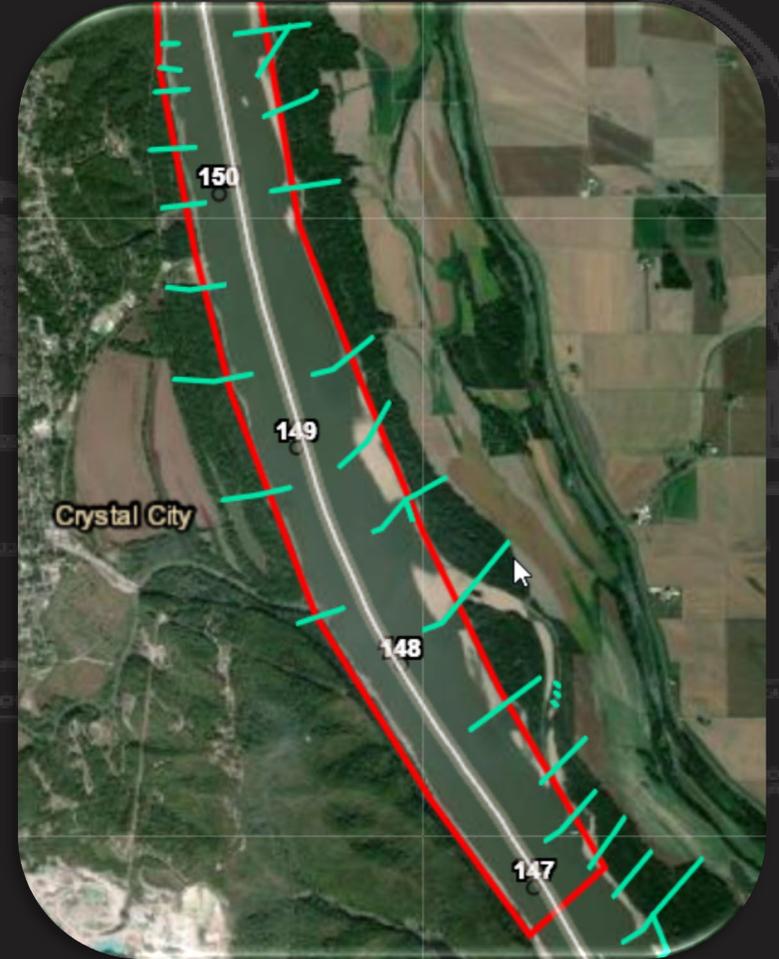


# NAVIGATION ECOSYSTEM SUSTAINABILITY PROGRAM (NESP) - MMR STONE DIKE ALTERATIONS

RRAT Trip  
12-14 Sep 2023



U.S. ARMY



US Army Corps  
of Engineers®

# STUDY OVERVIEW

- Authorization: Navigation Ecosystem Sustainability Program (NESP)
- Locations where the biological need aligns with an opportunity to alter existing navigation structures.
- Bankline to Bankline / under OHW, not including side channels
- Project measures would require minimal O&M costs. This project only modifies existing navigation structures; therefore, the construction of this project would be 100% Federal
- No Sponsor
- Estimated Total Project Cost is approx. \$15-18M (including an estimated \$200,000 for monitoring and \$300,000 for adaptive manage
- Endorsed by RRAT in July 2021 / USACE PDT kick off June 2022





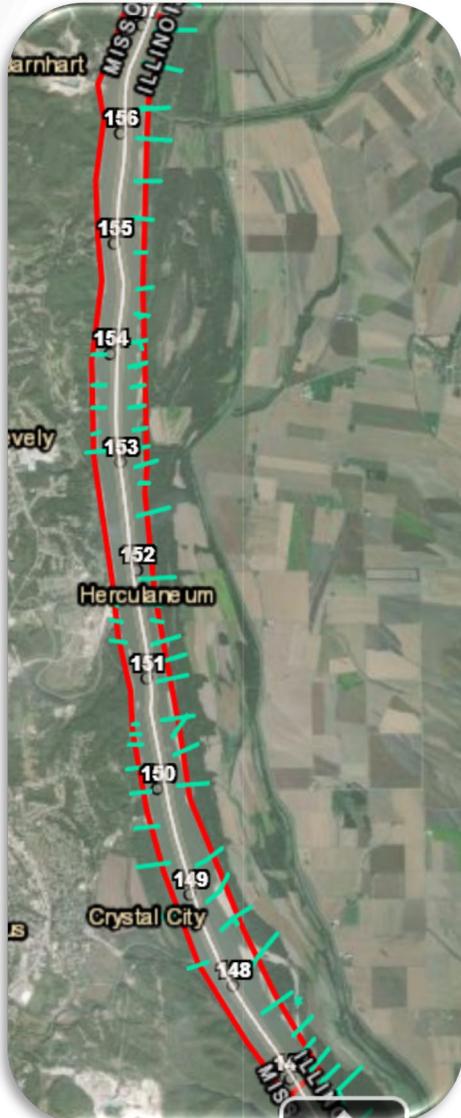
U.S. ARMY



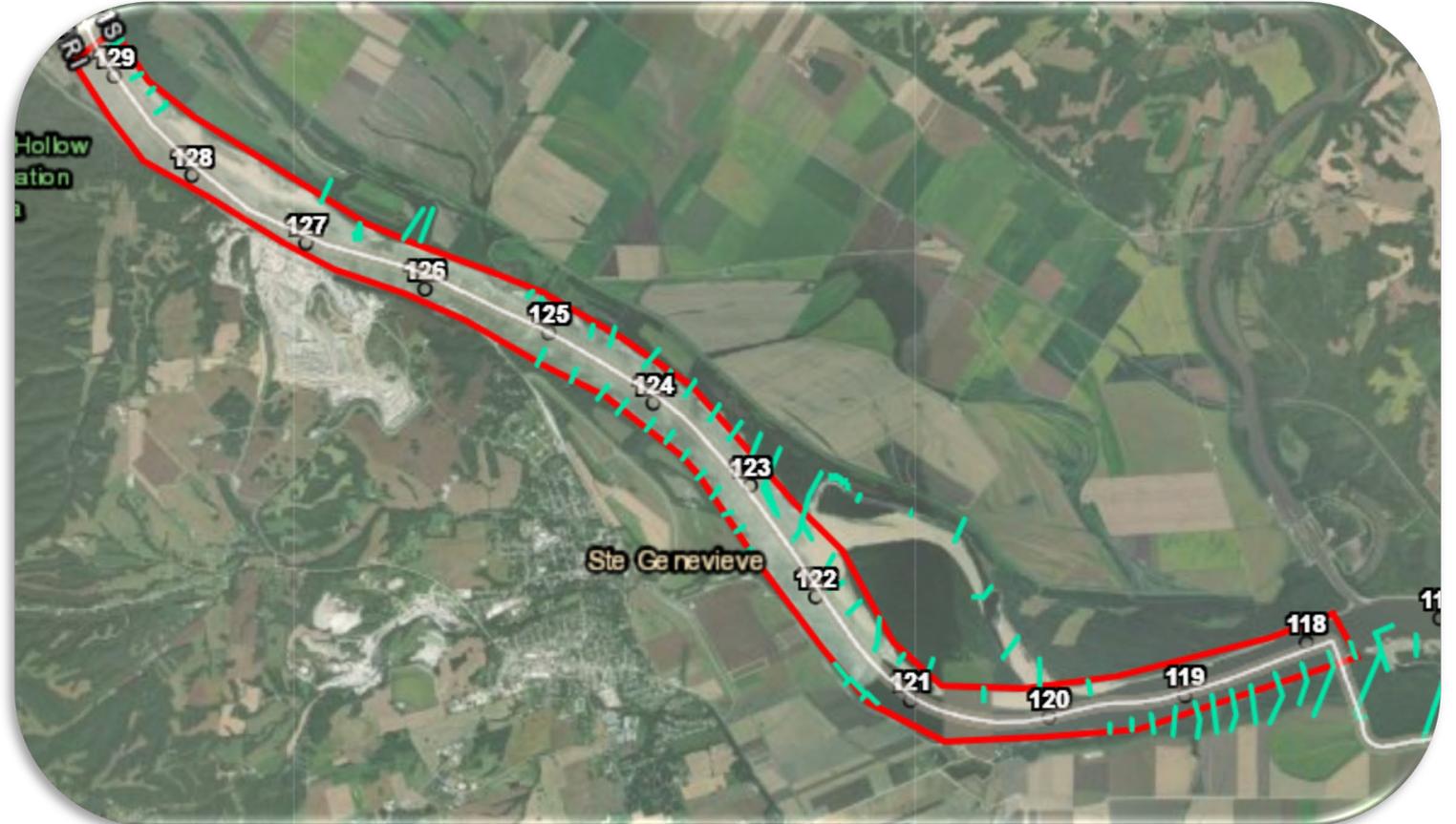
US Army Corps  
of Engineers®

# STUDY AREA

- Over 200 existing river training structures within approximately 3,500 acres of main channel border habitat
- Phase 1 focuses on two river reaches: RM 157-147 (Barnhart, MO to Crystal City, MO) and RM 129-118 (St. Genevieve, MO)



MMR RM 157-147



MMR RM 129-118

# BACKGROUND – PURPOSE OF STONE DIKES

- Constructed out of stone & built perpendicular to flow
- Vary in height and length; built approximately at a height midway up the channel & at varying lengths
- Placed in river to redirect the energy to provide a variety of effects
- Used to manage sediment response distribution within the channel to deepen the channel
- Provide adequate depth for navigation and reduce navigation maintenance



# PROBLEM

- Cause a homogeneous pattern of sediment deposition
- Limit the quality & diversity of aquatic habitat for riverine fishes
- Result in side channels, chutes and floodplain habitats becoming hydrologically disconnected from the river
- Lacking backwater habitat which is important feeding, spawning & nursery areas
- Lacking habitat for other environmentally sensitive wildlife and invertebrate species



# NEED & OBJECTIVES

**NEED:** Habitat need to diversify flow & depositional patterns within these homogenous dike fields to benefit native riverine species.

## OBJECTIVES:

- Improve flow and depositional diversity within dike fields
- Improve aquatic habitat for native riverine fishes
- Improve longitudinal connectivity for migratory spawners and small bodied fishes
- Improve substrate diversity

## MEASURES:

- Dike alteration (including but not limited to removal, lowering, degrading, raising, extending, or notching)
- Opportunistic incorporation of woody structure with dike alteration
- Reallocate altered dike material to form areas of cobble substrate



# EXAMPLE MEASURE – NOTCHED DIKE

- Continue to create navigation dimensions as well as support diverse habitats
- River is allowed to move in & out between the notches creating all four of the primary river habitats
- Sediment buildups & forms small sandbars between each of the dikes
- Resulting in the creation of diverse environments





U.S. ARMY



US Army Corps  
of Engineers®

# ALTERNATIVES

## HERCULANEUM REACH (RM 157-147)

Dike	Alternative 1 – Max Env Benefits	Alternative 2 – Constructability/Efficiency	Alternative 3 – Lowest Risk to Nav
156.7 L	Degradation and drag to riffle	Degradation with angled dike	Rootless
156.0 L	Replace with Z dike	Degrade to prevailing grade, leave tip	Replace with chevron
155.6 L	Replace with Z dike	Degrade to prevailing grade, leave tip	Replace with chevron
154.1L	Create irregular, undulating surface with up to 10 ft variation in heights. Leave tip high.	Create irregular, undulating surface with up to 10 ft variation in heights. Leave tip high.	No Action
153.90L	Create irregular, undulating surface with up to 10 ft variation in heights. Scatter material into scour in piles of varying height.	Create irregular, undulating surface with up to 10 ft variation in heights. Scatter material into scour in piles of varying height.	No Action
153.7 R	Use rock from removal of 153.25R for re-sloping and scattering	Use rock from removal of 153.25R for re-sloping and scattering	Use rock from removal of 153.25R for re-sloping and scattering
153.5 R	Use rock from removal of 153.25R for re-sloping and scattering	Use rock from removal of 153.25R for re-sloping and scattering	Use rock from removal of 153.25R for re-sloping and scattering
153.25 R	No Action	No Action	No Action
152.5 L	Removal; bankline revetment	Degradation; bankline revetment	Removal and replace with a mini Z dike upstream; bankline revetment
152.2 L	Removal; bankline revetment	Degradation; bankline revetment	Removal and replace with a mini Z dike upstream; bankline revetment
151.8 L	No Action	No Action	No Action
151.5 L	No Action	No Action	No Action
151.3 L	Removal	Step down	Rootless with angled upstream at tip, creating a scour hole behind dike, leaving some rock to create diversity
151.0 L	Removal	Degradation to create riffle	Step Down
147.1 L	Degrade to prevailing grade	Degrade to prevailing grade	No Action



U.S. ARMY



US Army Corps of Engineers®

# ALTERNATIVES

## STE. GENEVIEVE REACH (RM 129-118)

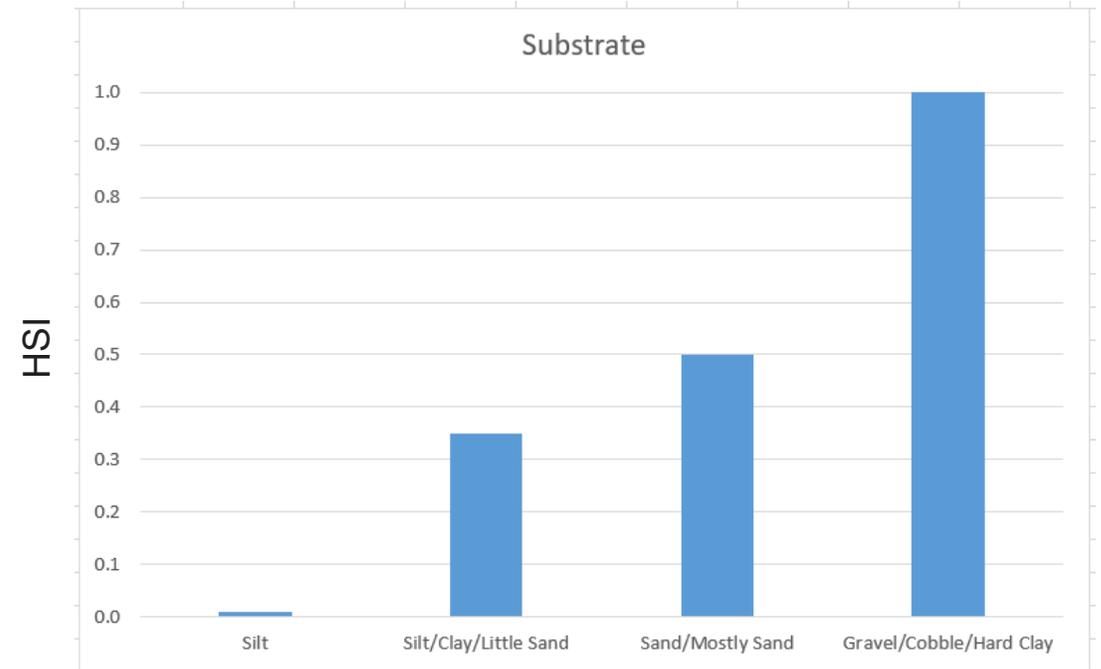
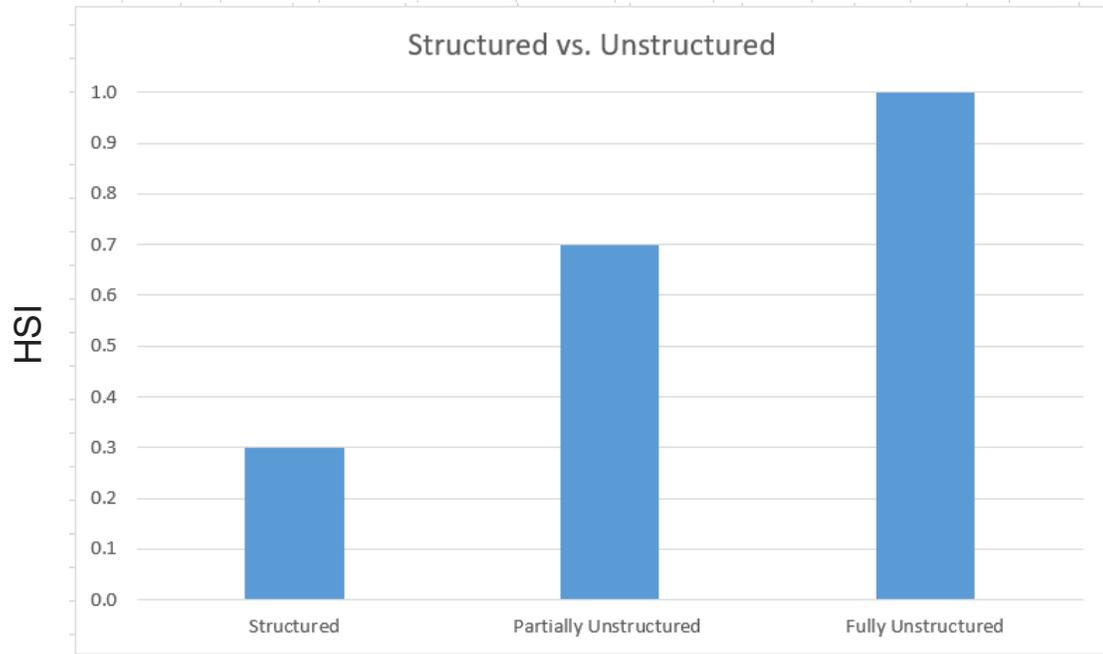
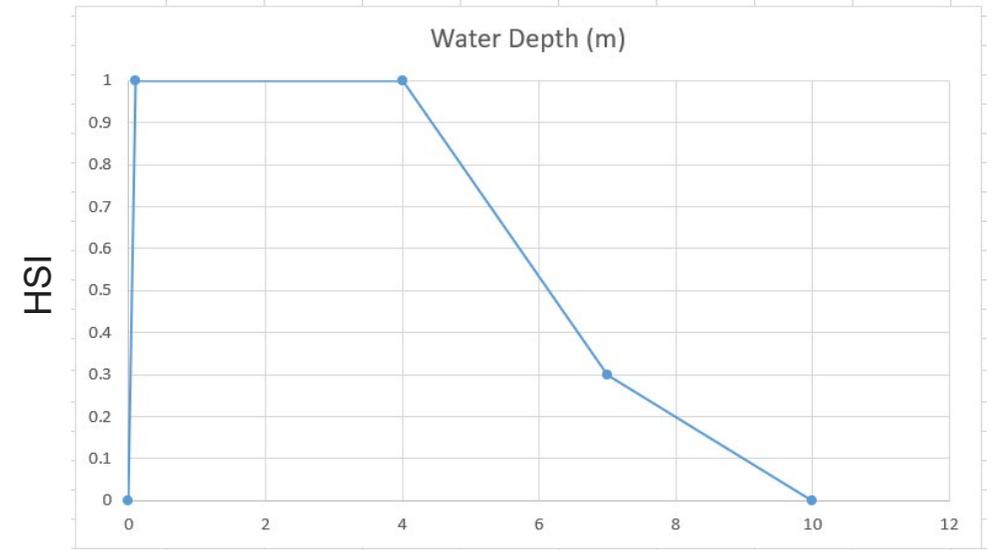
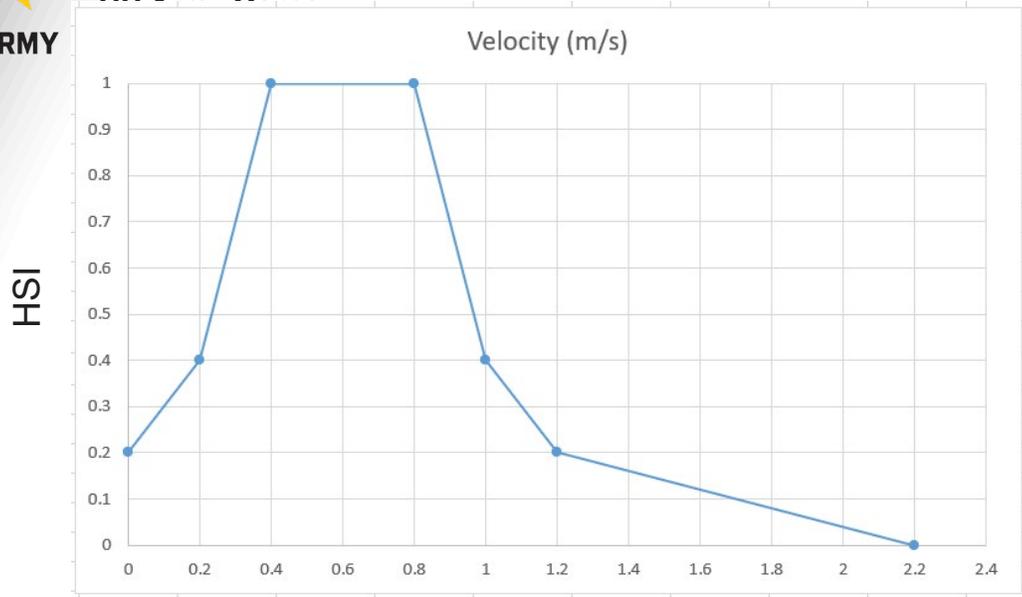
Dike	Alternative 1 – Max Env Benefits	Alternative 2 – Constructability/Efficiency	Alternative 3 – Lowest Risk to Nav
129.2 L	Lower notch; Degrade interior	Degrade interior	No Action
128.8 L	Shallow sloping bar formed by re-sloping higher at bank to lower to channel	Shallow sloping bar formed by re-sloping higher at bank to lower to channel	No Action
124.7 R	Mile 100 recreation (create flow along bank and create a separated islands (make all of them rootless))	Step down benches	Angle upstream (w potential notch near the bank like Brad's model)
124.5 R			
124.2 R			
123.9 R			
123.7 R			
123.5 R			
123.4 R			
123.2 R			
122.9 R			
122.8 R			
122.6 R			
122.1 L	No Action	No Action	No Action
121.9 L	Remove and trail upstream	Degrade	Degrade
121.5 L	Degrade / lower to prevailing grade for flow diversity; MRS "trail" upstream of dike in multiple locations.	Degrade / lower to prevailing grade	Degrade / lower to prevailing grade
121.2 L	Removal	Removal	Removal
121.0 L	Partial degrade; MRS Trail with rock from degradation	Partial degrade	Partial degrade
121.0 L	Partial degrade with MRS trail	Partial degrade	Partial degrade
120.7 L	Removal	Removal	Removal
120.20L	Potential MRS; Degrade to create additional sandbar habitat downstream	Potential MRS; Degrade to create additional sandbar habitat downstream	No Action
119.50R	Removal of multiple dikes	"Cheese Wedge" notch	Stepping down to prevailing grade
119.30R			
119.20R			
119.00R			
118.80R			
118.70R			
118.60R			
118.40R			
118.30R			
118.10R			



U.S. ARMY

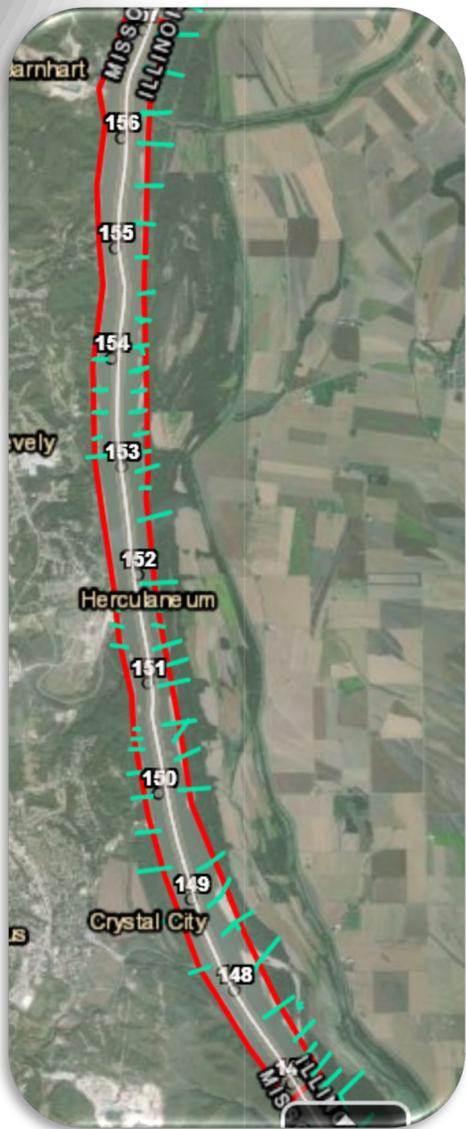


# CHUB MODEL VARIABLES



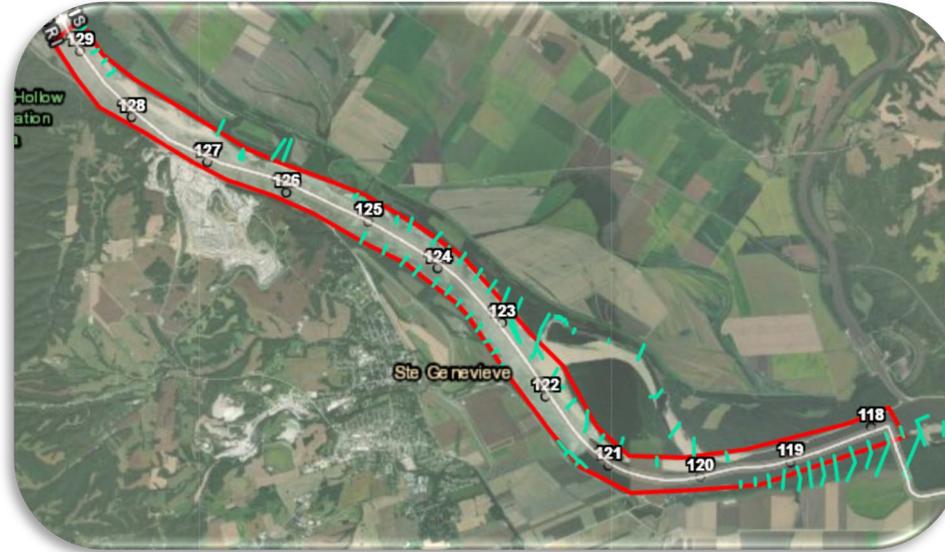


# HERCULANEUM REACH RESULTS

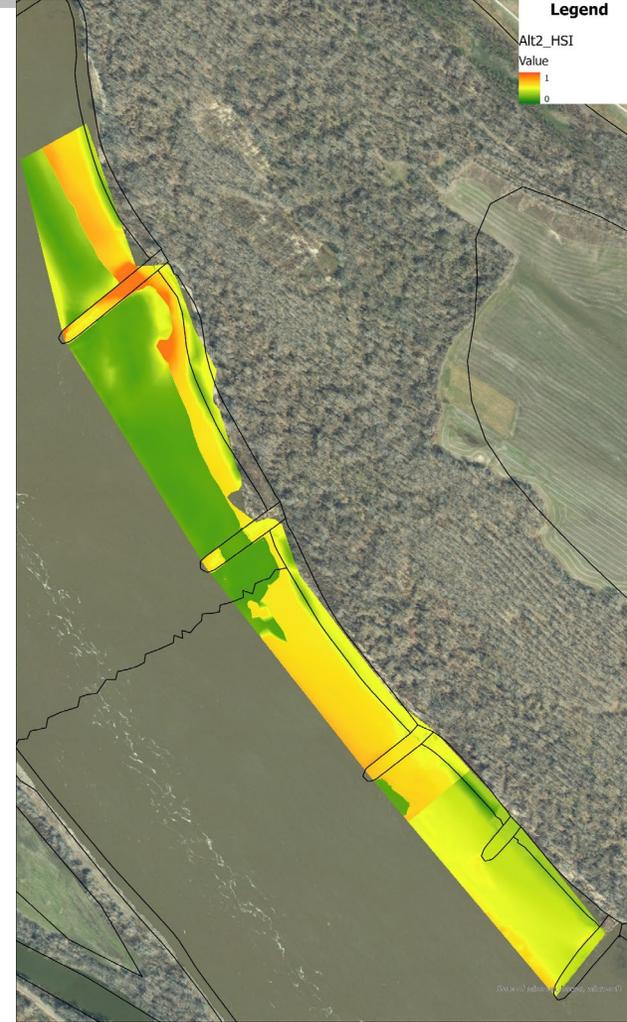
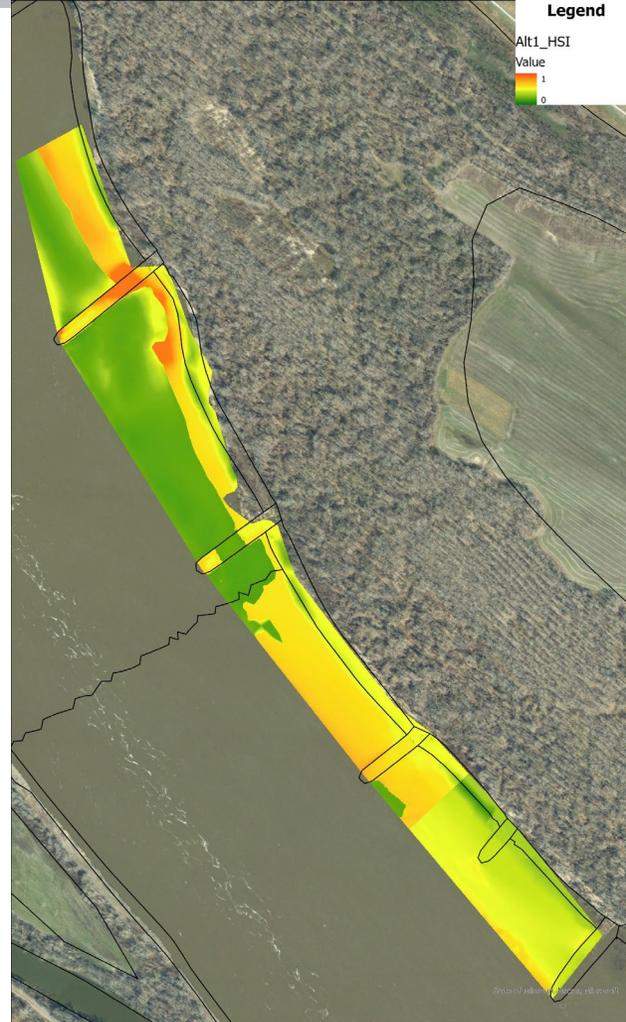


Alternative	Total Acres	Velocity			Depth			Substrate			Structured/ Unstructured			Check				
		Pre HSI	Post HSI	D	Pre HSI	Post HSI	D	Pre HSI	Post HSI	D	Pre HSI	Post HSI	D	Pre HSI	Post HSI	Pre HUs	Post HUs	Net HUs
BASE3	527.10	0.36	0.36	0.00	0.73	0.73	0.00	0.50	0.50	0.00	0.34	0.34	0.00	0.48	0.48	253.54	253.54	0.00
ALT1	527.10	0.36	0.38	0.03	0.73	0.69	-0.04	0.50	0.50	0.00	0.34	0.61	0.26	0.48	0.54	253.54	286.41	32.87
ALT2	527.10	0.36	0.42	0.06	0.73	0.68	-0.05	0.50	0.50	0.00	0.34	0.68	0.34	0.48	0.57	253.54	299.84	46.30
ALT3	527.10	0.36	0.40	0.05	0.73	0.71	-0.02	0.50	0.50	0.00	0.34	0.55	0.21	0.48	0.54	253.54	284.84	31.30

# STE. GENEVIEVE REACH RESULTS



River Mile	Total Acres	Velocity			Depth			Substrate			Structured/ Unstructured			Check				
		Pre HSI	Post HSI	Delta	Pre HSI	Post HSI	Delta	Pre HSI	Post HSI	Delta	Pre HSI	Post HSI	Delta	Pre HSI	Post HSI	Pre HUs	Post HUs	Net HUs
BASE	318.60	0.31	0.31	0.00	0.83	0.83	0.00	0.50	0.50	0.00	0.35	0.35	0.00	0.50	0.50	159.30	159.30	0.00
ALT1	318.60	0.31	0.38	0.06	0.83	0.83	-0.01	0.50	0.50	0.00	0.35	0.68	0.32	0.50	0.60	159.30	189.61	30.31
ALT2	318.60	0.31	0.36	0.05	0.83	0.82	-0.01	0.50	0.50	0.00	0.35	0.60	0.25	0.50	0.57	159.30	181.98	22.68
ALT3	318.60	0.31	0.35	0.03	0.83	0.83	-0.01	0.50	0.50	0.00	0.35	0.57	0.22	0.50	0.56	159.30	178.67	19.37



## BASE

## ALT 1

## ALT 2

## ALT 3

Dike	Alt 1	Alt 2	Alt 3
129.6 L	Slightly degrade towards bankline	Slightly degrade towards bankline	Slightly degrade towards bankline
129.2 L	Lower notch; Degrade interior	Lower notch; Degrade interior	Degrade interior
128.8 L	Shallow sloping bar formed by resloping higher at bank to lower to channel;	Shallow sloping bar formed by resloping higher at bank to lower to channel	Shallow sloping bar formed by resloping higher at bank to lower to channel

**BASE – Existing Conditions**



**ALT 1 - Rootless**



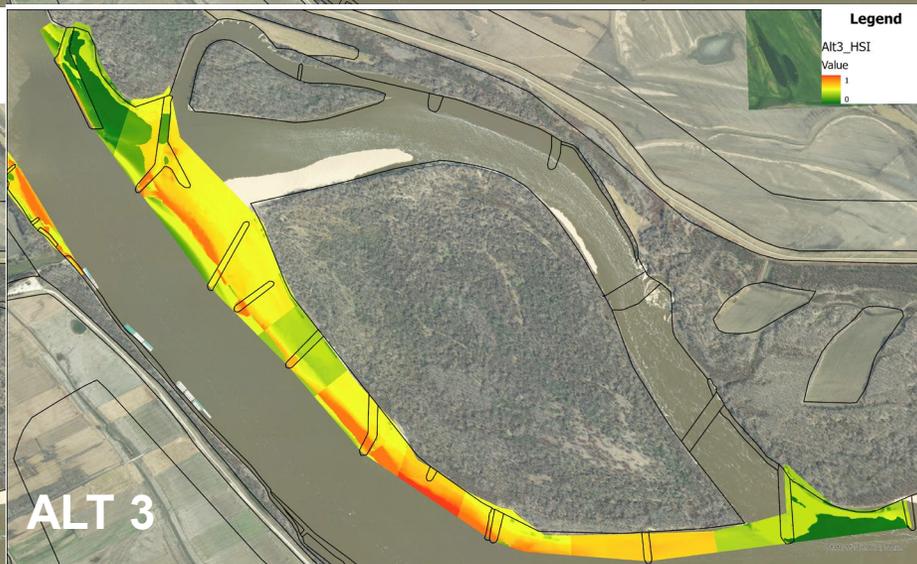
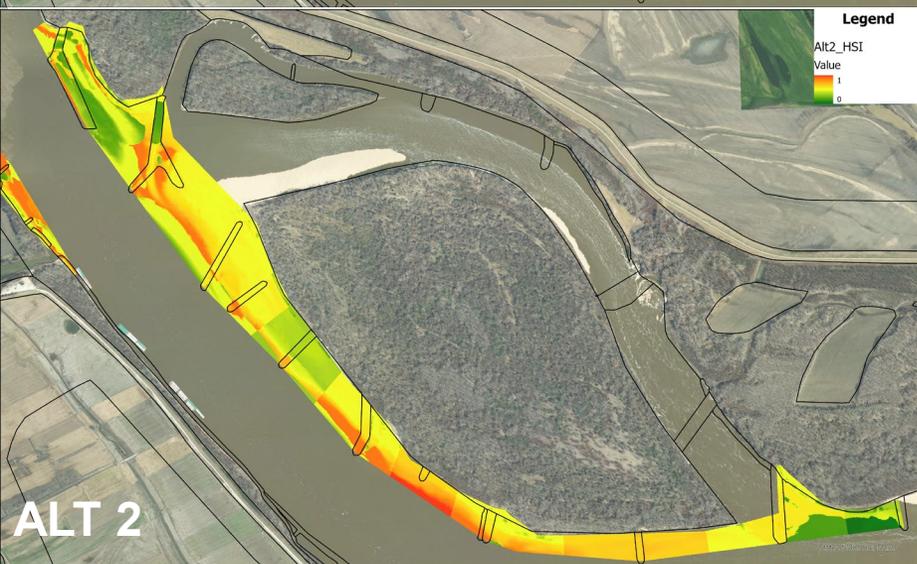
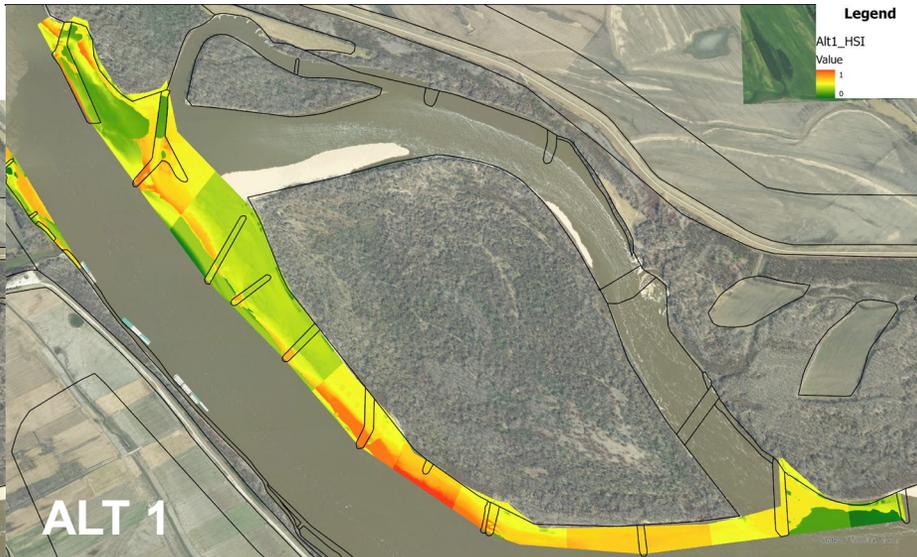
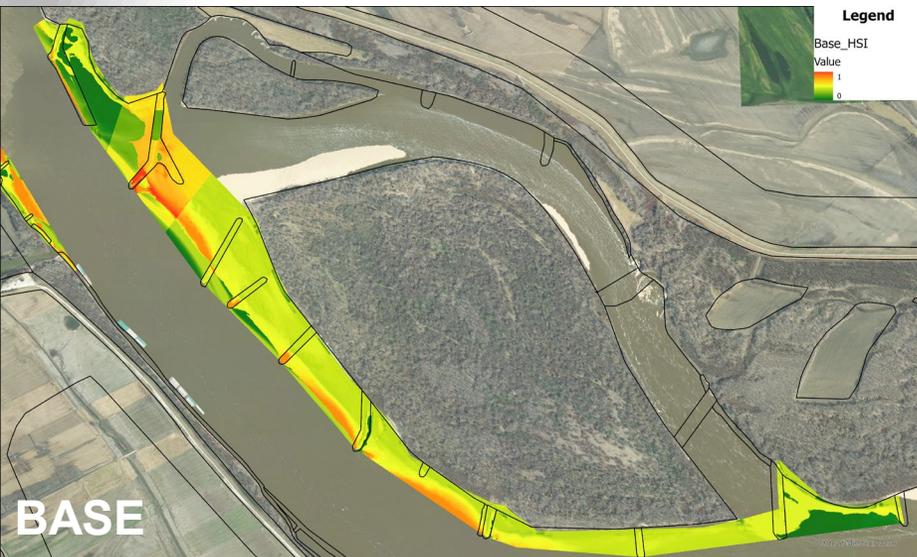
**ALT 2 - Step down benches**



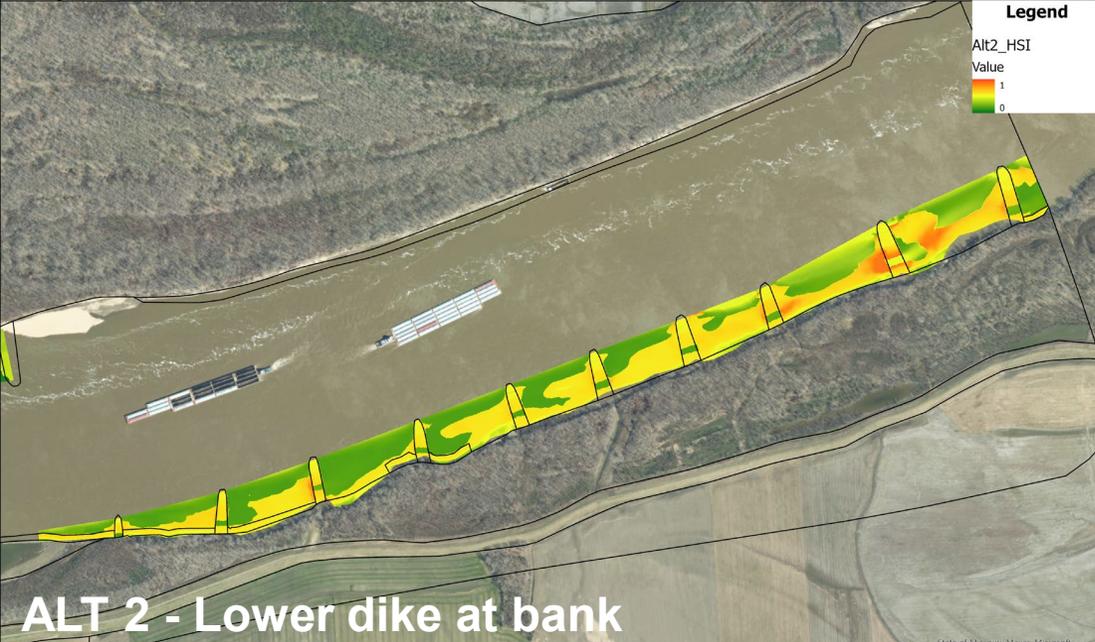
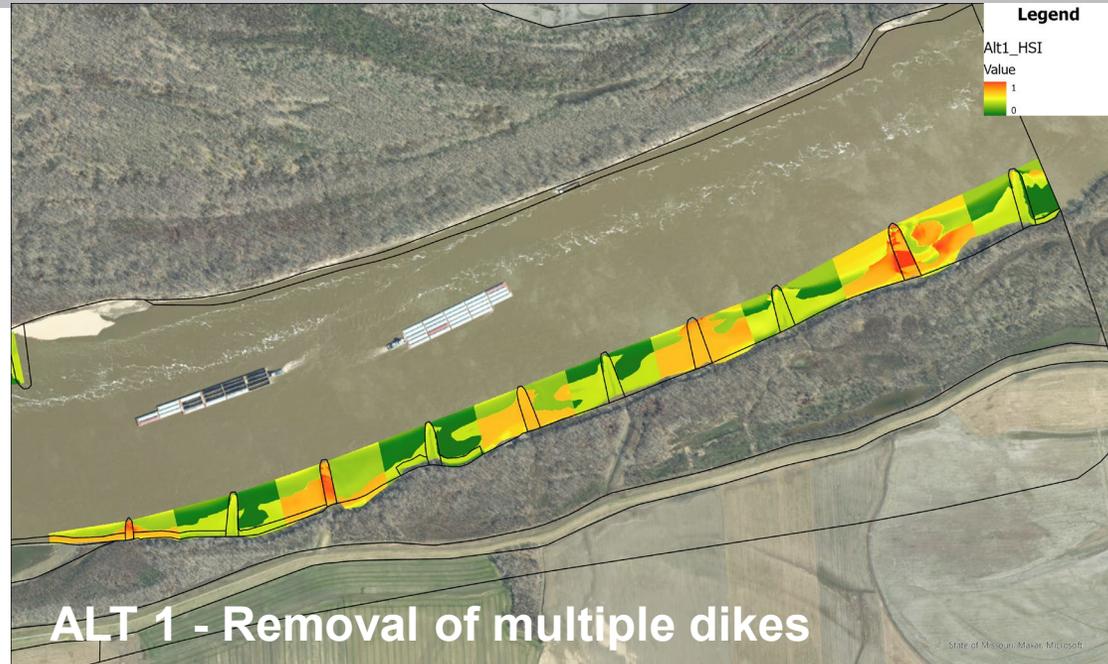
**ALT 3 - Angle upstream with notch near bank**



Dike	Alt 1	Alt 2	Alt 3
124.7 R-122.6R	Rootless	Step down benches	Angle upstream with notch near the bank



Dike	Alt 1	Alt 2	Alt 3
123.0 L	Slight degrade	Slight degrade	No Action
122.6 L	Crown manipulation	Crown manipulation	No Action
121.9 L	Remove and trail upstream	Degrade	Degrade
121.5 L	Degrade, MRS trail	Degrade	Degrade
121.2 L	Removal	Removal	Removal
121.0 L	Degrade, MRS trail	Degrade	Degrade
120.7 L	Removal	Removal	Removal
120.20L	Degrade, MRS trail	Degrade, MRS trail	No Action

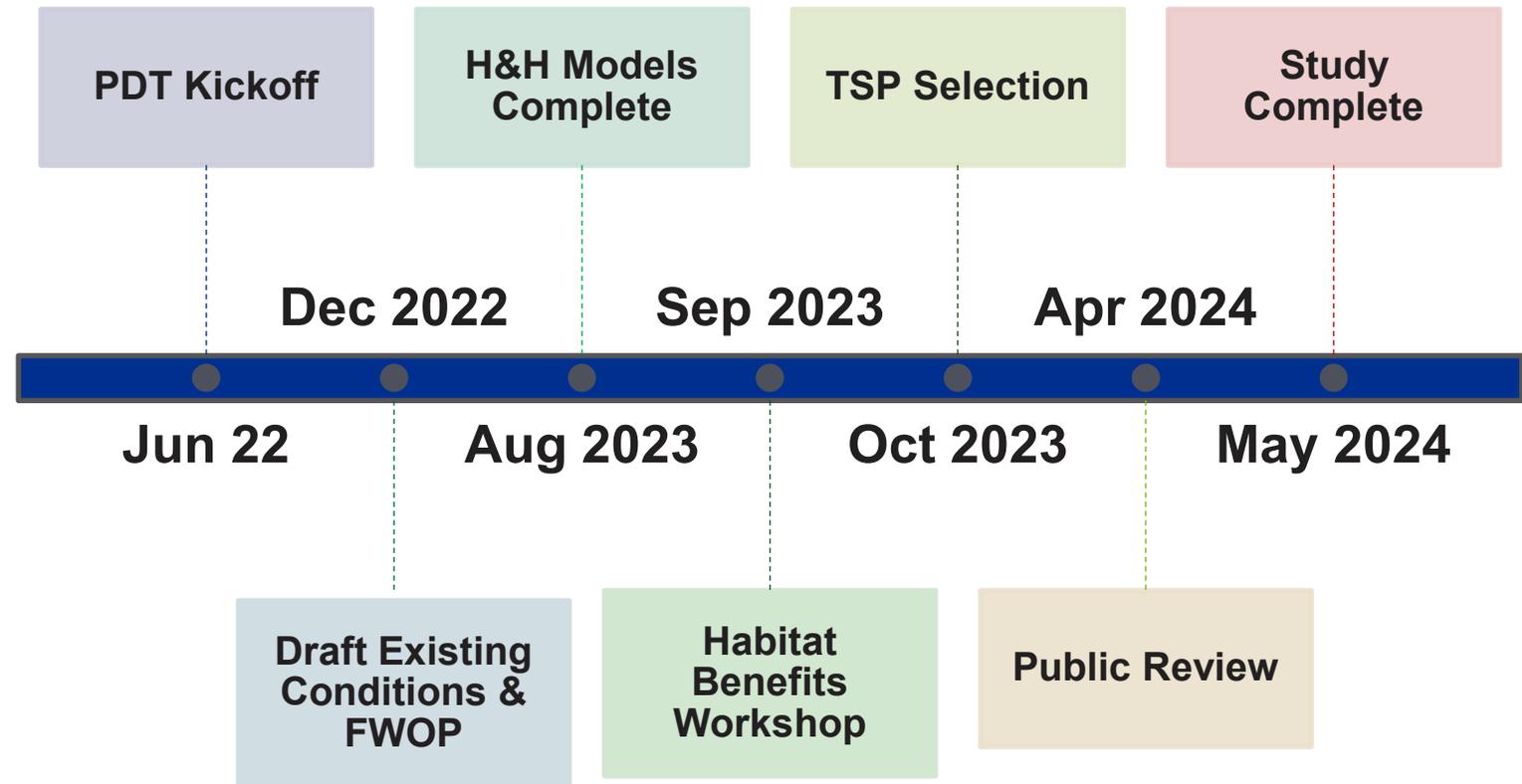


Dike	Alt 1	Alt 2	Alt 3
119.50R-118.1R	Removal of multiple dikes	Lower dike at bank	Stepping down to prevailing grade

# PROJECT TIMELINE

## NEXT STEPS

- Complete H&H modeling results of alternatives for each river reach
- Chub Model – HSI
- Habitat Benefits Workshop with RRAT
- Chose Tentatively Selected Plan / Design
- Study complete



# NESP ENVIRONMENTAL



# Questions??



US Army Corps  
of Engineers®

U.S. ARMY