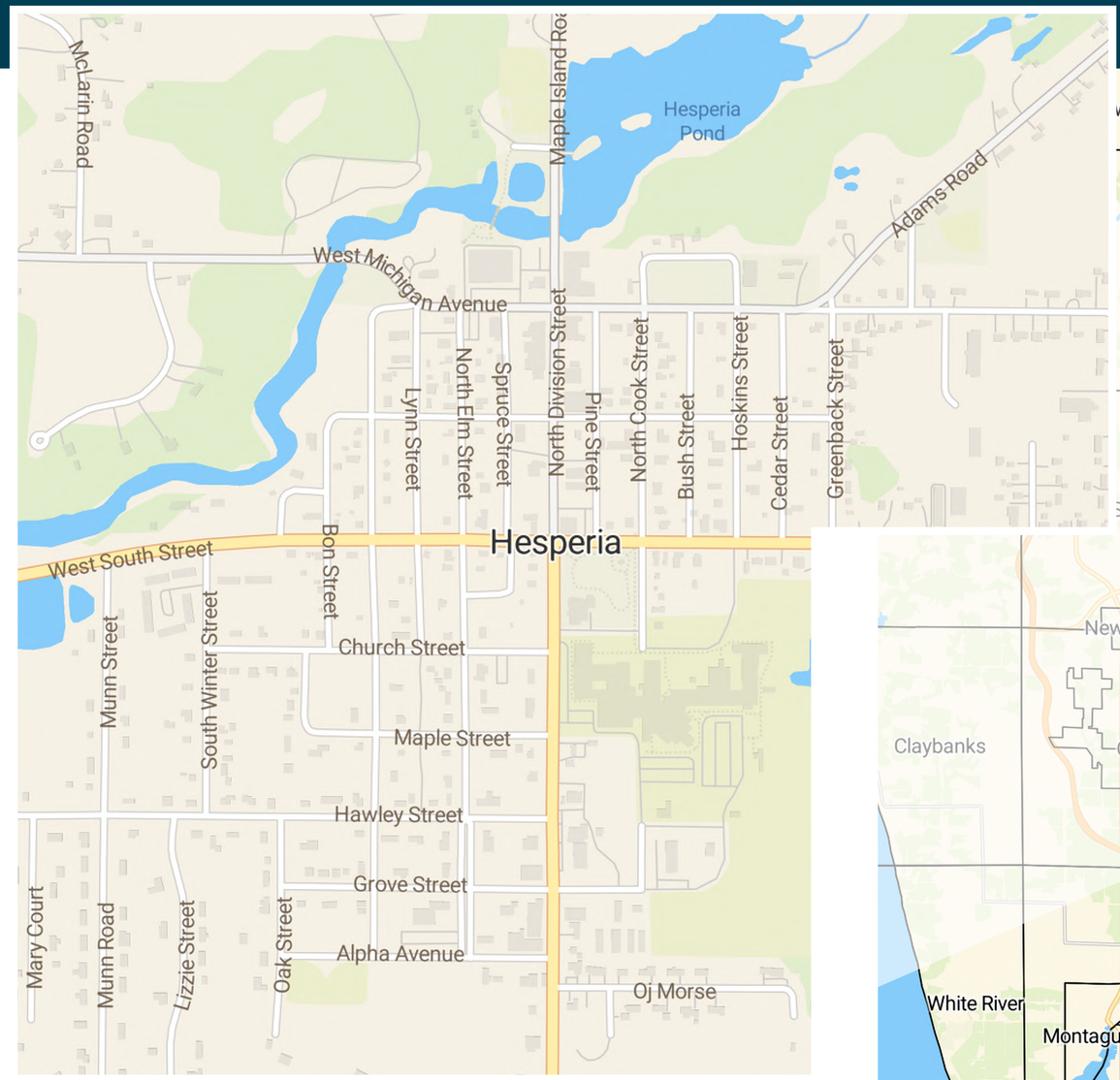
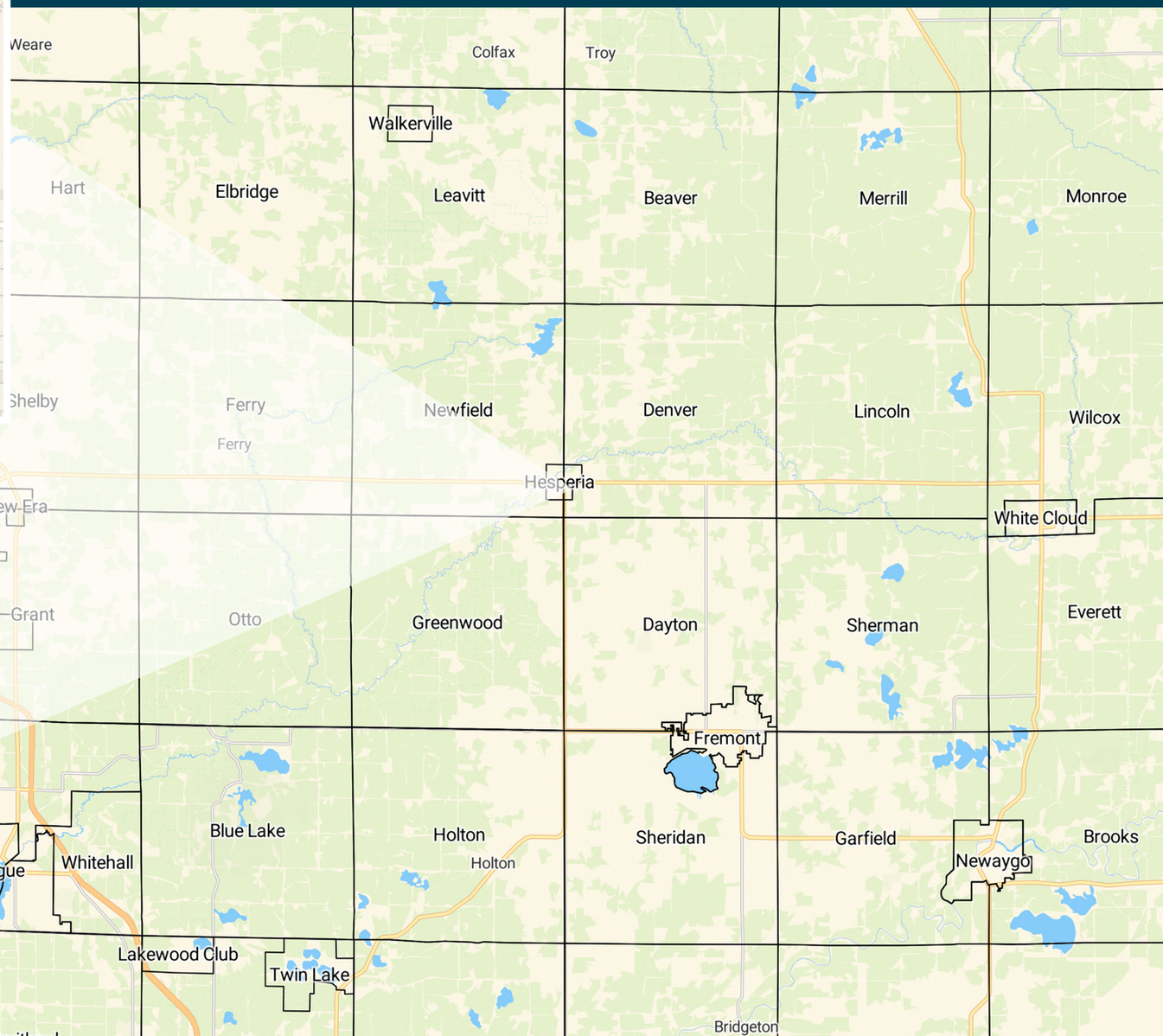
SHARE A MEMORY OF THE HESPERIA DAM

Use a post-it note!

WHERE DO YOU LIVE?

Place a sticker on the map!





PROJECT OVERVIEW

This project began after an inspection by the engineering firm hired by the Village, Fleis & Vanderbrink, and Michigan Department of Environment, Great Lakes, and Energy (EGLE) identified critical deficiencies with the dam. The Village and project partners hired GEI Consultants and Fleis & Vanderbrink to develop a scope of work to further identify deficiencies with the dam and prepare a feasibility study to assess rehabilitation measures to mitigate concerns.

PROJECT GOALS

The goal of this project is to develop a feasibility study that considers alternatives for the Hesperia Dam that will benefit the community and natural habitats that surround it.

This study considers alternatives for the Hesperia dam that address:

- Rehabilitate the dam to meet current dam safety requirements
- Minimizing risk of non-native, invasive Sea lamprey infestation
- Improving fish passage - Reconnecting important river habitat to Great Lakes species
- Maintaining/enhancing park usage and amenities

NEXT STEPS

1. Selection of Alternative
2. Design of Alternative and Permitting *
3. Bidding to Construction *
4. Construction *

** Requires additional funding. Funding strategy is currently in progress.*

PROJECT FUNDING

This feasibility study is funded by the EGLE Dam Risk Reduction Grant Program and Great Lakes Fishery Commission (GLFC).

WHAT IS A FEASIBILITY STUDY?

A feasibility study is a detailed preliminary analysis that reviews and considers critical aspects of a proposed project in order to determine the best solution for the future of the dam. A feasibility study is often the first step of a multi-phase project and is largely a planning level study. The alternative designs developed during this study are at an approximate 10% design level.

KEY PROJECT PARTNERS

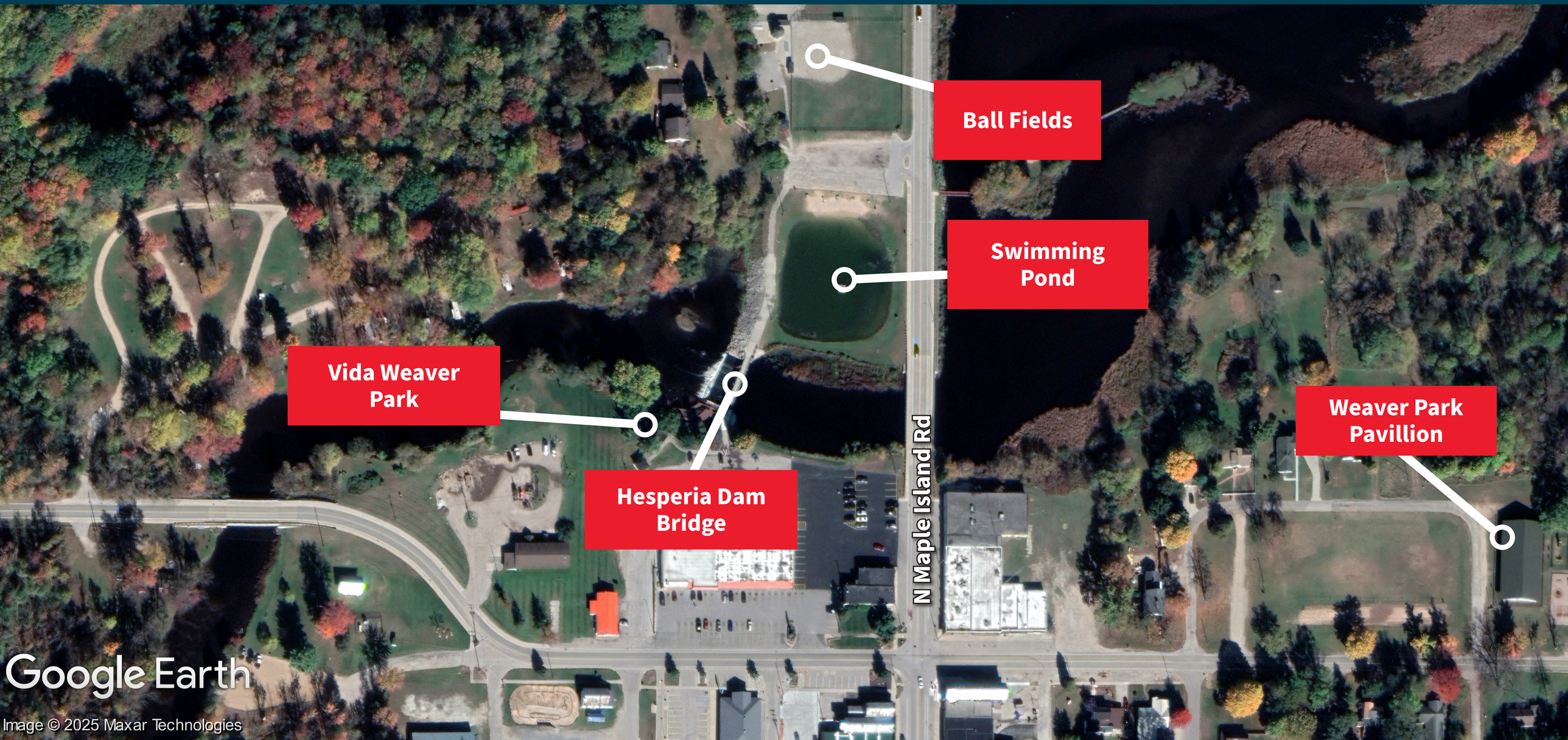
Owner

Partners/Regulatory Agencies

The feasibility study is being completed by GEI Consultants and Fleis & Vanderbrink.

WHICH LOCATIONS DO YOU VISIT MOST?

Use a Post-It note to describe what activities you do there!



WHY IS DAM SAFETY IMPORTANT?

Dam Safety practices are required to prevent loss of life, damage to property and the environment, and preserve economic vitality. Recent examples have shown the cost of reconstructing a failed dam is approximately 10x more then the cost of rehabilitation.

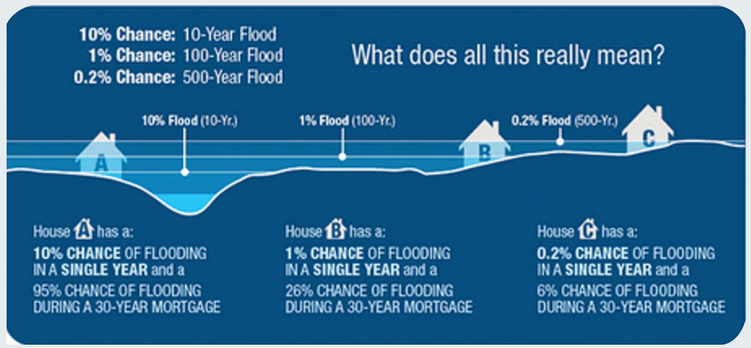
STORM CAPACITY AT HESPERIA DAM

Dams must be prepared for extreme rainfall events.

The Hesperia Dam is required to be able to pass **200-year storm events**.

Currently, it can only safely pass a **100-year storm**.

2 YEAR	5 YEAR	10 YEAR	50 YEAR	100 YEAR	200 YEAR
✓	✓	✓	✓	✓	X



Citation: https://www.fema.gov/sites/default/files/documents/fema_r3_reducing-risk-in-floodplain-guide.pdf

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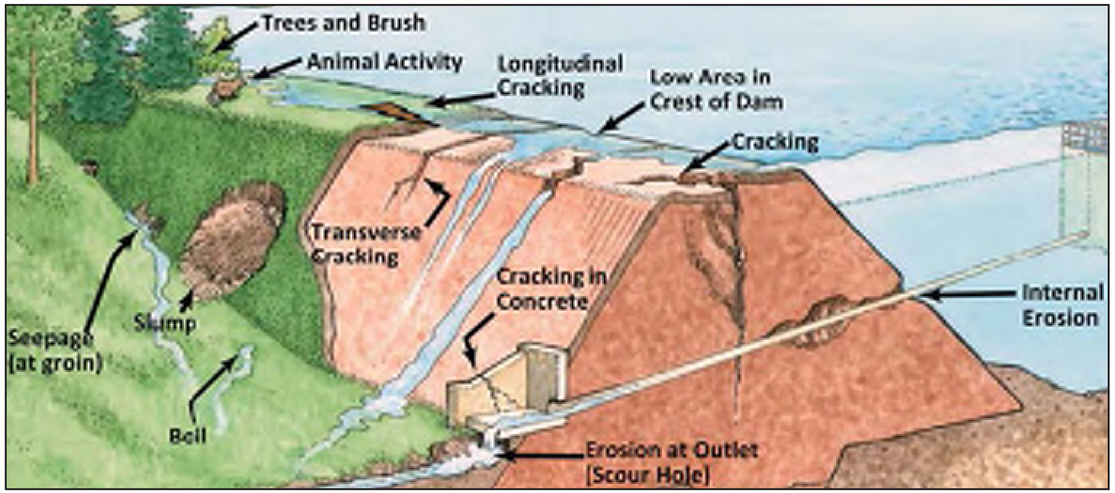
The photos used are copyright of Federal Emergency Management Agency.

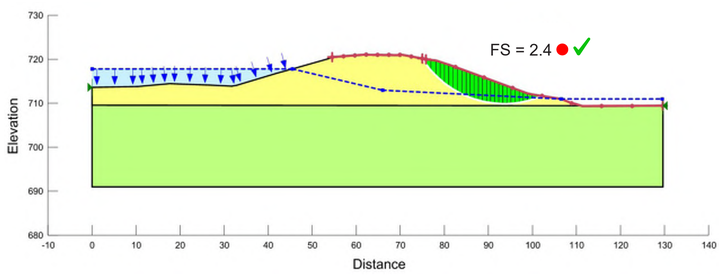
COMMON CAUSES OF DAM FAILURE

Dams can have deficiencies that create safety issues during normal conditions and extreme rainfall events. There are several common dam failure modes.

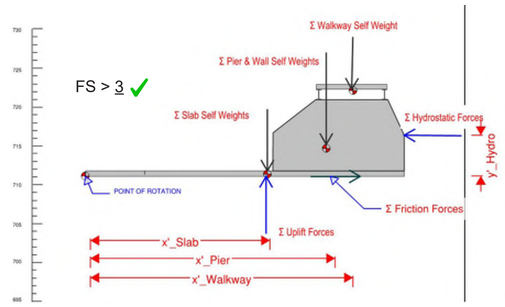


Citation and figure file: https://www.fema.gov/sites/default/files/2020-08/fema_911_pocket_safety_guide_dams_impoundments_2016.pdf

DAM STABILITY



EMBANKMENT STABILITY



STRUCTURAL STABILITY

Existing spillway structure and embankments meet industry standard factors of safety for stability. However, will require upgrades to address spillway capacity requirements. This allows dam rehabilitation to be a viable option and the dam to continue to serve as a critical barrier for watershed health and sea lamprey protection.

DAM'S CURRENT CONDITION

A recent assessment identified several deficiencies that affect the dam's performance, safety, and maintenance. These include the following concerns:

EROSION

VEGETATION OVERGROWTH

OVERTOPPING

STOPLOG OPERATION

SEEPAGE

Sea lamprey escapement risk

CONDITION ASSESSMENT CATEGORY

CONDITION	DESCRIPTION
Satisfactory	No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions.
Fair	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in dam safety deficiency.
Poor	**A dam safety deficiency is recognized for loading conditions that may realistically occur. Remedial action or further investigations and studies are necessary to determine risk.**
Unsatisfactory	A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.
Not Rated	The dam has not been inspected, is not under State jurisdiction, or has been inspected bu for whatever reason, has not been rated.

HAZARD POTENTIAL CATEGORY

CLASSIFICATION	LOSS OF HUMAN LIFE	ECONOMIC, ENVIRONMENTAL, LIFELINE LOSSES
Low	None Expected	Low (Generally limited to owner)
Significant	**None Expected**	**Yes**
High	Probable (1+ expected)	Yes

INTERM RISK REDUCTION MEASURE

Village has increased monitoring of the dam for seepage and flow management.

Due to significant hazard potential rating, minimal improvement in hydraulic capacity and no other significant dam safety concerns an interim draw down is not currently warranted.

HESPERIA DAM

circa 1900

Dam and powerhouse built

1925

Downstream evacuations due to dam breach upstream of Hesperia

Oceana sheriff praises volunteers who helped save dam at Hesperia

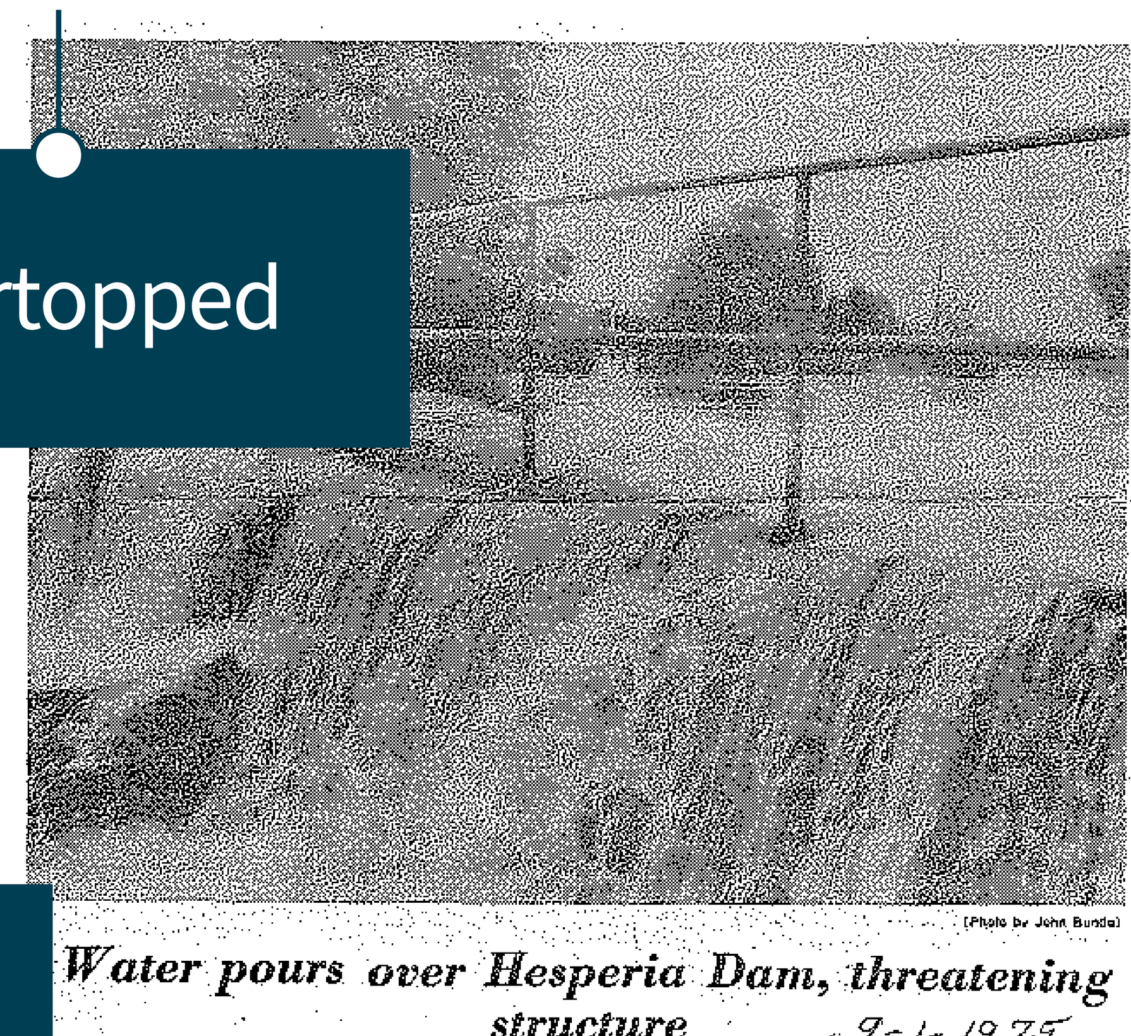
~1950s

Hydroelectric power generation ends & Village takes ownership of dam

Begin recording overtopping events

1975

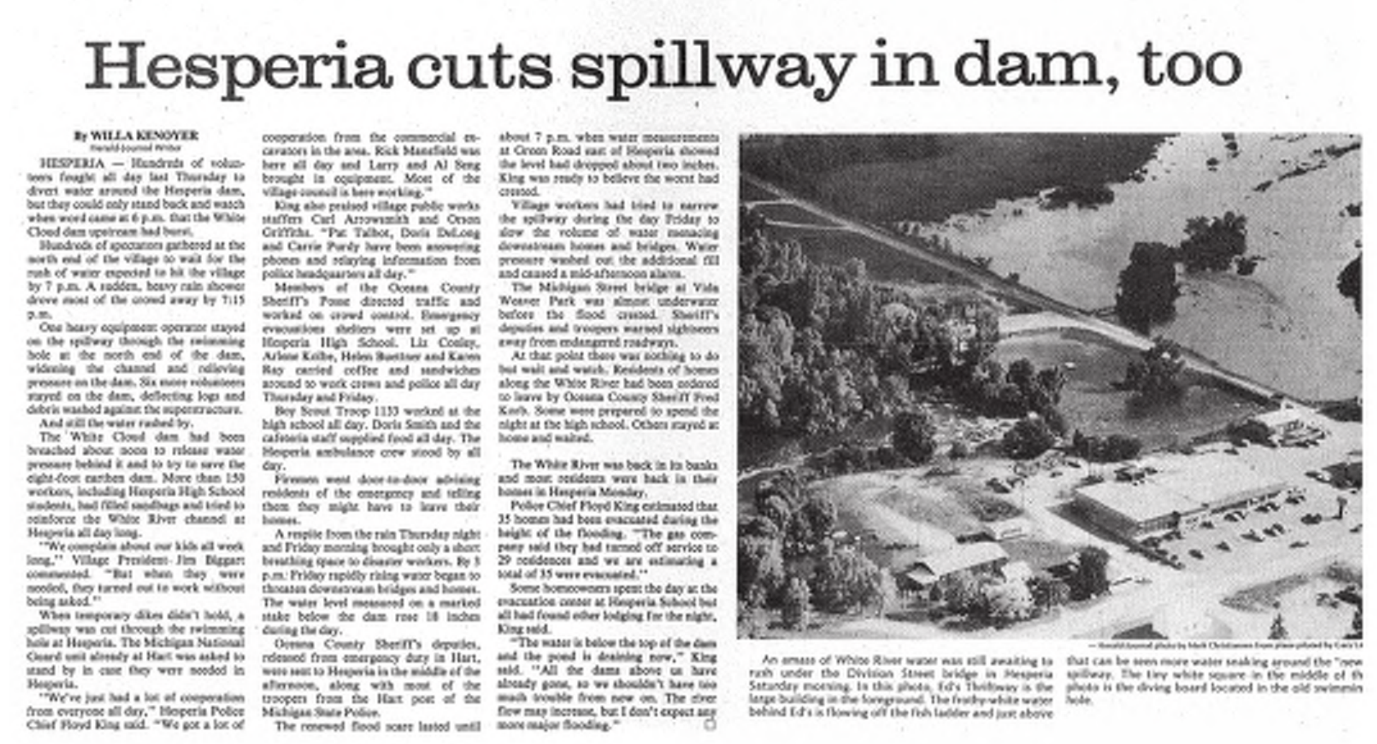
Overtopped



Water pours over Hesperia Dam, threatening structure 9-1-1975

1986

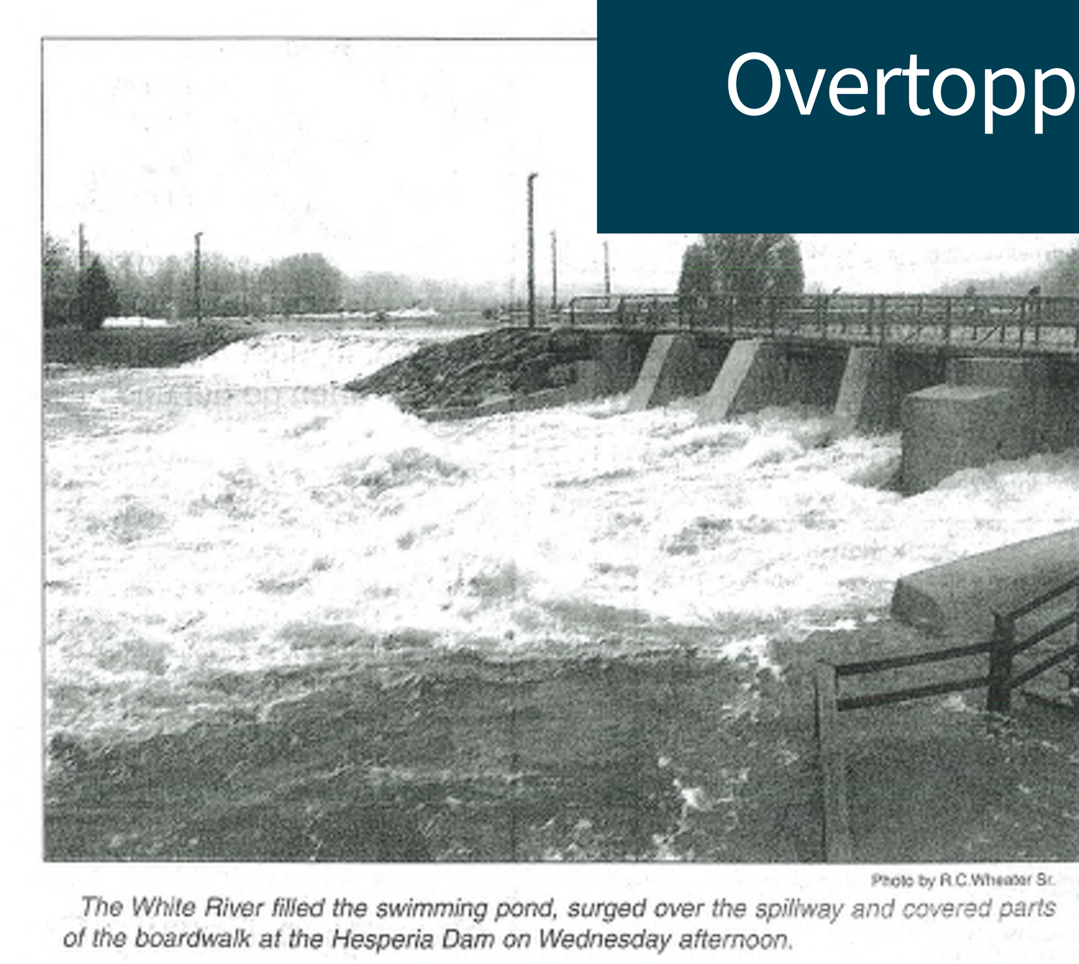
Mechanically breached as precaution to upstream dam failure. Auxillary spillway added



Hesperia cuts spillway in dam, too

1995

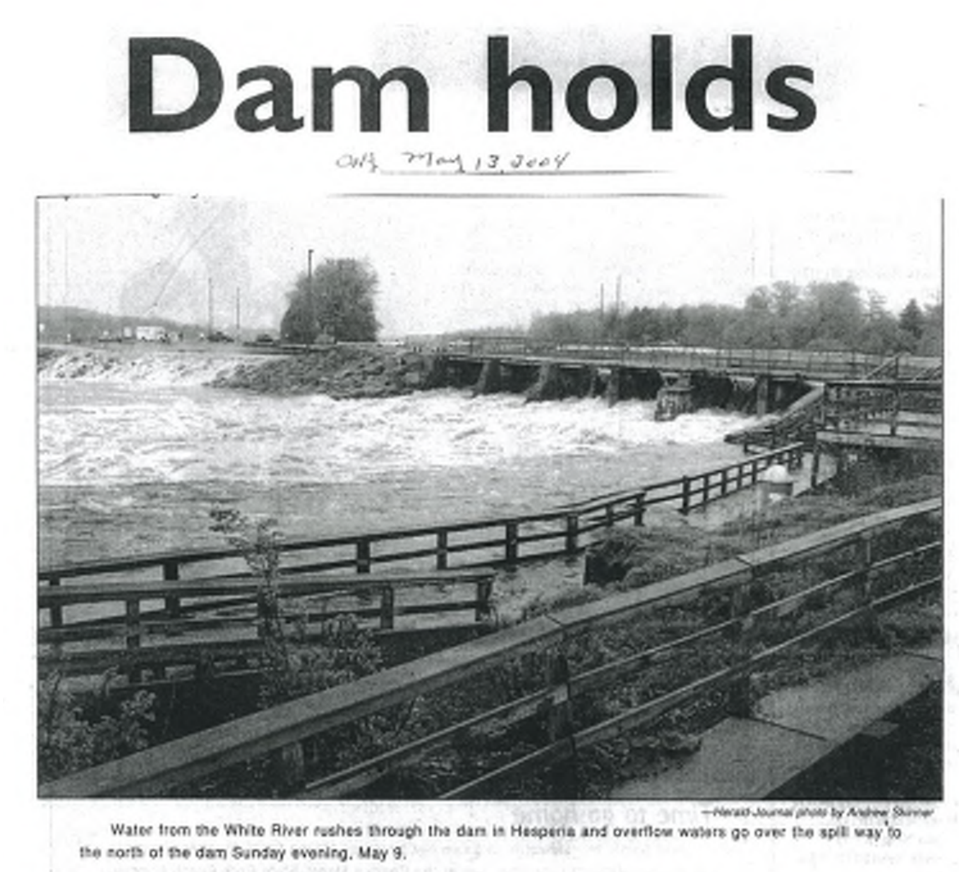
Overtopped



The White River filled the swimming pond, surged over the spillway and covered parts of the boardwalk at the Hesperia Dam on Wednesday afternoon.

2004

Nearly overtopped



Dam holds

Water from the White River rushes through the dam in Hesperia and overflow waters go over the spill way to the north of the dam Sunday evening, May 9.

2014

Overtopped

Overtopped

2018

Overtopped

2021

Stoplog failure

2024

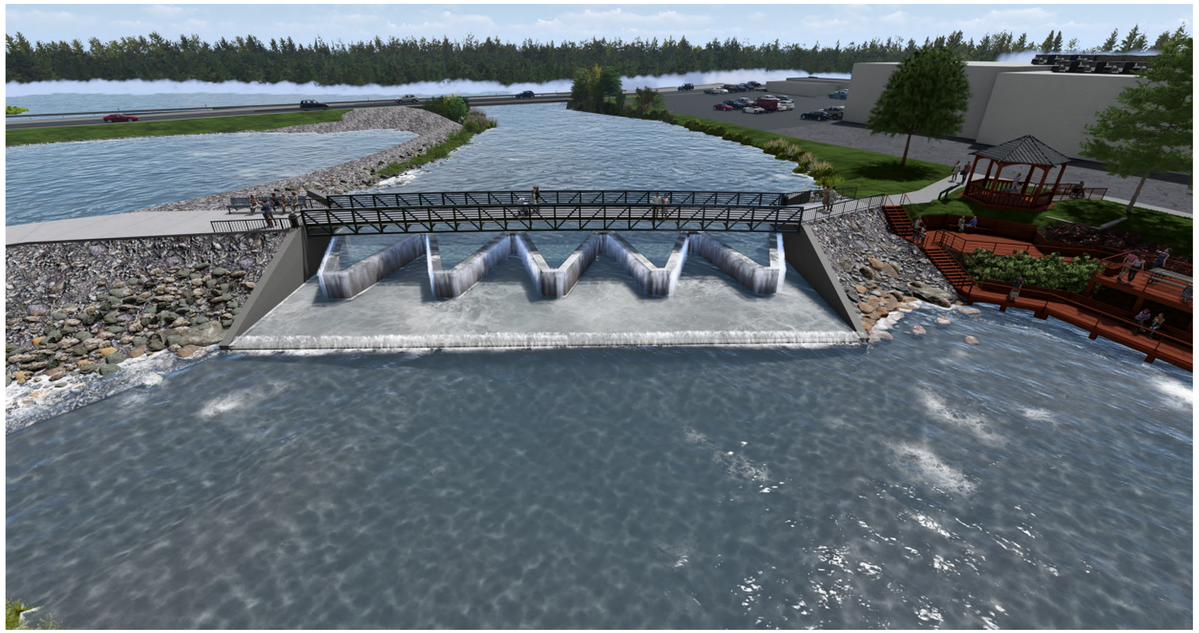
Rehabilitation feasibility study begins

LIST YOUR 3 CONCERNS FOR HESPERIA DAM

Use a sticker to vote for priority option!

Aquatic Invasive Species (e.g. Sea Lamprey)	
Community Gathering Space	
Dam Failure	
Fish Passage	
Flooding	
Nature Viewing	
Other (List)	
River Rock Campground Access	
Safe Swimming Area	
Shoreline Access	
Walking Bridge over Dam	
Wildlife Habitat	

DAM DESIGN ALTERNATIVE: 1 LABYRINTH



Rendering of proposed design

Estimated Cost	Low Cost Estimate	High Cost Estimate
Dam Rehabilitation	$8,000,000	$12,000,000
Amenities	$1,800,000	$2,600,000
Engineering & Permitting	$1,000,000	$1,500,000
Engineering & Construction Oversight	$1,000,000	$1,500,000
TOTAL	**$11,800,000**	**$17,600,000**

DESIGN FACTORS

Benefits

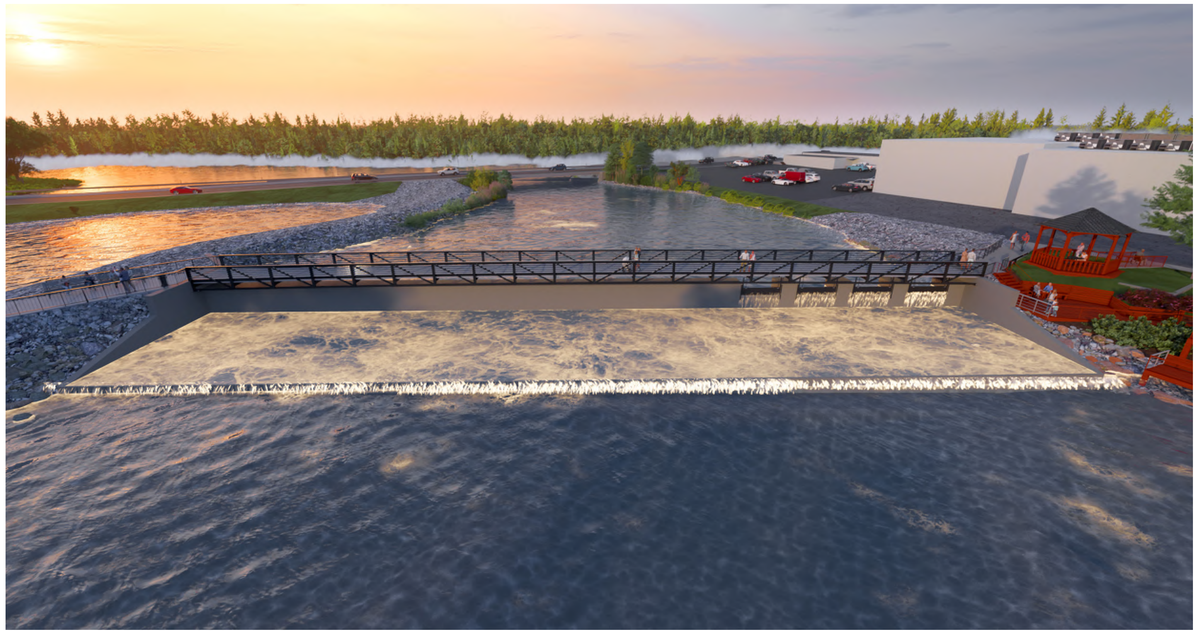
- Smaller footprint compared to Alternative 2
- Passive structure with no gate operation required
- Upstream cutoff wall helps address seepage
- Maintains impoundment for recreational use

Considerations

- Ice buildup can cause problems for labyrinth structures
- Modifications needed to existing berm at swimming pond

Rendering of proposed design

DAM DESIGN ALTERNATIVE: 2 GATED STRAIGHT DROP



Rendering of proposed design

Estimated Cost	Low Cost Estimate	High Cost Estimate
Dam Rehabilitation	$8,200,000	$12,300,000
Amenities	$2,200,000	$3,200,000
Engineering & Permitting	$1,100,000	$1,600,000
Engineering & Construction Oversight	$1,100,000	$1,600,000
TOTAL	**$12,600,000**	**$18,700,000**

DESIGN FACTORS

Benefits

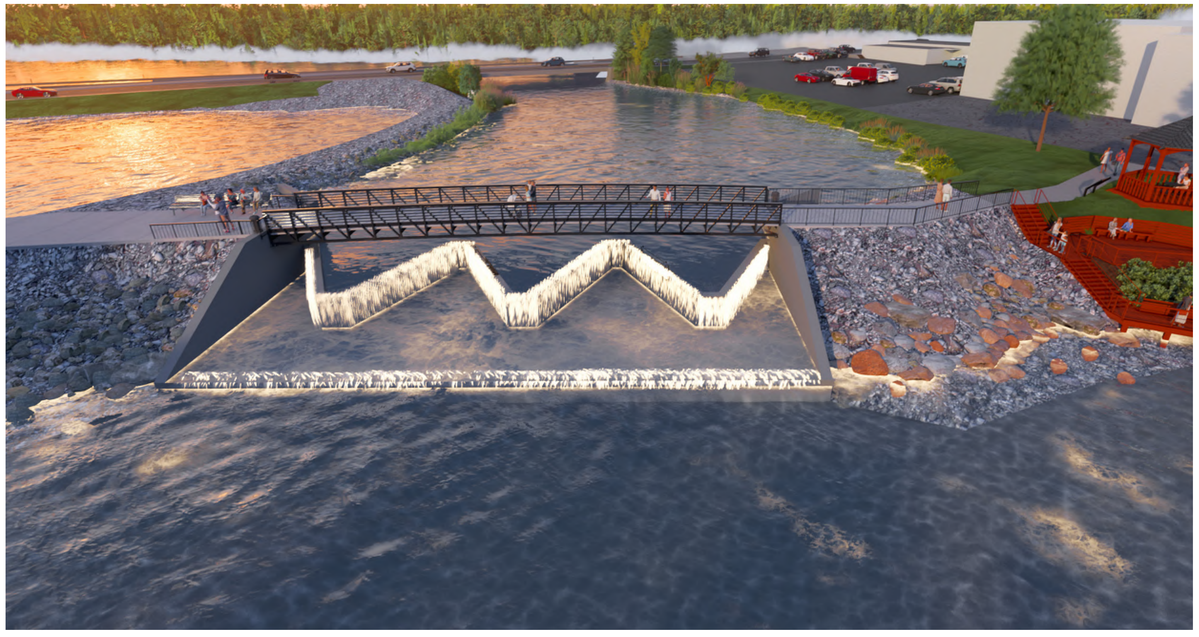
- Offers operational flexibility
- Upstream cutoff wall helps address seepage
- Maintains impoundment for recreational use

Considerations

- Requires greater area which would reduce the footprint of the swimming pond
- Modifications needed to existing berm at swimming pond
- Requires gate operations during higher flood events
- Largest footprint among alternatives

Rendering of proposed design

DAM DESIGN ALTERNATIVE: 3 GATED LABYRINTH



Rendering of proposed design

Estimated Cost	Low Cost Estimate	High Cost Estimate
Dam Rehabilitation	$7,400,000	$11,100,000
Amenities	$1,400,000	$2,000,000
Engineering & Permitting	$900,000	$1,400,000
Engineering & Construction Oversight	$900,000	$1,400,000
TOTAL	**$10,600,000**	**$15,900,000**

DESIGN FACTORS

Benefits

- Smallest footprint among alternatives
- Offers operational flexibility
- Upstream cutoff wall helps address seepage
- Maintains impoundment for recreational use

Considerations

- Ice buildup can potentially cause problems for labyrinth structures.
- Modifications needed to existing berm at swimming pond
- Requires gate operations during higher flood events
- Larger footprint compared to Alternative 1

Rendering of proposed design

WHAT IS FISH PASSAGE?

WHAT IS A BARRIER?

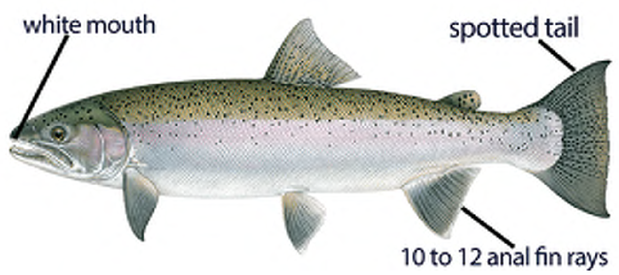
A barrier is anything that prevents or reduces the ability of aquatic species to move when and/or where needed to survive and complete their life cycle.

Physical barriers:
dam, culverts, levees

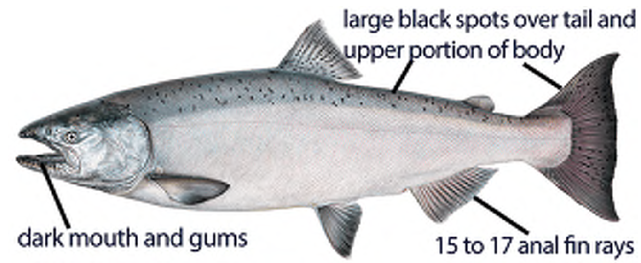
Environmental barriers:
excessive sediment, poor water quality

WHAT IS FISH PASSAGE?

Fish passage is the ability of fish or other aquatic species to move through an aquatic system among all habitats necessary to complete their life cycle.

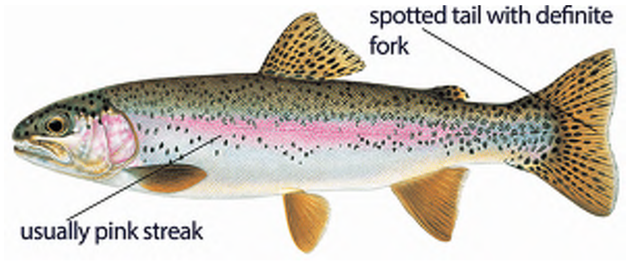


STEELHEAD TROUT



CHINOOK SALMON

WALLEYE



RAINBOW TROUT

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The photos used are provided by the Michigan Department of Natural Resources.

NATURAL VS TECHNICAL FISH PASSAGE

NATURAL

BENEFITS:

- Emulates natural stream conditions
- Maintains sediment transport
- Supports passage of more species (aids mussel conservation)
- Removable barrier can block lamprey during spawning

AIM TO PASS:

- Smallmouth Bass, Largemouth Bass
- Northern Pike, Walleye, Channel Catfish, Flathead Catfish
- Crappie, darters, minnows, and various sucker species
- Chinook, Coho, Steelhead, Brown Trout, Rainbow Trout

DISADVANTAGES:

- May require imported fill such as boulders and cobble
- Additional real estate required
- Temporary barrier required during April to July, only jumping species passage during this time

TECHNICAL

BENEFITS:

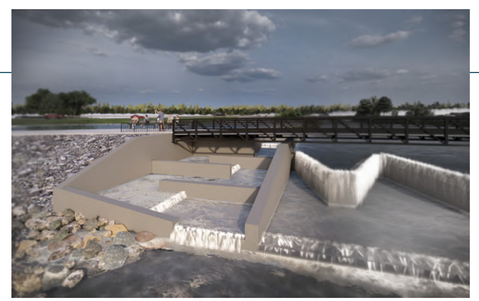
- Pool and weir configuration
- Aims to pass jumping species
- Drop heights to block sea lamprey

AIM TO PASS:

- Chinook, Coho
- Steelhead, Brown Trout, Rainbow Trout

DISADVANTAGES:

- Low structure width/low attraction flows can make it difficult for fish to find the structure
- No sediment continuity



SEA LAMPREY: AN INVASIVE PARASITE

WHAT IS A SEA LAMPREY?

- Parasitic fish (Petromyzon marinus) native to the Atlantic Ocean
- Feed by sucking blood and body fluids from other fish
- Have remained largely unchanged for more than 340 million years
- Survived through at least four major extinction events

HOW TO CONTROL?

Pheromone & Alarm Cues

Traps

Barrier

Lampricides

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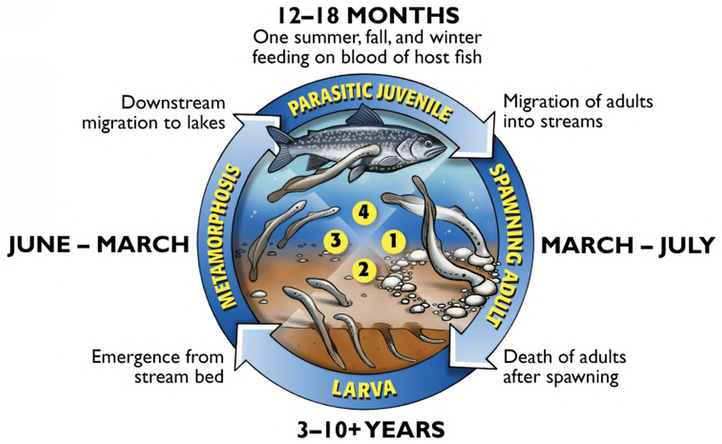
The photos used are provided by the Great Lakes Fishery Commission.



DID YOU KNOW?

One female can lay up to 100,000 eggs (10% survival rate)

HOW DO THEY KILL?

- First, they use their suction-cup mouth to stick onto a fish.
- Next, they dig their teeth into the fish's skin to hold on tight.
- Then, they scrape through the scales and skin with their sharp tongue.
- Finally, they drink the fish's body fluids. They release a special enzyme that keeps the blood from clotting, similar to how leeches feed.

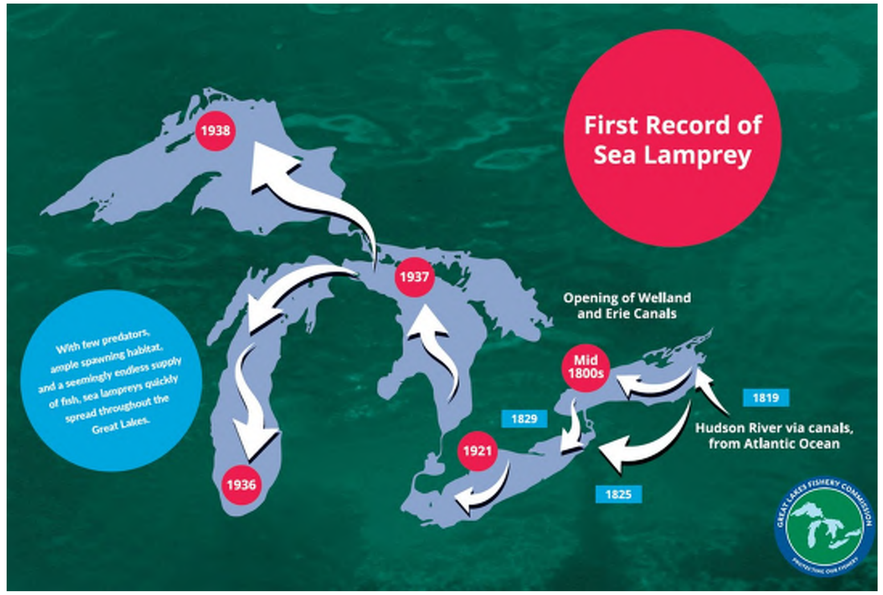
SEA LAMPREY: GREAT LAKES INVASION

DID YOU KNOW?

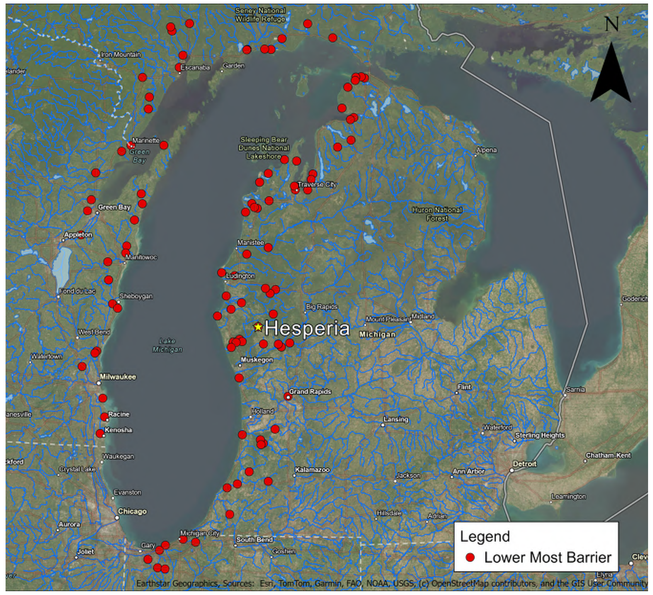
Lampricide treatments of the White River cost on average $550,000 per treatment.

DID YOU KNOW?

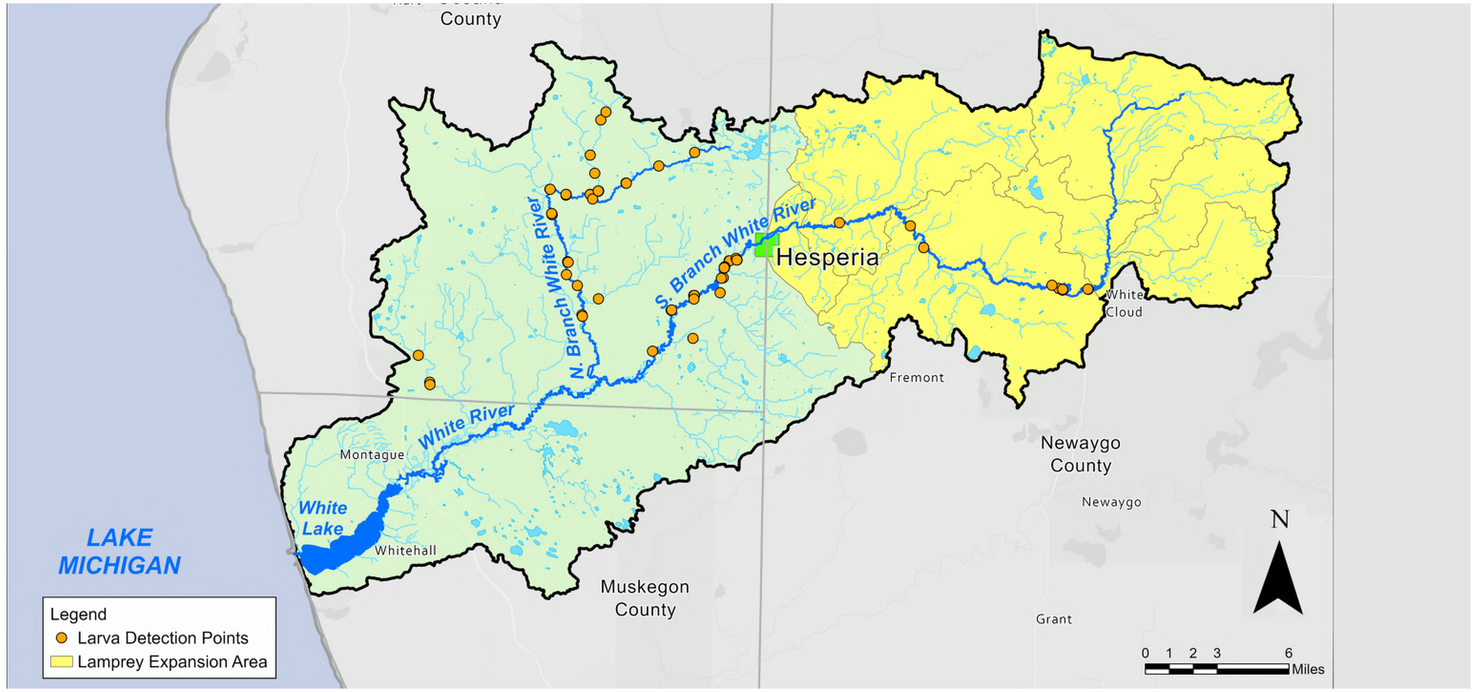
One lamprey can eat up to 40 pounds of fish over their 12-18 month feeding period.



Sea lampreys invade the Great Lakes through shipping canals.



Lower most barriers help protect the watershed from sea lamprey.

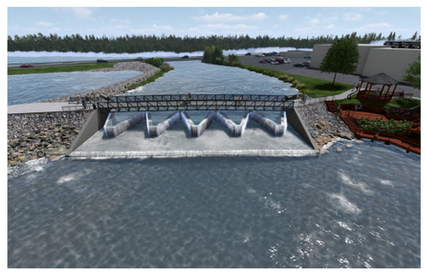
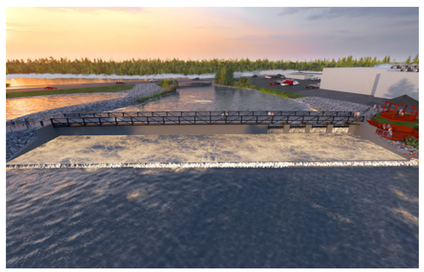
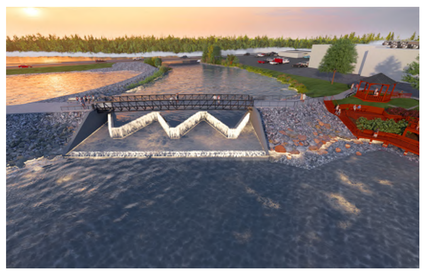
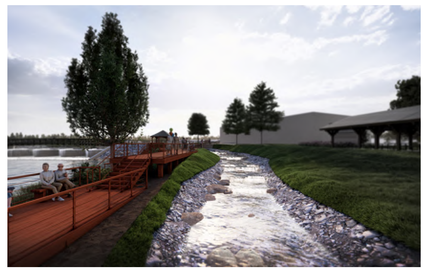
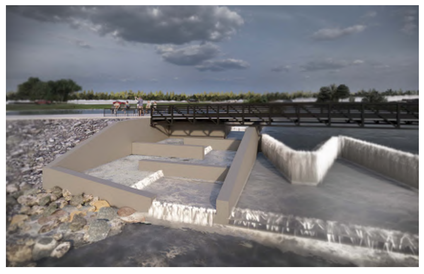


WHITE RIVER WATERSHED

The rehabilitated Hesperia Dam will protect approximately 137,000 acres within the watershed and 30 miles of the White River from sea lamprey habitat expansion.

WHICH DAM FEATURES TYPE DO YOU PREFER?

Use a sticker to vote for each option!

Feature	Design Example #1	Design Example #2	Design Example #3	Prefer neither option
DAM ALTERNATIVE				
BRIDGE DESIGN				
FISH PASSAGE OPTION				No Fish Passage

WHICH AMENITY FEATURES TYPE DO YOU PREFER?

Use a sticker to vote for each option!

Feature	Design Example #1	Design Example #2	Prefer neither option	Do not want
SHORELINE ACCESS	 Photo credit: Richard Bednarski			
EDUCATIONAL SIGNAGE				
SEATING