacts. Mitigation from impacts will be considered to the extent practicable, including the associated costs and potential negative impacts to the navigation channel. Compensatory mitigation actions cannot counter the Project purpose; they must be designed such that no adverse effects to the navigation channel occur, increasing the need for channel maintenance dredging.

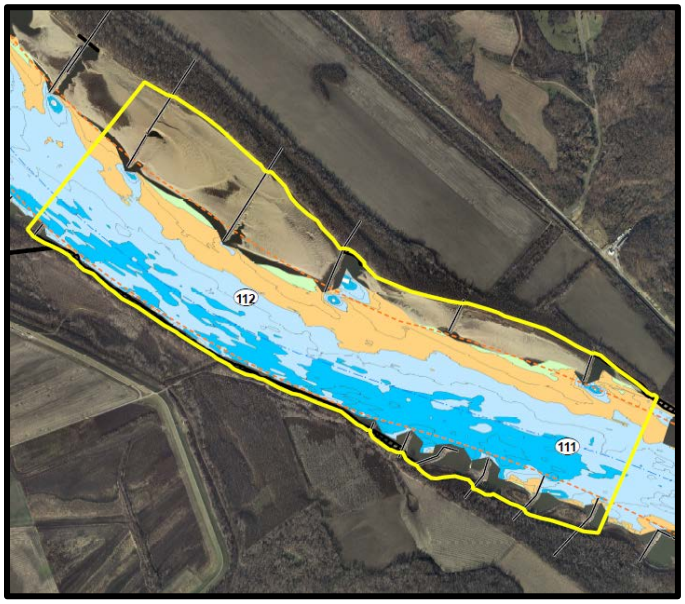


Figure 14. Example of a potential mitigation work site in the MMR identified by District hydrualic engineers.

Due to the results of the initial assessment, compensatory mitigation action is not currently warranted. However, it is anticipated that some degree of compensatory mitigation will eventually be warranted as new work is carried out under the Project. Therefore, planning of mitigation work will proceed concurrently with the normal Project process. Through a cooperative effort with the AMT, the District is in the process of selecting prospective mitigation sites in preparation for designing various mitigation alternatives. Initially, District hydraulic engineers identified a list of potential mitigation work areas in the MMR, with the overarching criteria that mitigation work could not negatively affect the navigation channel, leading to future channel maintenance

dredging. Five comprehensive hydrographic surveys (2005, 2007, 2010, 2013, and 2014) were studied to identify reaches that had a thalweg with sufficient depth and width beyond the minimum authorized dimensions (depth that exceeded -18 LWRP14). Next, specific criteria were used to further refine the potential mitigation sites:

- The desired depth was not within a weir field;
- No recent construction has occurred in the area;
- The area has existing structures that could be removed or modified to restore habitat;
- No plans for future construction in the area; and
- Work in the area would not impact the navigation channel in another district.

This effort resulted in 23 reaches of various lengths within the MMR in which mitigation work would likely be feasible (Figure 14). During the RRAT Executive meeting held 23 January 2018, the AMT discussed the restoration potential of each of the 23 sites, shared ideas on potential mitigation measures that could be implemented at each site, and ranked the sites accordingly. The AMT decided the top six sites would be carried forward into the design phase. Currently, District hydraulic engineers are designing and modeling potential mitigation measures at each of the six sites based on input from the AMT. This effort will ensure the discussed mitigation measures are feasible, would not adversely affect the navigation channel, and would result in a net gain in AAHUs. Ultimately, multiple mitigation alternatives will be developed for each of the six sites, after which a CE/ICA will be performed thus ensuring the District and the AMT have a sufficient list of cost effective mitigation alternatives to select from when compensatory mitigation measures are considered and deemed warranted due to overall Project impacts to shallow to moderate-depth, moderate-to high-velocity habitat MCB habitat.

3.5 Monitoring

The CEQ NEPA Task Force (CEQ 2003) suggests that the effectiveness of adaptive management hinges upon an effective monitoring program to establish objectives, thresholds, and baseline conditions. As discussed above, this will be achieved through a stepwise process that includes pre- and post-construction monitoring of physical habitat. These monitoring activities will occur for both impact and mitigation sites, allowing impacts to be verified, and for mitigation effectiveness to be evaluated.

Following the adaptive framework of this document, impacts will be monitored over time and performance of measures will be assessed to determine whether additional avoidance, minimization, or compensatory mitigation measures should be considered. Future monitoring will provide information on the accuracy of the conclusions reached on the extent of impacts from the work area features and evaluate the effectiveness of mitigation. Monitoring activities, including review of results, will be performed collaboratively with the AMT. The specific monitoring methods will be tailored to each of the Chub Model parameters, except for the structured/unstructured model parameter which does not require any monitoring, as it is simply based on the delineation of river training structures in the work areas. Details are as follows:

- Velocity - Once completed work areas have reached dynamic equilibrium, District channel survey vessels will be used to collect acoustic doppler current profile (ADCP) data during a period of moderate discharge. Timing and execution of ADCP data collection is largely dependent on river stage/discharge and the existing physical conditions found at each site, coupled with the location and workload of the survey vessels at that given time. Therefore, ADCP data collection will be tentatively scheduled only after completed work areas have reached dynamic equilibrium, without strict execution dates. This flexibility will allow for proper execution during the appropriate stage and discharge. Collecting velocity data at flows that are higher or lower than the moderate discharge used in the development of the model can impact the model results. If velocity data cannot be collected during the appropriate stage and discharge, a numeric model or other method of estimating velocity may be required.

- Depth - District channel survey vessels will be used to collect bathymetric survey data. The District monitors the navigation channel depths by maintaining updated bathymetry throughout the MMR. This is achieved by performing periodic reach-wide channel surveys using single-beam bathymetry. These data will be relied upon to monitor and update depths for each of the work areas, and to determine whether sites have reached dynamic equilibrium. If and when the channel surveys lack sufficient data for specific work areas, the District may deploy survey vessels to collect site specific multi-beam bathymetric data.

- Substrate - Monitoring of substrate conditions at completed work sites will be largely based on visual observations made at completed work sites, at which time the post-construction substrate category could be updated for any of the work sites assessed herein, potentially altering the overall Project tally of AAHUs. Further, if visual observation suggest that substantial changes to the substrate composition have occurred within a work area, ponar dredge grab samples could be collected to assess and confirm the observed changes.

The tentative schedule for site specific monitoring activities is presented in Table 1, along with the results of the initial mitigation assessment. Completed monitoring activities and subsequent changes to the monitoring and adaptive management process will be updated and discussed in all future NEPA documentation for the Regulating Works Project. Further the overall impacts of the Regulating Works Project will continue to be updated in further NEPA documentation.

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FINDING OF NO SIGNIFICANT IMPACT

Supplemental Environmental Assessment:

Mosenthein-Ivory Landing Phase 4
Eliza Point-Greenfield Bend Phase 3
Dogtooth Bend Phase 5
Mosenthein-Ivory Landing Phase 5
Grand Tower Phase 5

1. In accordance with the National Environmental Policy Act, I have reviewed and evaluated the documents concerning the supplement to the aforementioned Site-Specific Environmental Assessments (SSEAs) for the Regulating Works Project (Project). As part of this evaluation, I have considered:

    a. The potential impact on main channel border habitat identified in the SEIS;

    b. The Project's impact on main channel border habitat at the five work areas listed above;

    c. The development of the Middle Mississippi River Sturgeon Chub Model and its use in assessing the site specific work areas and

    d. The mitigation plan developed for the Project.

2. The potentially significant impact to main channel border habitat identified in the SEIS was unknown at the time the SSEAs were implemented. The completed construction activities have now been assessed in regards to this potential impact, and my evaluation of this assessment has contributed to my findings:

    a. Main channel border habitat for the MMR has not been significantly impacted by the construction of river training structures associated with the SSEAs;

    b. Compensatory mitigation action is not currently warranted for the Project, but will be re-evaluated as monitoring efforts are completed and future site-specific construction activities are planned; and

    c. An appropriate mitigation plan has been developed, which will ensure the Project is implemented without adversely affecting the environment.

3. Based on the evaluation and disclosure of impacts contained within the Supplemental Environmental Assessment, I find no significant impacts to the human environment are likely to occur as a result of the implemented actions.

06/14/2018
(Date)

Bryan K. Sizemore
BRYAN K. SIZEMORE
COL, EN
Commanding

Distribution List

The following individuals and organizations received e-mail notification of the Public Notice:

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Alexander County Highway Department
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Goode, Peter
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Harding, Scott
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Henry, Donovan
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HMT Bell South
Hoppies Marine

Howard, Chuck
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IL SHPO
Jamison, Larry
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Jefferson Port Authority
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Knuth, Dave
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Larson, Robert
Lauer, Steve
Lavalle, Tricia;
Leary, Alan
Lipeles, Maxie
Logicplus
Lorberg, Jerry
Louis Marine
Malone, Pat
Manders, Jon
Mangan, Matthew
Mannion, Clare
Marrs, T. Bruce
Mauer, Paul
McGinnis, Kelly
McPeek, Kraig
MDNR
Medina, Santita
Melgin, Wendy
Menees, Bob
Middleton, Joeana;
Senator McCaskill
Miller, Jeff
Miller, Kenneth
Miller, M
Missouri Corn Growers Association
Morgan, Justin
Morrison, Bruce
Muench, Lynn
Muir, T
Nash-Mayberry, Jamie
Nelson, Lee
Niquette, Charles
Novak, Ron
O'Carroll, J
Paurus, Tim
Pehler, Kent
Peper, Sarah
Pinter, Nicholas
Popplewell, Mickey
Porter, Jason
Randolph, Anita
Reitz, Paul
Roark, Bev
Rowe, Kelly
Salveter, Amy
Samet, Melissa
Sauer, Randy
Schranz, Joseph Standing Bear
Schulte, Rose
SEMO Port
Senator Blunt’s Office
Shepard, Larry
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Slay, Glen
Smith, David
Southern Illinois Transfer
Spoth, Robert
Stahlman, Bill
Staten, Shane
Sternburg, Janet
Stewart, Robert
Stout, Robert
Strole, Todd
SUMR Waterways
Taylor, Susan
Teah, Philip
Todd, Brian

Tow Inc
Tyson, J
Urban, David
U.S. Salt
USEPA Region 5
USEPA Region 7
Vitello, Matt
Walker, Brad
Welge, Owen
Werner, Paul
Westlake, Ken
Wilmsmeyer, Dennis
Winship, Jaci
York Bridge Co.
Zupan, T

The following individuals received a hard copy mailing of the Public Notice:

Bighorse, Scott
Blankenship, Tina
Bradley, Russell
Campbell, Leon
Congressman Bost
Congressman Luetkemeyer
Congressman Smith
Congresswoman Wagner
Damptz, Amanda
Governor Greitens
Governor Rauner
Keo, Nellie
Knupp, Virgil
Korando, David
Houghton, Fay
Houston, Elena
Mezo, Braden
Schranz, Joseph Standing Bear
Senator Durbin
Senator Duckworth
Shepard, Ron
Spurlock, Jessica
Taflinger, Jim
Verble, Kenneth
Verble-Whitaker, LaRae

APPENDIX A.
Comments Received During Public Review Period

National Wildlife Federation
American Rivers
Great Rivers Environmental Law Center
Prairie Rivers Network

April 30, 2018

Via Email: Shane.M.Simmons@usace.army.mil

Shane Simmons
U.S. Army Corps of Engineers (CEMVP-PD-P)
1222 Spruce Street
St. Louis, MO 63103

Re: Comments on the March 2018 Draft Supplemental Environmental Assessment with Unsigned Finding of No Significant Impact Assessing Mitigation for Construction Carried Out During the Preparation of the Regulating Works Project Supplemental Environmental Impact Statement

Dear Shane Simmons:

The National Wildlife Federation, American Rivers and Prairie Rivers Network (collectively, the Conservation Organizations) appreciate the opportunity to submit these comments on the above-referenced Environmental Assessment (the "March 2018 EA").[1]

The Conservation Organizations urge the U.S. Army Corps of Engineers (Corps) to redo the March 2018 EA to ensure that it meets the requirements of the National Environmental Policy Act and the mitigation mandates established by the Water Resources Development Acts. The new environmental assessment should assess the full suite of direct, indirect, and cumulative adverse ecological and fish and wildlife impacts caused by each element of each project evaluated, and develop a specific mitigation plan that will ensure full mitigation for those adverse impacts, as required by law. Mitigation solutions should prioritize removal and modification of existing infrastructure and not construction of new infrastructure.

The National Wildlife Federation (NWF) is the nation's largest conservation education and advocacy organization. NWF has almost six million members and supporters and conservation affiliate organizations in 51 states and territories. NWF has a long history of advocating for the protection, restoration, and ecologically sound management of the Mississippi River. NWF also has a long history of working to modernize federal water resources planning to protect the nation's rivers, wetlands, floodplains, and coasts and the fish and wildlife that depend on those vital resources.

[1] The March 2018 EA evaluates the following five projects: Mosenthein-Ivory Landing Phase 4, Eliza Point-Greenfield Bend Phase 3, Dogtooth Bend Phase 5, Mosenthein-Ivory Landing Phase 5, and Grand Tower Phase 5.

American Rivers protects wild rivers, restores damaged rivers, and conserves clean water for people and nature. Since 1973, American Rivers has protected and restored more than 150,000 miles of rivers through advocacy efforts, on-the-ground projects, and an annual America's Most Endangered Rivers® campaign. Headquartered in Washington, DC, American Rivers has offices across the country and more than 200,000 members, supporters, and volunteers. The Upper Mississippi River is one of 11 priority river basins where American Rivers is concentrating and integrating our work to protect and restore rivers over the next 5 years.

Great Rivers Environmental Law Center is a nonprofit organization dedicated to providing free and reduced-fee public interest legal services to individuals and organizations working to protect and preserve Missouri's environment.

Prairie Rivers Network (PRN) is Illinois' advocate for clean water and healthy rivers. PRN champions clean, healthy rivers and lakes and safe drinking water to benefit the people and wildlife of Illinois. Drawing upon sound science and working cooperatively with others, PRN advocates public policies and cultural values that sustain the ecological health and biological diversity of water resources and aquatic ecosystems.

General Comments

The March 2018 EA suffers from multiple failings, including failing to comply with the impacts assessment and mitigation review requirements of the National Environmental Policy Act (NEPA) and failing to comply with the mandatory mitigation requirements established through the Water Resources Development Acts. The March 2018 EA also relies exclusively on a questionable mitigation model to identify needed mitigation.

The Conservation Organizations strongly support effective mitigation that strives to restore the natural ecological functions and processes in the Middle Mississippi River. We urge the Corps to prioritize the removal and/or modification of the more than 1,375 existing river training structures in this portion of the river to achieve these important mitigation goals. Regrettably, the March 2018 EA does not utilize this approach to mitigation but instead contends that the construction of a large suite of new river training structures can somehow mitigate the adverse impacts of other new river training structures located both 108 miles upstream and 64 miles downstream from the so-called "mitigation" site.

The Conservation Organizations urge the Corps to redo the March 2018 EA to ensure that it meets the requirements of the National Environmental Policy Act and the mitigation mandates established by the Water Resources Development Acts. The new environmental assessment should assess the full suite of direct, indirect, and cumulative adverse ecological and fish and wildlife impacts caused by each element of each project evaluated, and develop a specific mitigation plan that will ensure full mitigation for those adverse impacts, as required by law. Mitigation solutions should prioritize removal and modification of existing infrastructure and not construction of new infrastructure.

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Specific Comments

A. The March 2018 EA Fails to Comply With the National Environmental Policy Act

The March 2018 EA fails to comply with NEPA because it fails to evaluate project impacts, fails to properly evaluate mitigation, and improperly restricts the scope of review.

1. The March 2018 EA Fails to Properly Evaluate Project Impacts and Thus, Cannot Properly Evaluate Needed Mitigation

The March 2018 EA fails to comply with NEPA because it does not meaningfully evaluate project impacts. The failure to meaningfully assess the impacts of the projects reviewed in the March 2018 EA and the Regulating Works Project as a whole have been discussed extensively in previous comments submitted by the Conservation Organizations.

These include the comments submitted on the Environmental Assessments for the individual projects addressed in the March 2018 EA, and the comments submitted on the Draft and Final Supplemental Environmental Impact Statement for the Regulating Works Project. These comments are incorporated by reference as though fully set forth herein, and are attached to these comments as follows:

- Attachment A: June 27, 2017 comments on the Final Supplement I to the Final Environmental Impact Statement for the Mississippi River Between The Ohio And Missouri Rivers (Regulating Works) (May 2017).
- Attachment B: January 18, 2017 comments on the Regulating Works Project Draft Supplemental Environmental Impact Statement (November 2016).
- Attachment C: April 22, 2016 comments on Amended Draft Environmental Assessment with Unsigned Finding of No Significant Impact, Regulating Works Project Grand Tower Phase 5
- Attachment D: April 9, 2015 comments on Draft Environmental Assessment for Mosenthein/Ivory Landing Phase V Regulating Work Projects
- Attachment E: January 24, 2014 comments on Draft Environmental Assessment with Unsigned Finding of No Significant Impact, Regulating Works Project Dogtooth Bend Phase 5
- Attachment F: November 15, 2013 comments on the Draft Environmental Assessment with Unsigned Finding of No Significant Impact for Mosenthein/Ivory Landing Phase 4
- Attachment G: November 15, 2013 comments on Draft Environmental Assessment with Unsigned Finding of No Significant Impact, Regulating Work Projects Eliza Point/Greenfield Bend Phase 3.

Because the March 2018 EA has not meaningfully assessed the full extent of the harm to ecological resources and fish and wildlife as a result of the direct, indirect, and cumulative impacts of the projects assessed, it also cannot—and has not—properly evaluated the need for, amount of, and types of mitigation required to offset those adverse project impacts.

2. The March 2018 EA Fails to Properly Evaluate Mitigation

The March 2018 EA fails to comply with NEPA because it does not meaningfully evaluate mitigation measures. NEPA requires the Corps to discuss mitigation measures with "sufficient detail to ensure that environmental consequences have been fairly evaluated." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989). A "perfunctory description" of mitigating measures is not sufficient. *Neighbors of Cuddy Mountain v. U.S. Forest Service*, 137 F.3d 1372, 1380 (9th Cir.1998). NEPA also requires a discussion of the effectiveness of potential mitigation measures:

> "An essential component of a reasonably complete mitigation discussion is an assessment of whether the proposed mitigation measures can be effective. The Supreme Court has required a mitigation discussion precisely for the purpose of evaluating whether anticipated environmental impacts can be avoided. A mitigation discussion without at least *some* evaluation of effectiveness is useless in making that determination."

South Fork Band Council v. Dept. of Interior, 588 F.3d 718, 727 (9th Cir. 2009) (internal citations omitted).

A bald assertion that mitigation will be successful is not sufficient. The effectiveness must instead be supported by "substantial evidence in the record." *Wyoming Outdoor Council v. U.S. Army Corps of Eng'rs*, 351 F. Supp. 2d 1232, 1252 (D. Wyo. 2005).

The March 2018 EA does not satisfy these well-settled requirements for a meaningful assessment of mitigation for at least the following reasons:

(a) The March 2018 EA cannot—and has not—properly evaluated the need for, amount of, and types of mitigation required to offset adverse project impacts because it has not assessed the full extent of harm to ecological resources and fish and wildlife as a result of the direct, indirect, and cumulative impacts of the individual projects assessed or of the Regulating Works Project as a whole.

(b) The March 2018 EA does not discuss mitigation measures with "sufficient detail to ensure that environmental consequences have been fairly evaluated," and instead simply provides a list of possible mitigation activities:

> "Potential mitigation actions may include, but are not limited to, the following: wing dike notching, dike removal, wing dike creation using alternative designs (e.g., rootless dikes), use of rock piles, dredging or material placement of sand, and other possible activities. Mitigation will be tailored toward the goals and objectives identified by the AMT, but will generally be designed to compensate for the loss of shallow to moderate depth, moderate to high velocity habitat along the main channel border habitat. Such habitat may be challenging to design and effectively implement. The ability to design for such habitat, including the associated costs, may need to be carefully considered within the context of the impacts. Mitigation from impacts will be considered to the extent practicable." March 2018 EA at 28-29.

(c) The March 2018 EA fails to provide any discussion or assessment of the effectiveness of potential or actual mitigation measures.

(d) As discussed in Section B of these comments, the March 2018 EA fails to properly assess mitigation because it relies on a legally insupportable concept of "programmatic mitigation."

B. The March 2018 EA Fails to Comply with Mandatory Mitigation Requirements

The March 2018 EA fails to comply with the mandatory mitigation requirements established by the Water Resources Development Acts.

1. The March 2018 EA Fails to Mitigate Adverse Impacts That Are More Than Negligible

The Water Resources Development Acts require the Corps to mitigate all losses to "ecological resources and fish and wildlife" created by a project unless the Secretary determines that the adverse impacts to "ecological resources, including terrestrial and aquatic resources, and fish and wildlife losses created by such project" will be "negligible." 33 U.S.C. § 2283(d)(1). This mitigation must ensure that "impacts to bottomland hardwood forests are mitigated in-kind and harm to other habitat types are mitigated to not less than in-kind conditions, to the extent possible." 33 U.S.C. § 2283(d)(1).

The March 2018 EA fails to comply with these important mitigation requirements for at least the following reasons.

(a) The March 2018 EA does not propose mitigation for all impacts to natural resources and fish and wildlife that are more than negligible, as required by law. The Corps instead states that impacts must be "significant" before mitigation is required. March 2018 EA at 25.

(b) The March 2018 EA explicitly excludes projects from mitigation based solely on the purpose of the project assigned by the Corps. The March 2018 EA excludes from review all projects that did not have the purpose of "obtaining and maintaining the authorized navigation channel." March 2018 EA at 8. According to the Corps:

> "The potential adverse impact to MCB habitat identified in the SEIS is a product of the continued construction of river training structures for the purpose of obtaining and maintaining the authorized navigation channel. As such, the SSEA's for new construction of river training structures for other purposes under the Project were deemed not to have a significant adverse impact on this habitat, so these SSEA's were not reevaluated with the habitat model."

March 2018 EA at 8. Since the entire purpose of the Regulating Works Project is in fact to maintain the authorized navigation channel, the Corps' argument makes no sense. This approach is also in direct violation of the Corps' civil works construction mitigation requirements. The Corps' conclusion that the projects built for "other purposes" were "deemed not to have a significant adverse impact" is also completely arbitrary as it is has no support in the record.

(c) The March 2018 EA improperly considers impacts to only one habitat type: "shallow to moderate-depth, moderate- to high-velocity habitat." March 2018 EA at 8. Because it

explicitly looks only at impacts to this one habitat type, the March 2018 EA fails to discuss adverse impacts from construction of new revetment and construction of bendway weirs and other river training structures located in the navigation channel. *See, e.g.*, March 2018 EA at 15-21.

2. The March 2018 EA Utilizes a Legally Insupportable Concept of "Programmatic Mitigation"

The March 2018 EA utilizes a legally insupportable concept of "programmatic mitigation." According to the Corps:

> "The impact to this specific habitat was deemed to be a significant impact on a programmatic basis within the SEIS; therefore, the compensatory mitigation will also be considered on a programmatic basis moving forward. This will be achieved through a monitoring and adaptive management plan developed specifically for the Project."

March 2108 EA at 25-26. The Conservation Organizations are not aware of any justification in statute, regulation, case law, or implementing guidance that supports this concept. Development of a programmatic EIS or even a programmatic mitigation plan[2] does not justify determining the need for mitigation based on a "programmatic basis moving forward."

The Corps has utilized its novel "programmatic mitigation" concept to support its contention that activities conducted at River Miles 67 and 69 (Grand Tower Phase 5 Vancill Dikes) can effectively mitigate damages at River Miles 175 to 171 (Mosenthein-Ivory Landing Phase 4) and River Miles 3 to 2.2. (Eliza Point-Greenfield Bend Phase 3). *See* March 2018 EA at 15-24. According to the March 2018 EA:

> "While some of the construction has reduced the aforementioned habitat type in certain work area vicinities, the programmatic results demonstrate an overall net gain of this habitat type (i.e., increased AAHUs) within the MMR. This outcome is largely due to the construction activity completed at the Vancill Towhead work area – primarily the construction of the innovative S-dike structures."

March 2018 EA at 21. From an ecological perspective, even if the Vancill Dikes construction did increase this habitat type at the Grand Tower location, it is too far removed from the other sites to meaningfully offset habitat losses at the Mosenthein-Ivory and Eliza Point locations. The March 2018 EA also fails to provide any evidence that the adverse impacts of habitat lost at one location can somehow be replaced or offset by creating new habitat 108 miles upstream or 64 miles downstream. To put these distances in perspective – it would take one hour and 48 minutes driving at 60 miles an hour to reach the Mosenthein-Ivory location from Grand Tower, and it would take more than one hour driving at 60 miles an hour to reach the Eliza Point site from Grand Tower.

[2] The Conservation Organizations are well aware that the Water Resources Reform and Development Act of 2014 authorized the development of programmatic mitigation plans. 33 U.S.C. § 2283(h). However, such plans, where they are developed, are merely a tool to help guide the development and implementation of the other mitigation requirements applicable to the Corps. See, e.g., 33 U.S.C. § 2283(h)(2) ("The Secretary shall, to the maximum extent practicable, use programmatic mitigation plans developed in accordance with this subsection to guide the development of a mitigation plan under subsection (d)"). Development of a programmatic mitigation plan does not eliminate the other mitigation requirements. 33 U.S.C. § 2283 (h)(11) (nothing in 33 U.S.C. 2283(h) "affects the mitigation responsibilities of the Secretary under any other provision of law."). Moreover, neither the March 2018 EA nor the Regulating Works Project Final SEIS establish a programmatic mitigation plan.

The Corps' "programmatic mitigation" approach also does not make sense from a planning perspective. The inclusion of the Grand Tower Phase 5 Vancill Dikes project in this EA was mere happenstance. The Grand Tower Phase 5 project construction was examined in a stand-alone environmental assessment that did not include a discussion of either the Mosenthein Ivory or Eliza Point projects. If the Corps had not included the Grand Tower Phase 5 Vancill Dikes project in the March 2018 EA, the Corps' would not be able to argue that this project would somehow offset the damage from the other projects.

The Corps' "programmatic mitigation" approach also fails to account for the significant cumulative adverse impacts of the Regulating Works Project. Rather than properly accounting for mitigation to address cumulative losses, the Corps has assessed a random subset of construction projects carried out under the project and has improperly concluded that new river training structure construction has somehow offset the impacts of a handful of other new river training structure construction projects.

3. The March 2018 EA Fails to Include a Specific Mitigation Plan, as Required by Law

Unless a Corps project will cause only "negligible" adverse impacts to ecological resources and fish and wildlife, each report recommending an alternative must include a specific mitigation plan that includes, at a minimum:

1. The type, amount, and characteristics of the habitat being restored, a description of the physical actions to be taken to carry out the restoration, and the functions and values that will be achieved;
2. The ecological success criteria, based on replacement of lost functions and values, that will be evaluated and used to determine mitigation success;
3. A description of the lands and interest in lands to be acquired for mitigation, and the basis for determining that those lands will be available;
4. A mitigation monitoring plan that includes the cost and duration of monitoring, and identifies the entities responsible for monitoring if it is practicable to do so (if the responsible entity is not identified in the monitoring plan it must be identified in the project partnership agreement that is required for all Corps projects). Corps mitigation must be monitored until the monitoring demonstrates that the ecological success criteria established in the mitigation plan have been met; and
5. A contingency plan for taking corrective action in cases where monitoring shows that mitigation is not achieving ecological success as defined in the plan. 33 U.S.C. § 2283(d).

"To mitigate losses to flood damage reduction capabilities and fish and wildlife resulting from a water resources project," Corps mitigation plans must also comply with "the mitigation standards and policies established pursuant to the regulatory programs" administered by the Corps.[3] 33 U.S.C. § 2283(d).

Corps mitigation must be monitored until the monitoring demonstrates that the ecological success criteria established in the mitigation plan have been met. The Corps is also required to consult yearly on each project with the appropriate Federal agencies and the states on the status of the mitigation efforts.

[3] In addition, mitigation lands for Corps civil works projects must be purchased before any construction begins. 33 U.S.C. § 2283(a). Any physical construction required for purposes of mitigation should also be undertaken prior to project construction but must, at the latest, be undertaken "concurrently with the physical construction of such project." *Id*.

The consultation must address the status of ecological success on the date of the consultation, the likelihood that the ecological success criteria will be met, the projected timeline for achieving that success, and any recommendations for improving the likelihood of success. 33 U.S.C. § 2283(d).

The March 2018 EA does not provide a specific plan to mitigate the adverse impacts of the Project that satisfies the requirements discussed above, including the requirement to monitor mitigation efforts until it can be demonstrated that the mitigation has been ecologically successful.

4. The March 2018 EA Improperly Concludes that Mitigation is Not Mandatory for the Regulating Works Project

The Water Resources Development Act of 2007 requires the Corps to implement mitigation, and comply with mitigation planning requirements, for any project for which the Corps "select[s] a project alternative in any report." 33 U.S.C. § 2283(d). As a result, the Corps is required to mitigate all harm to ecological resources and fish and wildlife that is more than negligible caused by the projects assessed in the March 2018 EA.

The March 2018 EA repeats the flawed contention from the Final Supplemental Environmental Impact Statement for the Regulating Works Project that the Corps is not legally required to carry out mitigation for the Regulating Works Project. March 2018 EA at 25 (according to the Corps, mitigation "is not required by law for the Regulating Works Project"). This interpretation is incorrect as 33 U.S.C. § 2283(d) explicitly requires the inclusion of a specific mitigation plan in "any report" that selects a project alternative, including the underlying EAs for each of the project's addressed in the March 2018 EA and for the continuation of the Regulating Works Project as recommended in the Final SEIS:

> "After November 17, 1986, the Secretary shall not submit any proposal for the authorization of any water resources project to Congress in any report, **and shall not select a project alternative in any report**, unless such report contains (A) a recommendation with a specific plan to mitigate for damages to ecological resources, including terrestrial and aquatic resources, and fish and wildlife losses created by such project, or (B) a determination by the Secretary that such project will have negligible adverse impact on ecological resources and fish and wildlife without the implementation of mitigation measures. Specific mitigation plans shall ensure that impacts to bottomland hardwood forests are mitigated in-kind, and other habitat types are mitigated to not less than in-kind conditions, to the extent possible. If the Secretary determines that mitigation to in-kind conditions is not possible, the Secretary shall identify in the report the basis for that determination and the mitigation measures that will be implemented to meet the requirements of this section and the goals of section 2317(a)(1) of this title. In carrying out this subsection, the Secretary shall consult with appropriate Federal and non-Federal agencies."

33 USC 2283(d)(1) (emphasis added).

Under the Corps' interpretation, the entire independent clause ", and shall not select a project alternative in any report" would be given no meaning whatsoever.[4] Under the Corps' interpretation the adjective "any" as a qualifier for "report" in that independent clause also would be given no meaning. However, such outcomes violate the most fundamental principles of statutory construction.

[4] This intended outcome is amplified by the fact that reports proposing authorization of a water resources project submitted to Congress by the Corps by their very nature select a project alternative.

It is "'a cardinal principle of **s**tatutory construction'" that "'a statute ought, upon the whole, to be so construed that, if it can be prevented, no clause, sentence, or word shall be superfluous, void, or insignificant.'" *TRW Inc. v. Andrews*, 534 U.S. 19, 31 (2001) (quoting *Duncan v. Walker*, 533 U.S. 167, 174 (2001)). Indeed, it is a court's "duty 'to give effect, if possible, to every clause and work of a statute.'" *United States v. Manasche*, 348 U.S. 528, 538-539 (1955) (quoting *Montclair v. Ramsdell*, 107 U.S. 147, 152 (1883)). As a result, "a statute must, if possible, be construed in such fashion that every word has some operative effect." *U. S. v. Nordic Village*, 503 U.S. 30, 36 (1992).

Moreover, "unless otherwise defined, words [of a statute] will be interpreted as taking their ordinary, contemporary, common meaning." *Perrin v. United States*, 444 U.S. 37, 42 (1979). As a result, the adjective "any" as the qualifier in the phrase "and shall not select a project alternative in any report" means just what it says. "Any" means "any" which is variously defined as every (*i.e.*, every report that selects an alternative) or "of whatever kind" (*i.e.*, a report of whatever kind that selects an alternative).

As a result, the Corps' claim that mitigation for the Regulating Works Project "is not required by law for the Regulating Works Project" is incorrect and cannot stand. March 2018 EA at 25. As a matter of law, the Corps must mitigate the adverse impacts of the projects evaluated in the March 2018 EA and for all elements of the Regulating Works Project going forward.

C. The March 2018 EA Relies Entirely on a Problematic Model for Assessing Needed Mitigation

The Conservation Organizations appreciate the fact that the St. Louis District provided a briefing on the Chubb Model to a number of conservation organizations prior to release of the March 2018 EA. However, the lack of detailed information on the model in the March 2018 EA precludes a full assessment of the model in these comments. The limited information that is provided does give rise to at least the following concerns with the model:

1. Both the model and its application appear to rely heavily on multiple layers of averaging to provide an output that is focused on only a single point in time (the end of the 50 year project life). This could result in significant modelling errors and outputs that do not properly evaluate impacts over time, calling into question the accuracy of the model outputs and any conclusions drawn from those outputs. For example, the March 2018 EA states that the model "combined and averaged" four separate HSI score rasters representing each of the four model parameters for use in the Chubb model. The habitat quality generated from the Chubb Model was then used in conjunction with total area of influence to derive additional averages—Average Annual Habitat Units (AAHUs). The AAHUs were then assessed over a 50 year period, "after which the net differences in AAHUs between these scenarios was derived."

2. The Chubb Model was also populated with data points derived from a model that also relied on a series of layered averages. The 3-D hydraulic model that "served as one of the primary sources of input data for the velocity parameter" relied on "average velocity rates" at select locations, and the "average velocity at each site" was then used to develop the velocity HSI score. Notably, only moderate discharge rates appear to have been used in that model, excluding low flows and flood flows from the model's assessment. March 2018 EA at 14.

3. The reliance on AAHUs ignores the need for specific habitat types during specific times of the year, or during specific periods of flow (i.e., low flow, moderate flow, high flow). Species' needs

can vary significantly during different times of the year or under different flow regimes, and these varying needs and conditions can have significant implications for species health and viability that should be accounted for in the model.

4. The model relies extensively on "best professional judgment" rather than actual field data or modeled data. While best professional judgment can be an appropriate tool, and it some cases must be relied on, the excessive reliance on best professional judgment calls into question the accuracy of the model outputs. For example, best professional judgment or simple "assumptions" were used in at least three of the four key model parameters:

    i. Area of Influence: "Because this general approach **relies heavily on best professional judgment**, some degree of subjectivity is required to ensure all potential changes to the aquatic habitat fall within the analyzed area of influence. Specifically, if changes to depth and velocity characteristics were anticipated further upstream or downstream, either due to the results of modeling efforts, post-construction data collection, **or simply best professional judgment**, the area of influence was extended to encompass such changes." March 2018 EA at 11 (emphasis added).

    ii. Structured vs. Unstructured: "While the model documentation and instructions provide a general definition for each of the three categorical options, **some degree of best professional judgment is required during the process of categorizing areas** based on the definitions." March 2018 EA at 12 (emphasis added).

    iii. Substrate: "However, given the fact that little predictive capability exists regarding changes to substrate composition resulting from the Project, and the fact that substrate data were not available, **it was assumed that the substrate in the work areas was mostly sand** (HSI = 0.5) for both the pre- and post-construction conditions. This assumption was further supported by empirical evidence from previously constructed dike fields within the MMR. Thus the substrate parameter had no influence on the net change to AAHUs in this initial assessment. However, new pre- and post-construction substrate data may become available as data are collected and visual observations are made at planned and completed work sites. Therefore, **this assumption may be revisited** during future project planning and mitigation assessments, at which time the pre- and post-construction substrate category could be updated for any of the work sites assessed herein, potentially altering the programmatic change in AAHUs." March 2018 EA at 13 (emphasis added).

5. It is not clear how the HSI values were selected, particularly the difference between the low quality habitat (HSI=3.0) and the moderate quality habitat (HSI=0.7). The process used to select the HSI values is not discussed in the March 2018 EA. The assignment of HSI values can have significant implications for the model outputs. During the briefing on the model, the Corps advised the participants that "Trawl data suggest that approximately 70% of sturgeon chub were collected from MCB areas outside of the influence of river training structures. Approximately 30% were collected in areas influenced by river training structures." However, it is not clear how this might translate into the HSI values for moderate and low quality habitat as areas outside of the influence of river training structures are identified as being high quality habitat in the March 2018 EA.

6. It is not clear why the model uses different approaches to assessing the habitat values influenced by structures versus the habitat values obtained by removing structures. While the March 2018 EA discusses these different approaches, the explanation is both confusing and strongly suggests that the model will create inconsistent outcomes. The explanation provided in the March 2018 EA is as follows:

> "The most commonly encountered scenario was new structures built in moderate score areas, resulting in a reduced structure score (0.7 to 0.3) for the area immediately downstream of the new structure. Further, if a structure was built in a high quality unstructured area, the drop in structure score was more severe (1.0 to 0.3) for the area immediately downstream of the structure, while the remaining area also dropped (1.0 to 0.7) because this area is now "influenced" by the structure (Figure 5). Lastly, a slightly different approach was taken to address the removal of structures. Given the definition of each category in the structured/unstructured parameter, the removal of any structure should result in a high quality structure score (1.0). Therefore, dike removal boosts the structure score (0.3 to 1.0) for the immediate downstream area, even if river training structures still exist within the total area of influence, that would otherwise be deemed as an "influence" on the newly opened area. This would result in a less substantial boost (0.3 to 0.7) to the structure score if the same approach to adding structures was used. Preliminary hydraulic modeling of potential mitigation sites revealed that structure removal would often fail to affect the depth and velocity parameters. Meaning these parameters would not capture any benefit of structure removal. Therefore, this alternate approach was necessary in order to fully quantify the benefit of complete structure removal when implementing future mitigation actions. The same habitat analysis and approach will be applied to mitigation actions in order to quantify the resulting net gain in AAHUs." March 2018 EA at 13.

7. Problems or limitations with the underlying models used to populate data points in the Chubb Model will also create significant problems with the Chubb Model that undermine the reliability of the Chubb Model outputs and conclusions drawn from those outputs. For example, as noted above, the 3-D hydraulic model that "served as one of the primary sources of input data for the velocity parameter" relied on multiple layers of data averaging and utilized only moderate flow rates. March 2018 EA at 14.

8. The March 2018 EA states that prior to collecting post-construction field data to assess the accuracy of the model predictions, each work area is to be given the time to "reach a state of dynamic equilibrium." March 2018 EA at 11. It is not clear, however, whether the state of dynamic equilibrium will be established at the three year mark, or at a much later date. According to the March 201 EA:

> "Collection of post construction field data will not be finalized until work sites reach a state of dynamic equilibrium, in which ongoing significant changes to bathymetry and flow patterns are no longer occurring. Allowing enough time for these changes to occur will ensure that post-construction field data best reflects the physical changes that would result from construction activities, and that mitigation assessments accurately capture the net gain/loss in AAHUs. **The immediate changes that result from construction or modification of river training structures typically occur within three years of implementation**, during which different seasonal hydrologic events can act

upon the site (e.g., high-flow events, droughts, etc.), **progressing it toward a state of dynamic equilibrium."** March 2018 EA at 11.

9. During the briefing on the model, the Corps advised the participants that the model had been certified for use and had been subjected to Independent External Peer Review (IEPR). However, the Corps also advised the participants that the IEPR was conducted by only one individual. The Conservation Organizations believe that a single-person IEPR process does not provide an appropriate level of outside review. In addition, information on the IEPR process (including all IEPR comments) and information on the model certification process should have been included with the March 2018 EA.

Conclusion

For at least the reasons set forth in these comments, the Conservation Organizations urge the Corps to redo the March 2018 EA to ensure that it meets the requirements of the National Environmental Policy Act and the mitigation mandates established by the Water Resources Development Acts. The new environmental assessment should assess the full suite of direct, indirect, and cumulative adverse ecological and fish and wildlife impacts caused by each element of each project evaluated, and develop a specific mitigation plan that will ensure full mitigation for those adverse impacts, as required by law. Mitigation solutions should prioritize removal and modification of existing infrastructure and not construction of new infrastructure.

Respectfully submitted,

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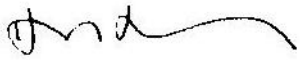

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Attachments A through G

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SARA PARKER PAULEY, Director

April 30, 2018

Shane Simmons
U.S. Army Corps of Engineers (CEMVP-PD-P)
1222 Spruce Street
St. Louis, MO 63103

Dear Mr. Simmons,

Thank you for the opportunity to review and comment on the Draft Supplemental Environmental Assessment with unsigned Finding of No Significant Impact for construction activities implemented under the St. Louis District's Regulating Works Project while the Regulating Works Project Supplemental Environmental Impact Statement (SEIS) was prepared. The Missouri Department of Conservation (Department) is the agency responsible for forest, fish, and wildlife resources in Missouri. As such, the Department actively participates in the review of National Environmental Policy Act (NEPA) documents when the project might affect those resources.

The Department offers the following comments on the SEA:

- The Department understands the intent of the SEA was to reevaluate these recent construction activities to determine impacts to shallow- to moderate-depth, moderate- to high-velocity habitat using the Chub Model developed during preparation of the SEIS. Although compensatory mitigation is based on the Chub Model and impacts to that specific habitat, it would be beneficial to include a description of other habitat types being created or lost regardless of the relevance to the Chub Model.

- Two of the projects resulted in negative Annual Average Habitat Units (AAHUs) comparing future without to future with project although the cumulative effect across all projects was an increase in AAHUs. We recommend future projects be evaluated individually or by grouping multiple phases of a project across a reach. In the projects evaluated in the SEA it would be appropriate to group the separate phases of specific reaches, i.e. Mosenthein and Grand Tower.

COMMISSION

DON C. BEDELL, Sikeston
MARILYNN J. BRADFORD, Jefferson City
DAVID W. MURPHY, Columbia
NICOLE E. WOOD, Bonne Terre

If you have any questions regarding these comments, please contact me at matt.vitello@mdc.mo.gov or by phone at 573-522-4115 extension 3191.

Sincerely,

MATT VITELLO, P.E.
POLICY COORDINATOR

c: USFWS: Matt Mangan
ILDNR: Butch Atwood

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Southern Illinois Sub-Office (ES)
8588 Route 148
Marion, Illinois 62959

FWS/SISO

April 30, 2018

Colonel Bryan K. Sizemore
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

Attn: Mr. Brian Johnson

Dear Colonel Sizemore:

Thank you for the opportunity to review and comment on the Supplemental Environmental Assessment (SEA) with unsigned Finding of No Significant Impact (FONSI) addressing construction activities implemented under the District's Regulating Works Project while the Regulating Works Project Supplemental Environmental Impact Statement (SEIS) was prepared. The purpose of the SEA is to quantify impacts to main channel border habitat and assess whether compensatory mitigation should be considered, as well as provide details on the development, implementation, and monitoring of potential mitigation actions going forward. These comments are prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.); and, the National Environmental Policy Act (83 Stat. 852, as amended P.L. 91-190, 42 U.S.C. 4321 et seq.).

Chapter 1 Introduction

The SEIS indicated that the continued construction of regulating training structures would be expected to have a significant impact on main channel border habitat due to the potential loss of approximately 1,100 acres (8%) of the remaining unstructured main channel border habitat in the Middle Mississippi River (MMR). The Corps indicated that this potential loss of habitat would result in the need for compensatory mitigation. While the Service agreed that unavoidable impacts should receive compensatory mitigation, the Services' mitigation policy places emphasis on avoidance and minimization of project impacts. The Service recommends that the Corps more clearly describe any avoidance and minimization measures that are utilized in developing project alternatives and that these measures are incorporated into the project record and compliance documents.

Chapter 2 Impact Assessment

Project impacts were evaluated using Habitat Evaluation Procedures (HEP) and specifically the MMR Sturgeon Chub Model. The model is intended to help quantify the impact of river training structures and evaluate the effectiveness of potential mitigation actions. The results of the initial mitigation assessment indicate an overall net gain in habitat across the five initial projects. This is largely due to the construction of one project utilizing newly developed "S-dike" structures. It is unclear whether the impact from these structures will match the model results given they have never been utilized before. Therefore, the model results will be compared with post-project monitoring to determine if the habitat evaluation score needs to be modified. This will also be done for the other four initial projects. Future projects will involve a comparison of pre- and post-project monitoring to more accurately measure project impacts and develop appropriate mitigation. Independent of these results, the Service still has concerns as to whether these river training structure modifications can truly create habitat that will be utilized by aquatic resources and mitigate for project impacts. The Service continues to recommend avoidance and minimization of sensitive fish habitats where possible.

Chapter 3 Mitigation Plan

Information included in the EA indicates that effectiveness of adaptive management hinges upon an effective monitoring program that establishes objectives, thresholds, and baseline conditions. The Corps is proposing to achieve this by utilizing pre- and post-construction monitoring of physical habitat to verify impacts and potential mitigation. However, no pre-project construction (baseline) monitoring has been conducted at the initial five Regulating Works Projects constructed prior to the completion of the SEIS. In addition, there is a lack of discussion regarding specific objectives or thresholds being utilized to verify project impacts and determine if mitigation is successful. The Service recommends that the Corps develop site specific monitoring plans for future projects that clearly define **pre-** and **post-project** monitoring requirements. In addition, the Corps should clearly define the objectives and thresholds that are being utilized for the monitoring program and for determining mitigation success.

The Corps is proposing to focus specifically on physical monitoring; however, it is unlikely that the success of a mitigation project can be evaluated solely utilizing physical habitat monitoring. The Service has recommended and continues to recommend that biological monitoring be a component of any monitoring or adaptive management plan. Especially for initial projects that will be used to help guide future project development. The Service also recommends that the Corps develop an adaptive management timeline for projects to ensure that the results of the monitoring are shared and reviewed by the Adaptive Management Team in a timely manner in order to inform future project/mitigation decisions.

The Service concurs with the FONSI for the proposed project. Thank you for the opportunity to provide comment on the EA and FONSI. For additional coordination, please contact me at (618) 998-5945.

Sincerely,

/s/ Matthew T. Mangan

Matthew T. Mangan
Fish and Wildlife Biologist

cc: EPA (Kowal)
IDNR (Atwood)
MDC (Vitello)

From:	Atwood, Butch
To:	Simmons, Shane M CIV USARMY CEMVP (US)
Cc:	Johnson, Brian L CIV USARMY CEMVS (US); Vitello, Matt; Matthew Mangan; McClelland, Michael
Subject:	[Non-DoD Source] Draft Supplemental Environmental Assessment with Unsigned Finding of No Significant Impact
Date:	Monday, April 30, 2018 6:47:01 PM

The Illinois Department of Natural Resources has reviewed the subject document and offer the following comments and suggestions for your consideration.

It's not clear in the document exactly how the raster analysis works. It would be very helpful if you could step through the analysis for us on at least one of the project areas. Grand Tower Phase 5 – Vancil Dikes would be a good example.

It would also be helpful if the total area of influence of each project were delineated on Figures 7 – 12.

We recommend projects be evaluated individually and on a reach by reach basis. Most fish populations and communities occupy discrete areas within specific reaches of river for most of their life cycles and, therefore, impacts and the need for mitigation should be evaluated and applied within the river reach in which it occurred so that local populations are appropriately compensated for loss of habitat. Reaches would be of mutually agreeable length and location and would be determined by the Adaptive Management Team (AMT).

Because the chub model gives us only a rough idea of impacts to MCB shallow to moderate – depth, moderate – to high – velocity habitat type we would suggest any reduction in the aforementioned habitat should be considered significant, with appropriate mitigation action applied (to be determined by the magnitude of AAHU loss due to project and professional judgement of the AMT). Those work areas showing net gain in AAHUs would not need mitigation.

We would recommend the report not be released until all work sites have achieved DE and all analyses are complete. Until the analysis is complete we cannot reliably determine the need for and amount of compensatory mitigation that will be necessary to achieve NEPA compliance.

Thank you for the opportunity to review and comment on this document.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

APR 0 2 2018

REPLY TO THE ATTENTION OF:

Shane Simmons
U.S. Army Corps of Engineers – St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103

Re: Regulating Works Project Draft Supplemental Environmental Assessment, Middle Mississippi River, Illinois and Missouri

Dear Mr. Simmons:

The Environmental Protection Agency reviewed the above-mentioned draft supplemental environmental assessment (SEA) dated March 2018 regarding proposed regulating works projects designed to maintain bank stability and ensure adequate navigation depth and width on the Middle Mississippi River (MMR)[1]. As stated in the SEA, the long-term goal of this proposed Regulating Works Project (Project) is to maintain the existing federal navigation channel, and reduce federal expenditures by alleviating the amount of annual maintenance dredging through the construction of regulating works. To that end, the St. Louis District of the U.S. Army Corps of Engineers is responsible for: 1) continually identifying and monitoring areas of the MMR that require frequent dredging to determine if an economical, long-term solution through regulating works is reasonable; and 2) monitoring bank stabilization areas to determine if additional work is needed to ensure the dependability of the navigation channel. This letter provides EPA's comments on the SEA, pursuant to our authorities under the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementing Regulations (40 CFR 1500-1508), and Section 309 of the Clean Air Act.

In 2013, the St. Louis District (District) of the U.S. Army Corps of Engineers (Corps) began the process of supplementing the 1976 Environmental Impact Statement (EIS). At that time, a decision was made to complete site-specific Environmental Assessments (SSEAs) for all new regulating works project construction prior to completion of the Supplemental EIS (SEIS). The SSEAs contained a commitment that, should the analyses undertaken as part of the SEIS process reveal any new impacts on the resources, ecosystem, or human environment not accounted for in the SSEAs, measures would be taken within the Corps' authority to avoid, minimize, and/or compensate for the impacts during the SEIS process, as appropriate. Ultimately, analyses completed as part of the SEIS process revealed that the alternative to continue construction of regulating works would likely have a significant adverse effect on shallow- to moderate-depth, moderate-to high-velocity habitat[2] along the main channel border. As stated in the SEIS, a habitat model has been developed to further evaluate the quantity and quality of this particular habitat impacted by new construction. The District reevaluated recent construction activities of the Project outlined in the SSEAs for impacts to main channel border habitat using the certified habitat model, given that the significant adverse impact to this habitat type was not known at the time the SSEAs were completed.

[1] MMR is defined as that portion of the Mississippi River that lies between its confluence with the Missouri River and the confluence with the Ohio River. Bank stabilization is achieved by revetment and river training structures; sediment management is achieved by river training structures.
[2] This habitat has been shown to be important for some MMR fish guilds that have seen declines in abundance since the mid-1900s.

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The purpose of the SEA is to supplement the completed SSEAs with site-specific quantification of impacts to main channel border habitat, for the purpose of assessing whether compensatory mitigation should be considered, as well as to provide the details of development, implementation, and monitoring of potential mitigation actions going forward[3]. The SEA indicates that, although construction of river training structures does benefit some MMR fish species by providing low-velocity habitats, the river training structures do not offset or compensate for the anticipated adverse effects to shallow- to moderate-depth, moderate- to high-velocity habitat. The adverse effects impact a different habitat type with a different function for a different group of fish than do the benefits. Due to these potential unavoidable adverse effects to main channel border habitat associated with future river training structure construction, the Corps anticipated these impacts would result in the consideration of compensatory mitigation. The Corps then developed a Sturgeon Chub Model[4] (Chub Model) based on input from an interagency workgroup that included U.S. Fish and Wildlife Service (USFWS), the Missouri Department of Conservation (MoDOC), and the Illinois Department of Natural Resources (IDNR). The Chub Model is designed to quantify changes to this specific habitat type and ultimately guide the quantification of potential compensatory mitigation.

After reviewing the SEA, EPA recommends the following issues be addressed before issuing a NEPA Decision Document.

Chub Model Application - Data Sources and Collection

The SEA states "*As part of its mitigation plan, the District will make a reasonable effort to collect post-construction field data from work sites during periods of moderate discharge, replacing some of the input data discussed herein, and updating this mitigation assessment as needed... Further, recognizing these data requirements moving forward, the District will attempt to collect depth and velocity data for both pre- and post-construction conditions for all future work completed under the Project, such that reliance on multiple data sources will be reduced during future mitigation calculations. ... Furthermore, prior to collecting post-construction field data, each work area will be given the opportunity to undergo the physical changes that result from implementation. Collection of post-construction field data will not be finalized until work sites reach a state of dynamic equilibrium, in which ongoing significant changes to bathymetry and flow patterns are no longer occurring.*"

Recommendations: Acknowledging budgetary constraints along with site-specific hydrologic windows during which field data can be collected, the above discussion concerning the collection of pre- and post-construction field data is vague. Because the impact to shallow- to moderate-depth, moderate- to high-velocity habitat was deemed to be a significant impact on a programmatic basis in the SEIS and monitoring and adaptive management are an integral part of the Project, EPA considers what the Corps deems a "reasonable effort" to monitor both pre- and post-construction

should receive more detail in the SEA. EPA recommends the Corps address the following in the SEA before a decision is reached:

1) Confirm that pre-construction field data (baseline data) will be collected at each Project site. If field data collection is not possible, how will the Corps supply pre-construction field data for the Chub Model?;

[5] The SEA indicates there is no new information or analyses that would suggest impacts to other resources would be different than those discussed in the SSEAs. Therefore, the other resources and impacts assessed in the SSEAs have not been re-evaluated or discussed in the SEA.

[4] Chub Model consists of Habitat Suitability Index (HSI) parameters for the habitat variables of depth, velocity, substrate, and structured/unstructured habitat.

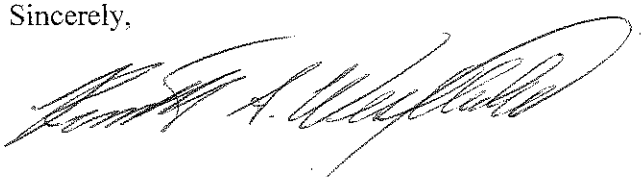
2) Confirm the parameter(s) that will indicate post-construction field data collection should commence (e.g., three seasons following completion of construction or modification of river training structures, dynamic equilibrium, etc.);
3) Indicate the anticipated duration of post-construction field data collection (e.g., one visit, several seasons until dynamic equilibrium or other endpoint is obtained, once each spring or fall depending on sturgeon chub life characteristics, etc.);
4) Indicate whether post-construction monitoring will include both physical and biological parameters (e.g., monitoring to determine whether habitat created by structures is utilized similarly to unstructured habitats);
5) Because monitoring and adaptive management are an integral part of the Project, indicate what trigger(s) obtained from post-construction monitoring might warrant a change in Project construction and/or mitigation; and
6) Indicate how often and with whom (e.g., interagency workgroup that assisted in development of the Chub Model) after-action reports will be shared and whether the recipients of the reports will have the chance to provide input concerning adaptive management for this habitat.

The above information would provide the public and relevant resource agencies with the Corps' intentions to monitor and adaptively manage mitigation for anticipated adverse effects to shallow- to moderate-depth, moderate- to high-velocity habitat.

EPA acknowledges the effort USACE expended to provide a robust technical review of the proposed project, as reflected in the SEA. EPA recommends adding (in future documents) a plain language summary or conclusion. "Connecting the dots," particularly when technical information (e.g., application of a model at various sites) is provided in an analysis, would help reviewers to understand and process technical information.

EPA appreciates the opportunity to review and comment on this project. Please send future NEPA documents concerning this proposed project to our office. If you have any questions about this letter, please contact Kathy Kowal of my staff at 312-353-5206 or via email at kowal.kathleen@epa.gov.

Sincerely,



Kenneth A. Westlake, Chief
NEPA Implementation Section
Office of Enforcement and Compliance Assurance

cc: (via email)
Matthew Mangan, USFWS
Adam Rawe, IDNR
Chris Wieberg, MoDOC

APPENDIX B.
Responses to Reviewer Comments

Responses to National Wildlife Federation, American Rivers, Great Rivers Environmental Law Center, and Prairie Rivers Network Comments

Comment A-1: *The March 2018 EA Fails to Comply With the National Environmental Policy Act.....The March 2018 EA Fails to Properly Evaluate Project Impacts and Thus, Cannot Properly Evaluate Needed Mitigation.*

Response: The "March 2018 EA" is a Supplemental Environmental Assessment (SEA). It was prepared to supplement each previously completed site-specific environmental assessment (SSEA) with an assessment of impacts to shallow to moderate-depth, moderate- to high-velocity main channel border (MCB) habitat using the MMR Sturgeon Chub Model (Chub Model) for the overall Regulating Works Project as discussed in the 2017 SEIS and as committed to in the SSEAs. Project and work area site-specific impacts are thoroughly evaluated in the SSEAs and the 2017 SEIS. For detailed responses to comments provided on the SSEAs and the 2017 SEIS see the applicable appendix in each document.

Comment A-2: *The March 2018 EA Fails to Comply With the National Environmental Policy Act.……The March 2018 EA Fails to Properly Evaluate Mitigation.*

Response: The Regulating Works Project authority for mitigation is pursuant to 33 USC § 2283(b), so mitigation for this project is discretionary and not required by law. However, mitigation has been evaluated for the Regulating Works Project and a programmatic monitoring and adaptive management plan has been developed for the Project, see Appendix C of the 2017 SEIS. As committed to in the 2017 SEIS and documented in the 2018 SEA, the District has developed the Chub Model and assessed impacts to MCB habitat at the work areas associated with the SSEAs. Loss or gain of Average Annual Habitat Units (AAHUs) have been calculated for each of the sites, and the District has committed to monitoring the sites and updating the AAHUs accordingly. The District will ensure the effectiveness of any compensatory mitigation measures that are implemented in the future. As stated in Section 3.4 of the SEA….

"Currently, District hydraulic engineers are designing and modeling potential mitigation measures at each of the six sites based on input from the AMT. This effort will ensure the discussed mitigation measures are feasible, would not adversely affect the navigation channel, and would result in a net gain in AAHUs."

Comment B-1: *The March 2018 EA Fails to Comply with Mandatory Mitigation Requirements.…… The March 2018 EA Fails to Mitigate Adverse Impacts That Are More Than Negligible.*

Response: The Regulating Works Project is not subject to any mandatory mitigation requirements. The reference to 33 USC § 2283(d)(1) is misplaced because it is not applicable to the SEIS since it is not a report being prepared for authorization by Congress. The Regulating Works Project authority for mitigation of project impacts is pursuant to 33 USC § 2283(b), which is discretionary and subject to funding limitations.

As such, the District has committed to evaluating the need for compensatory mitigation for the impacts to shallow to moderate-depth, moderate- to high-velocity MCB habitat for the entire Regulating Works Project – the only impact found to be potentially significant for the overall Project through the analyses completed as part of the 2017 SEIS. Further, some activities under the Regulating Works Project, as well as those done in the site-specific work areas discussed in the SSEAs, were excluded from the mitigation assessment because they did not involve construction of new river training structures associated with obtaining and maintaining the authorized navigation channel, which was the only action taken under the Project identified as having a potentially significant impact that warrants the consideration of compensatory mitigation as discussed in the 2017 SEIS.

Comment B-2: *The March 2018 EA Fails to Comply with Mandatory Mitigation Requirements.…… The March 2018 EA Utilizes a Legally Insupportable Concept of "Programmatic Mitigation."*

Response: See response to Comment A-2 above that the Regulating Works Project authority for mitigation is pursuant to 33 USC § 2283(b), so mitigation for this project is discretionary and not required by law. The mitigation plan developed for the overall Project is in accordance with current law, regulation, and guidance. The Regulating Works Project is a single, on-going project; therefore, the analysis of impacts as well as any consideration of compensatory mitigation within the Project footprint is appropriate. The potential adverse impact on MCB habitat was only found to be potentially significant when assessing overall Project impacts. As such, assessing this potential impact and any compensatory mitigation will be done on a Project-wide basis, and is legally supportable. Due to the confusion of the use of "programmatic" in both the 2017 SEIS and in the Draft SEA, the Final SEA has been modified to better clarify the mitigation assessment for the overall Project (see also Footnote 2 in Section 3.1 of the Final SEA).

Comment B-3: *The March 2018 EA Fails to Comply with Mandatory Mitigation Requirements.…… The March 2018 EA Fails to Include a Specific Mitigation Plan, as Required by Law.*

Response: When it is determined the Project's impacts warrant the consideration of compensatory mitigation, detailed mitigation planning will be completed on a site-specific, tiered EA approach, which will also include further details regarding monitoring and adaptive management, all in accordance with current law, regulation, and guidance as to the overall Project. This is in accordance with the following Council on Environmental Quality guidance: Memorandum for Heads of Federal Departments and Agencies, subject: Effective Use of Programmatic NEPA Reviews, 18 December 2014 pursuant to the project being an on-going project with unknown future specific construction plans as described in the guidance.

Comment B-4: *The March 2018 EA Fails to Comply with Mandatory Mitigation*

Requirements.……The March 2018 EA Improperly Concludes that Mitigation is Not Mandatory for the Regulating Works Project.

Response: See responses to Comments A-2 and B-1 above.

Comment C: *The March 2018 EA Relies Entirely on a Problematic Model for Assessing Needed Mitigation.*

Response: The Chub Model was prepared, certified and approved for use following USACE's model certification process (EC 1105-2-412) prior to being used to assess Project impacts. Language has been added to Section 1.4 of the SEA stating the incorporation by reference of the Chub Model documentation and certification documentation, which are now posted to the SEIS Library: http://www.mvs.usace.army.mil/Missions/Navigation/SEIS/Library.aspx.

Responses to the Missouri Department of Conservation Comments

Comment 1: *The Department understands the intent of the SEA was to reevaluate these recent construction activities to determine impacts to shallow- to moderate depth, moderate- to high-velocity habitat using the Chub Model developed during preparation of the SEIS. Although compensatory mitigation is based on the Chub Model and impacts to that specific habitat, it would be beneficial to include a description of other habitat types being created or lost regardless of the relevance to the Chub Model.*

Response: Impacts to other resources have been thoroughly evaluated and discussed in the site-specific environmental assessments prepared for each of the work area locations, as well as in the 2017 SEIS, all of which were incorporated by reference in the SEA.

Comment 2: *Two of the projects resulted in negative Annual Average Habitat Units (AAHUs) comparing future without to future with project although the cumulative effect across all projects was an increase in AAHUs. We recommend future projects be evaluated individually or by grouping multiple phases of a project across a reach. In the projects evaluated in the SEA it would be appropriate to group the Separate phases of specific reaches, i.e. Mosenthein and Grand Tower.*

Response: Through the analyses completed as part of the 2017 SEIS effort, the potential adverse impact on MCB habitat was only found to be potentially significant based upon the overall Regulating Works Project. As such, the District concluded that evaluation of Project impacts and assessment of any potential compensatory mitigation would be assessed to the entire Project and properly evaluated in tiered site-specific EAs accordingly. As stated in response to Conservation Organizations Comment B-2, the confusion created by using the word “programmatic” in both the 2017 SEIS and the Draft SEA has been clarified to note that the Regulating Works Project is not a “program” in the traditional sense but rather an on-going, single project with unknown future detailed work plans.

Responses to the U.S. Fish and Wildlife Service Comments

Comment 1: *While the Service agreed that unavoidable impacts should receive compensatory mitigation, the Services' mitigation policy places emphasis on avoidance and minimization of project impacts. The Service recommends that the Corps more clearly describe any avoidance and minimization measures that are utilized in developing project alternatives and that these measures are incorporated into the project record and compliance documents.*

Response: Avoidance and minimization measures used during the alternative development process are discussed in the SSEAs and the 2017 SEIS. The District will continue to provide the specific details on all avoidance and minimization measures included in site-specific alternative development in future NEPA documents. Further, the District will make its best attempt to increase the level of detail provided in future compliance documents and reports regarding the alternative development process and the avoidance and minimization measures incorporated into alternatives.

Comment 2: *It is unclear whether the impact from these structures will match the model results given they have never been utilized before. Therefore, the model results will be compared with post-project monitoring to determine if the habitat evaluation score needs to be modified. This will also be done for the other four initial projects. Future projects will involve a comparison of pre- and post-project monitoring to more accurately measure project impacts and develop appropriate mitigation. Independent of these results, the Service still has concerns as to whether these river training structure modifications can truly create habitat that will be utilized by aquatic resources and mitigate for project impacts. The Service continues to recommend avoidance and minimization of sensitive fish habitats where possible.*

Response: The Chub Model parameters were developed by analyzing multiple sets of trawling field data and by comparing the relative abundance of sturgeon chub found at different depths, velocities, and substrate types. Because the model was developed from real field data, the District believes an area with a high HSI score would reflect a functional aquatic habitat that would be utilized by sturgeon chub. If river training structures produce areas with relatively high HSI scores using the Chub Model, the District believes this would effectively offset other Project impacts. The District concurs with the Service's recommendation of continued avoidance and minimization of sensitive fish habitats, and will continue to include such measures in future site-specific alternatives.

Comment 3: *No pre-project construction (baseline) monitoring has been conducted at the initial five Regulating Works Projects constructed prior to the completion of the SEIS. In addition, there is a lack of discussion regarding specific objectives or thresholds being utilized to verify project impacts and determine if mitigation is successful. The Service recommends that the Corps develop site specific monitoring plans for future projects that clearly define pre- and post-project monitoring requirements. In addition, the Corps*

should clearly define the objectives and thresholds that are being utilized for the monitoring program and for determining mitigation success.

Response: The results of the assessment to the potentially significant impact to MCB habitat identified in the 2017 SEIS and documented in the SEA demonstrate that a specific mitigation action is not currently warranted. Therefore, a site-specific mitigation objective is not included in the SEA, but will be included in future site-specific mitigation plans when applicable. Site-specific monitoring plans are included in Section 2.4 of the SEA. The District acknowledges that an increased amount of detail (e.g., schedule, duration) for each site-specific plan would be ideal. However, given the complexities of collecting physical monitoring data on the MMR, providing further detail in the site-specific monitoring plans may in fact be misleading, as it would likely not be executed specifically as stated. For example, as noted in Section 3.5 of the SEA…

"Timing and execution of ADCP data collection is largely dependent on river stage/discharge and the existing physical conditions found at each site, coupled with the location and workload of the survey vessels at that given time. Therefore, ADCP data collection will be tentatively scheduled only after completed work areas have reached dynamic equilibrium, without strict execution dates. This flexibility will allow for proper execution during the appropriate stage and discharge."

For more information, see the response below to Comment 4 from the Illinois Department of Natural Resources.

Comment 4: *The Service has recommended and continues to recommend that biological monitoring be a component of any monitoring or adaptive management plan. Especially for initial projects that will be used to help guide future project development. The Service also recommends that the Corps develop an adaptive management timeline for projects to ensure that the results of the monitoring are shared and reviewed by the Adaptive Management Team in a timely manner in order to inform future project/mitigation decisions.*

Response 4: While we appreciate the desire to include biological monitoring, there is concern that including a biological monitoring component could lead to false determinations of success or failure. For example, the successful collection of sturgeon chub at a mitigation site would not necessarily constitute mitigation success in itself. Moreover, these animals are generally only found in low densities in the MMR and are not readily collected even with modern sampling gear. For these reasons, it is likely that biological sampling would lead to false negatives, in which sturgeon chub do utilize the habitat created through mitigation actions, but are simply not detected through sampling efforts. Regarding an adaptive management timeline, see the response to Comment 3 above.

Responses to the Illinois Department of Natural Resources Comments

Comment 1: *It's not clear in the document exactly how the raster analysis works. It would be very helpful if you could step through the analysis for us on at least one of the project areas. Grand Tower Phase 5 – Vancil Dikes would be a good example. It would also be helpful if the total area of influence of each project were delineated on Figures 7 – 12.*

Response: Information on the raster component of the mitigation analysis has been added to Section 2.2, and delineation of each area of influence has been added to Figures 7-12.

Comment 2: *We recommend projects be evaluated individually and on a reach by reach basis. Most fish populations and communities occupy discrete areas within specific reaches of river for most of their life cycles and, therefore, impacts and the need for mitigation should be evaluated and applied within the river reach in which it occurred so that local populations are appropriately compensated for loss of habitat. Reaches would be of mutually agreeable length and location and would be determined by the Adaptive Management Team (AMT).*

Response: See the above response to Comment B-2 from the National Wildlife Federation, American Rivers, Great Rivers Environmental Law Center, and the Prairie Rivers Network. Project impacts and mitigation will be assessed for the overall Regulating Works Project. During mitigation planning, the AMT can consider and discuss the proximity of potential mitigation sites to work areas where impacts to shallow to moderate-depth, moderate-to high-velocity MCB habitat have occurred.(i.e., Mosenthein-Ivory Landing Phase 4, Eliza Point-Greenfield Bend Phase 3), with the understanding of the need to work within the confines of the mitigation site criteria documented in Section 3.4 of the SEA.

Comment 3: *Because the chub model gives us only a rough idea of impacts to MCB shallow to moderate – depth, moderate – to high – velocity habitat type we would suggest any reduction in the aforementioned habitat should be considered significant, with appropriate mitigation action applied (to be determined by the magnitude of AAHU loss due to project and professional judgement of the AMT). Those work areas showing net gain in AAHUs would not need mitigation.*

Response: See the above response to Comment B-2 from the National Wildlife Federation, American Rivers, Great Rivers Environmental Law Center, and the Prairie Rivers Network. Project impacts and mitigation will be based upon the overall Project with updates on this assessment in tiered, site-specific documentation.

Comment 4: *We would recommend the report not be released until all work sites have achieved DE and all analyses are complete. Until the analysis is complete we cannot reliably determine the need for and amount of compensatory mitigation that will be necessary to achieve NEPA compliance.*

Response: The SEA was prepared to supplement each previously completed SSEA with an assessment of impacts to shallow to moderate-depth, moderate- to high-velocity MCB habitat using the Chub Model for the overall Regulating Works Project as discussed in the 2017 SEIS and as committed to in the SSEAs. The Project's adaptive management plan was developed precisely to address the fact the work sites will need time to reach DE, and that many changes to the work areas and their HSI scores will occur over that time. The District has acknowledged that the "need for and amount of compensatory mitigation" will likely change in the future as the monitoring and adaptive management plan are implemented. The signing of a FONSI and finalization of the SEA will not conclude our monitoring and adaptive management, mitigation determination, of the overall Project impact assessment. From Section 3.1 of the SEA….

"Given the nature of the Project and the subsequent complexities of its monitoring and adaptive management plan, the District is committed to being fully transparent with every detail of the process, including data sources used, site-specific and overall Project updates to AAHUs due to monitoring efforts, mitigation site planning, decisions made at adaptive management team meetings, etc. Accordingly, all future SSEAs will include the site-specific information presented in Table 1, make note of the updated information, and provide discussion on how updated information has affected the overall adaptive management process for the entire Project."

Responses to the Environmental Protection Agency Comments

Comment 1: *Confirm that pre-construction field data (baseline data) will be collected at each Project site. If field data collection is not possible, how will the Corps supply pre-construction field data for the Chub Model?*

Response: It is not necessary to collect pre-construction field data for the structure parameter, this is simply a delineation of current river training structures in the area. As a result of the comprehensive channel surveys performed by the District, pre-construction field data for the depth parameter (bathymetry) is readily available for use in all mitigation assessments. Substrate in the main channel of the MMR is composed primarily of sand; the District is confident in the assumption that sand was the primary substrate constituent at the work sites assessed in the SEA, and that it will be primary substrate constituent in future work sites. However, as noted in Section 2.2 of the SEA….

"New pre- and post-construction substrate data may become available as data are collected and visual observations are made at planned and completed work sites. Therefore, this assumption may be revisited during future Project planning and mitigation assessments, at which time the pre- and post-construction substrate category could be updated for any of the work sites assessed herein, potentially altering the change in AAHUs for the entire Project."

For the reasons noted in the SEA and cited in the comment letter provided by the EPA, the District cannot confirm that pre-construction field data for the velocity parameter will be collected prior to future mitigation assessments and/or construction activity. Collecting these data during the precise hydraulic window (i.e., mean discharge) required may prove to be impracticable. The District anticipates that 2-D hydraulic modeling will be required to produce pre-construction velocity data that can be applied to the Chub Model, because this method will allow for modeling during the exact discharge required by the chub model. The Language in Section 2.2 of the SEA has been updated for better clarity.

Comment 2: *Confirm the parameter(s) that will indicate post-construction field data collection should commence (e.g., three seasons following completion of construction or modification of river training structures, dynamic equilibrium, etc.).*

Response: Reaching a state of dynamic equilibrium will indicate that post-construction field monitoring should be collected for the velocity parameter. In the context of the Project's monitoring and adaptive management plan, dynamic equilibrium will be noted simply by a lack of ongoing significant changes to bathymetry in a work area, meaning multiple post-construction bathymetric surveys will need to be analyzed to determine whether dynamic equilibrium has been reached. Further, a quantitative definition of what constitutes dynamic equilibrium has not been developed for the Project because subtle changes to bathymetry will always occur around Project work areas throughout time. Developing a quantitative definition of dynamic equilibrium could falsely trigger post-construction field data collection or falsely indicate that the bathymetric conditions of a

site are still actively changing. Language in Section 2.2 of the SEA has been updated for better clarity.

Comment 3: *Indicate the anticipated duration of post-construction field data collection (e.g., one visit, several seasons until dynamic equilibrium or other endpoint is obtained, once each spring or fall depending on sturgeon chub life characteristics, etc.).*

Response: See response to Comment 2 above, that determination of dynamic equilibrium will require multiple bathymetric surveys to be performed. These are generally completed on a biannual basis, meaning that bathymetry will be monitored over the course of several years. If and when post-construction velocity field data can be successfully collected during the appropriate hydraulic window for a particular site (see above response to Comment 1 regarding the difficulty of collecting these data), this will mark the end of monitoring at that site. For example, as noted in Table 1 of the SEA; Eliza Point-Greenfield Bend Phase 3…

"If the site has reached DE, velocity field data will be collected and all HSI scores and AAHUs will be deemed final."

Language in Sections 2.2 and 3.5 of the SEA has been updated for better clarity.

Comment 4: *Indicate whether post-construction monitoring will include both physical and biological parameters (e.g .. monitoring to determine whether habitat created by structures is utilized similarly to unstructured habitats).*

Response: See response to USFWS Comment 4 above.

Comment 5: *Because monitoring and adaptive management are an integral part of the Project, indicate what trigger(s) obtained from post-construction monitoring might warrant a change in Project construction and/or mitigation.*

Response: Through a collaborative effort with the AMT, the District will track the overall Project AAHUs that result from the Project's monitoring and adaptive management plan. The team will determine if and when the overall loss of AAHUs will be deemed significant, and warrant any compensatory mitigation action. A specific threshold of AAHUs that would "trigger" mitigation action will not be established. However, given the results of the ongoing collaboration with the agencies included in the AMT, the District will implement the appropriate mitigation actions if and when it becomes reasonable and feasible.

Comment 6: *Indicate how often and with whom (e.g., interagency work group that assisted in*

development of the Chub Model) after-action reports will be shared and whether the recipients of the reports will have the chance to provide input concerning adaptive management for this habitat.

Response: This information is provided in Section 3.2 of the SEA.